



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

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 It supersedes BS EN 61587-1:2017, which will be withdrawn on 5 September 2022.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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and corrigenda (if any)

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)

This European Standard was approved by CENELEC on 2022-02-11. 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 CEN-CENELEC Management Centre or to any CENELEC member.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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).

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

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61587-1:2022 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 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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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

EN IEC 61587-1:2022 (E)

+ 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

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)	-	-

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	10
4 Classification of environmental conditions	10
5 General	11
6 Climatic tests.....	12
6.1 General.....	12
6.2 Cold, dry heat and damp heat (cyclic)	12
6.3 Industrial atmosphere	13
7 Mechanical load tests for subracks and associated plug-in units, chassis integrated subracks and chassis.....	14
7.1 General.....	14
7.2 Test setup.....	14
7.3 Test sample arrangement	15
7.4 Mechanical static load test.....	17
7.4.1 Mechanical static load categories	17
7.4.2 Total mass test categories	18
7.4.3 Test conditions	19
7.4.4 Test procedures.....	19
7.4.5 Assessment following the mechanical static load test	19
7.5 Mechanical dynamic load tests.....	19
7.5.1 Test conditions	19
7.5.2 Test procedures.....	20
7.5.3 Assessment following the vibration and shock tests	21
8 Mechanical load tests for cabinets and racks	21
8.1 General.....	21
8.2 Test setups for static load tests	21
8.3 Mechanical static load tests	25
8.3.1 General	25
8.3.2 Nominal load test (NL).....	25
8.3.3 Vertical structure test (VT).....	26
8.3.4 Stiffness test (ST).....	27
8.3.5 Combined classification levels of static loads for cabinets or racks	29
8.4 Mechanical dynamic load tests (vibration and shock tests).....	29
8.4.1 General	29
8.4.2 Test conditions	30
8.4.3 Test procedures.....	31
8.4.4 Assessment following the test.....	31
9 Applications of other performance levels or classifications and safety aspects	31
9.1 General.....	31
9.2 Degree of protection (IP code)	32
9.3 Impact test (IK code).....	32
9.4 Protective earth bonding	32
9.5 Flammability	32
9.6 Stability of cabinet or rack installations	32

Annex A (normative) Mechanical load tests for plug-in units	34
A.1 General.....	34
A.2 Test setup and test sample arrangement	34
A.3 Plug-in units mass load categories.....	36
A.4 Mechanical dynamic load tests.....	37
A.4.1 Test conditions	37
A.4.2 Test procedures and assessment following the tests	37
Annex B (normative) Stability tests for cabinets or racks equipped with castors	38
B.1 General.....	38
B.2 Stability tests	38
B.2.1 General	38
B.2.2 Test conditions and requirements	38
B.2.3 Test procedure and test severity.....	39
B.3 Assessment following tests	44
B.3.1 Assessment following the rolling test and the threshold test.....	44
B.3.2 Assessment following the blocking test and the touch-down test.....	44
B.4 Classification (stability performance levels).....	45
Figure 1 – Test setup within the test fixture.....	15
Figure 2 – Test sample arrangement, subrack with loaded plug-in units.....	16
Figure 3 – Test sample arrangement, chassis with an integrated subrack with loaded plug-in units.....	16
Figure 4 – Test sample arrangement, chassis with a dummy load	17
Figure 5 – Type A test setup, with M3 and M4 dummy loads	22
Figure 6 – Type B test setup, with M5 dummy loads	23
Figure 7 – Type C test setup, with M6 dummy loads on mounting plate.....	24
Figure 8 – Vertical structure test for cabinets or racks	26
Figure 9 – Stiffness test for cabinets or racks	28
Figure A.1 – Test setup and test fixture, for plug-in units in accordance with IEC 60297 series and IEC 60917 series	36
Figure B.1 – Rolling test setup	39
Figure B.2 – Threshold test setup	41
Figure B.3 – Blocking test setup	42
Figure B.4 – Touch-down test setup.....	44
Table 1 – Examples showing references to tests.....	11
Table 2 – Classifications for cold, dry heat and damp heat.....	12
Table 3 – Classifications for industrial atmosphere	13
Table 4 – Mechanical static load classification	18
Table 5 – Total mass test categories, for subracks and chassis integrated subracks.....	19
Table 6 – Vibration and shock load classifications for subracks, chassis integrated subracks and chassis.....	20
Table 7 – Nominal load test values for Type A test setup, with M3 and M4 dummy loads	22
Table 8 – Nominal load test values for Type B test setup, with M5 dummy loads.....	23
Table 9 – Nominal load test values for Type C test setup, with M6 dummy loads	24
Table 10 – Typical reporting of a cabinet nominal load test (NL)	26

Table 11 – Classification levels for cabinets/racks – vertical structure test (VT)	27
Table 12 – Typical reporting of a cabinet vertical structure test (VT)	27
Table 13 – Classification levels for cabinets/racks – stiffness tests (ST)	28
Table 14 – Typical reporting of a cabinet stiffness test (ST)	29
Table 15 – Combined classification levels of loads for cabinets or racks	29
Table 16 – Typical reporting of a cabinet combined static load test	29
Table 17 – Vibration and shock classifications for cabinets and racks	30
Table A.1 – Plug-in units mass load categories	37
Table B.1 – Minimum required load capacity of the castor kit (4 castors and fitting devices) according to the nominal load (NL) classification of cabinets or racks	39
Table B.2 – Rolling test	39
Table B.3 – Threshold test	40
Table B.4 – Blocking test	42
Table B.5 – Touch-down test	43
Table B.6 – Classification	45

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

- 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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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.

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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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.

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*