BS EN IEC 61587-1:2022

BSI Standards Publication

Mechanical structures for electrical and electronic equipment — Tests for IEC 60917 and IEC 60297 series

Part 1: Environmental requirements, test setups and safety aspects

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National foreword

This British Standard is the UK implementation of EN IEC 61587-1:2022. It is identical to IEC 61587-1:2022. It supersedes BS EN 61587-1:2017, which will be withdrawn on 5 September 2022.

The UK participation in its preparation was entrusted to Technical Committee EPL/48, Electromechanical components and mechanical structures for electronic equipment.

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

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Amendments/corrigenda issued since publication

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English Version

Mechanical structures for electrical and electronic equipment - Tests for IEC 60917 and IEC 60297 series - Part 1: Environmental requirements, test setups and safety aspects (IEC 61587-1:2022)

Structures mécaniques pour les équipements électriques et électroniques - Essais pour les séries IEC 60917 et IEC 60297 - Partie 1: Exigences environnementales, montages d'essai et aspects liés à la sécurité (IEC 61587-1:2022)

Mechanische Bauweisen für elektrische und elektronische Einrichtungen - Prüfungen für die Reihen IEC 60917 und IEC 60297 - Teil 1: Umgebungsanforderungen, Prüfaufbau und Sicherheitsaspekte (IEC 61587-1:2022)

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Europäisches Komitee für Elektrotechnische Normung

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European foreword

The text of document 48D/743/FDIS, future edition 5 of IEC 61587-1, prepared by SC 48D "Mechanical structures for electrical and electronic equipment" of IEC/TC 48 "Electrical connectors and mechanical structures for electrical and electronic equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61587-1:2022.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-11-11
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2025-02-11

This document supersedes EN 61587-1:2017 and all of its amendments and corrigenda (if any).

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where 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.

Publication	Year	Title	EN/HD	Year
IEC 60068-1	-	Environmental testing - Part 1: General and guidance	EN 60068-1	-
IEC 60068-2-1	-	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	-
IEC 60068-2-2	-	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	-
IEC 60068-2-6	-	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	-
IEC 60068-2-11	-	Environmental testing - Part 2-11: Tests - Test Ka: Salt mist	EN IEC 60068-2-11	-
IEC 60068-2-27	-	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	-
IEC 60068-2-30	-	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)	EN 60068-2-30	-
IEC 60068-2-42	-	Environmental testing - Part 2-42: Tests - Test Kc: Sulphur dioxide test for contacts and connections	EN 60068-2-42	-
IEC 60068-2-43	-	Environmental testing - Part 2-43: Tests - Test Kd: Hydrogen sulphide test for contacts and connections	EN 60068-2-43	-
IEC 60068-2-49	-	Basic environmental testing procedures - Part 2-49: Tests - Guidance to test Kc: Sulphur dioxide test for contacts and connections	-	-
IEC 60068-2-52	-	Environmental testing - Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)	EN IEC 60068-2-52	-
IEC 60068-2-64	2008	Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance	EN 60068-2-64	2008

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+ A1	2019		/A1	2019
IEC 60297	series	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series	EN 60297	series
IEC 60297-3-100	-	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series - Part 3-100: Basic dimensions of front panels, subracks, chassis, racks and cabinets	EN 60297-3-100	-
IEC 60297-3-101	-	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series - Part 3-101: Subracks and associated plug-in units	EN 60297-3-101	-
IEC 60297-3-105	-	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series - Part 3-105: Dimensions and design aspects for 1U high chassis	EN 60297-3-105	-
IEC 60297-3-107	-	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series - Part 3-107: Dimensions of subracks and plug-in units, small form factor	EN 60297-3-107	-
IEC 60297-3-108	-	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series - Part 3-108: Dimensions of R-type subracks and plug-in units	EN 60297-3-108	-
IEC 60512-1-1	-	Connectors for electronic equipment - Tests and measurements - Part 1-1: General examination - Test 1a: Visual examination	EN 60512-1-1	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	-	-
IEC 60654-4	-	Operating conditions for industrial-process measurement and control equipment. Part 4: Corrosive and erosive influences	EN 60654-4	-
IEC 60695-11-10	-	Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods	EN 60695-11-10	-
IEC 60721-3-2	-	Classification of environmental conditions - Part 3-2: Classification of groups of environmental parameters and their severities - Transportation and handling	EN IEC 60721-3-2	-
IEC 60721-3-3	-	Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weatherprotected locations	EN IEC 60721-3-3	-
IEC 60917	series	Modular order for the development of mechanical structures for electrical and electronic equipment practices	EN IEC 60917	series

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IEC 60917-2-1	-	Modular order for the development of mechanical structures for electronic equipment practices - Part 2: Sectional specification - Interface co-ordination dimensions for the 25 mm equipment practice - Section 1: Detail specification - Dimensions for cabinets and racks	EN 60917-2-1	-
IEC 60917-2-2	-	Modular order for the development of mechanical structures for electronic equipment practices - Part 2: Sectional specification - Interface co-ordination dimensions for the 25 mm equipment practice - Section 2: Detail specification - Dimensions for subracks, chassis, backplanes, front panels and plug-in units	EN 60917-2-2	-
IEC 61010-1	-	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements	-	-
IEC 61076-4-116	-	Connectors for electronic equipment - Product requirements - Part 4-116: Printed board connectors - Detail specification for a high-speed two-part connector with integrated shielding function	EN 61076-4-116	-
IEC 61373	-	Railway applications - Rolling stock equipment - Shock and vibration tests	EN 61373	-
IEC 61587-2	-	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 2: Seismic tests for cabinets and racks	EN 61587-2	-
IEC 61587-3	2013	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 – Part 3: Electromagnetic shielding performance tests for cabinets and subtracks	EN 61587-3	2013
IEC 61587-5	-	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 – Part 5: Seismic tests for chassis, subtracks, and associated plug-in units	EN 61587-5	-
IEC 62208	2011	Empty enclosures for low-voltage switchgear and controlgear assemblies - General requirements	EN 62208	2011
IEC 62262	-	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)	EN 62262	-
IEC 62368-1	-	Audio/video, information and communication technology equipment - Part 1: Safety requirements	EN IEC 62368-1	-
ISO 22878	-	Castors and wheels - Test methods and apparatus	-	-
ISO 22883	-	Castors and wheels - Requirements for applications up to 1,1 m/s (4 km/h)	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MECHANICAL STRUCTURES FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – TESTS FOR IEC 60917 AND IEC 60297 SERIES –

Part 1: Environmental requirements, test setups and safety aspects

FOREWORD

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IEC 61587-1 has been prepared by sub-committee 48D: Mechanical structures for electrical and electronic equipment, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

This fifth edition cancels and replaces the fourth edition published in 2016. This edition constitutes a technical revision.

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

a) Modification of title.
b) Revision of Clauses 6, 7 and 8 including new defined test setups.
c) Compatibility with IEC 61587-2, IEC 61587-3 and IEC 61587-5.

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

FDIS	Report on voting
48D/743/FDIS	48D/748/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.

The language used for the development of this International Standard is English.

This document was drafted in accordance with the ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts of the IEC 61587 series, under the general title *Mechanical structures for electrical and electronic equipment – Tests for IEC 60917 and IEC 60297 series*, can be found on the IEC website.

The committee has decided that the contents of this document 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,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This document provides a common methodology to perform and report conformance tests of IEC 60917 or IEC 60297 compliant cabinets, racks, subracks, chassis, chassis integrated subracks and associated plug-in units under indoor condition use and transportation conditions.

Manufacturers can show the performance and characteristics of products in their catalogues by using the classifications in accordance with this document.

Users get comparative figures to compare products of different producers and can choose products for their targeted system from their catalogues. With the information of different classification levels, they get important indices for the possible maximum loads of the enclosure, which are important for their individual and safe applicability.

Designers of new products can define the performance requirements of these new products for their targeted systems by referencing this document. This allows a cost optimized design in accordance with the intended application.

This edition 5 constitutes a revision of the previous edition, with the following changes:

a) Subracks, chassis with integrated subracks and associated plug-in units
   - The static mechanical tests of subracks as described in edition 4 were based on the inspection of load bearing structural parts (single point load). On the other hand, the dynamic mechanical load test in edition 4 described not only subracks but also various types of chassis with integrated subracks, based on the load categories. In addition, the dynamic mechanical test for plug-in units with mass load was defined. There was no mention of mechanical tests for chassis.
   - This edition 5 provides test methods for static load tests for subracks and chassis integrated subracks, which are categorized based on subracks' associated mass loaded plug-in units. The static load test for chassis is similarly categorized by applying with dummy loads for chassis. These load categories for subracks, chassis with integrated subracks and chassis are applied for the dynamic load tests. These test methods solve previous edition lack of requirements on the static/dynamic tests for subracks and associated plug-in units, chassis with integrated subrack and chassis.
   - Furthermore, a test setup is defined in a test fixture with optional recessed assembly fixtures at subracks in a housing or rack.
   - In the dynamic load tests, the random vibration test is added.
   - Specification of individual mechanical tests for plug-in units, which were defined in edition 4, are required for applications of single board computing system or embedded systems in relation with applied connector reliability test. The test specification is introduced as Annex A (normative).

b) Cabinets and racks
   - Test setups for the cabinet for different applications, e.g. using a mounting plate, are added.
   - The cabinet/rack samples with different dummy loads have been extended by a test sample with dummy loads mounted on a mounting plate for industrial electrical installations.
   - The vertical structure test is supplemented instead of the lifting test (LT) of edition 4.
   - In the dynamic load tests, the random vibration test is added.

In the revised Clause 9, stability, installation conditions of racks and cabinets are added.

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MECHANICAL STRUCTURES FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – TESTS FOR IEC 60917 AND IEC 60297 SERIES –

Part 1: Environmental requirements, test setups and safety aspects

1 Scope

This part of IEC 61587 specifies environmental requirements, test set-ups, as well as safety aspects for empty enclosures, i.e. cabinets, racks, subracks, chassis, chassis integrated subracks and associated plug-in units under indoor condition use and transportation. It defines classifications (product performance levels) for these products, regarding and simulating the usually arising loads during their use. For mechanical static and dynamic load tests typical examples with dummy loads are used.

The purpose of this document is to establish defined levels of physical performance in order to meet certain requirements of manufacture, storage, transport and final location conditions.

This document applies in general only to the above cited mechanical structures.

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 60068-1, *Environmental testing – Part 1: General and guidance*

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

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

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-11, *Environmental testing – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-42, *Environmental testing – Part 2-42: Tests – Test Kc: Sulphur dioxide test for contacts and connections*

IEC 60068-2-43, *Environmental testing – Part 2-43: Tests – Test Kd: Hydrogen sulphide test for contacts and connections*

IEC 60068-2-49, *Environmental testing – Part 2-49: Tests – Guidance to test Kc: Sulphur dioxide test for contacts and connections*

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IEC 60068-2-52, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium, chloride solution)*

IEC 60068-2-64:2008, *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance*
IEC 60068-2-64:2008/AMD1:2019

IEC 60297 (all parts), M*echanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series*

IEC 60297-3-100, *Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 3-100: Basic dimensions of front panels, subracks, chassis, racks and cabinets*

IEC 60297-3-101, *Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 3-101: Subracks and associated plug-in units*

IEC 60297-3-105, *Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 3-105: Dimensions and design aspects for 1U high chassis*

IEC 60297-3-107, *Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 3-107: Dimensions of subracks and plug-in units, small form factor*

IEC 60297-3-108, *Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 3-108: Dimensions of R-types subracks and plug-in units*

IEC 60512-1-1, *Connectors for electronic equipment – Tests and measurements – Part 1-1: General examination – Test 1a: Visual examination*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60654-4, *Operating conditions for industrial-process measurement and control equipment – Part 4: Corrosive and erosive influences*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60721-3-2, *Classification of environmental conditions – Part 3-2: Classification of groups of environmental parameters and their severities – Transportation and handling*

IEC 60721-3-3, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

IEC 60917 (all parts), *Modular order for the development of mechanical structures for electronic equipment practices*

IEC 60917-2-1, *Modular order for the development of mechanical structures for electronic equipment practices – Part 2: Sectional specification – Interface co-ordination dimensions for the 25 mm equipment practice – Section 1: Detail specification – Dimensions for cabinets and racks*

IEC 60917-2-2, *Modular order for the development of mechanical structures for electronic equipment practices – Part 2: Sectional specification – Interface co-ordination dimensions for the 25 mm equipment practice – Section 2: Detail specification – Dimensions for subracks, chassis, backplanes, front panels and plug-in units*

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IEC 61010-1, *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements*

IEC 61076-4-116, *Connectors for electronic equipment – Product requirements – Part 4-116: Printed board connectors – Detail specification for a high-speed two-part connector with integrated shielding function*

IEC 61373, *Railway applications – Rolling stock equipment – Shock and vibration tests*

IEC 61587-2, *Mechanical structures for electronic equipment – Tests for IEC 60917 and IEC 60297 – Seismic tests for cabinets and racks*

IEC 61587-3:2013, *Mechanical structures for electronic equipment – Tests for IEC 60917 and IEC 60297 – Electromagnetic shielding performance tests for cabinets and subracks*

IEC 61587-5, *Mechanical structures for electronic equipment – Tests for IEC 60917 and IEC 60297 – Seismic tests for chassis, subracks, and associated plug-in units*

IEC 62208:2011, *Empty enclosures for low-voltage switchgear and control gear assemblies – General requirements*

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

IEC 62368-1, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

ISO 22878, *Castors and wheels – Test methods and apparatus*

ISO 22883, *Castors and wheels – Requirements for applications up to 1,1 m/s (4 km/h)*

3 Terms and definitions

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
indoor condition
location at which the product is protected from weather influence

3.2
test sample
unit under test, dummy loaded where necessary in order to achieve repeatable results

4 Classification of environmental conditions

The climatic conditions are derived from IEC 60721-3-2, IEC 60721-3-3 and IEC 60654-4.

The mechanical conditions, which relate to the levels of vibration and shock, are derived from IEC 60721-3-2, and IEC 60721-3-3.

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