BS EN 61969-1:2012

BSI Standards Publication

Mechanical structures for electronic equipment — Outdoor enclosures

Part 1: Design guidelines

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National foreword

This British Standard is the UK implementation of EN 61969-1:2012. It is identical to IEC 61969-1:2011. It supersedes BS EN 61969-1:2000 which is withdrawn.

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 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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Structures mécaniques pour équipement électronique - Enveloppes de plein air - Partie 1: Lignes directrices pour la conception (CEI 61969-1:2011)

Mechanische Bauweisen für elektronische Einrichtungen - Außengehäuse - Teil 1: Konstruktionsleitfaden (IEC 61969-1:2011)

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Foreword

The text of document 48D/488/FDIS, future edition 2 of IEC 61969-1, prepared by SC 48D, "Mechanical structures for electronic equipment", of IEC/TC 48, "Electromechanical components and mechanical structures for electronic equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61969-1:2012.

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)	2012-09-22
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2014-12-22

This document supersedes EN 61969-1:2000.

EN 61969-1:2012 includes the following significant technical changes with respect to EN 61969-1:2000:

a) Addition of design guidance for thermal management and noise suppression as thermal/noise management is often considered a basic requirement of an empty outdoor enclosure. If thermal management components are included in the product, the environmental impact may become the responsibility of the empty outdoor enclosure manufacturer. Therefore the acoustic limitations shall be observed.

Typically, the user of the empty outdoor enclosure follows the local regulatory acoustic requirements (sound power and/or sound pressure). Acoustic measurements may be performed on the empty outdoor enclosure fitted with thermal management components only or, if agreed between manufacturer and user at the final stage of the application specific installation.

b) Historically, EN 61969-1:2000 intended to create a market for standardized empty outdoor enclosures offered by multiple vendors. Detail standards such as EN 61969-2-1:2000 and EN 61969-2-2:2000 were issued to guide users to preferred and available solutions.

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

Endorsement notice

The text of the International Standard IEC 61969-1:2011 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, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050-581	-	International Electrotechnical Vocabulary - Part 581: Electromechanical components for electronic equipment	-	-
IEC 60068	Series	Environmental testing	EN 60068-2-1	Series
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 60417	Data-base	Graphical symbols for use on equipment	-	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	-	-
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	Series	Classification of environmental conditions	EN 60721-1	Series
IEC 60825-1	-	Safety of laser products - Part 1: Equipment classification and requirements	EN 60825-1	-
IEC 60917	Series	Modular order for the development of mechanical structures for electronic equipment practices - Part 1: Generic standard	EN 60917	Series
IEC 60950	Series	Information technology equipment - Safety	EN 60950	Series
IEC 61010-1	-	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements	EN 61010-1	-
IEC 61140	-	Protection against electric shock - Common aspects for installation and equipment	EN 61140	-
IEC 61439-5	-	Low-voltage switchgear and controlgear assemblies - Part 5: Assemblies for power distribution in public networks	EN 61439-5	-
IEC 61587-1	-	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 1: Climatic, mechanical tests and safety aspects for cabinets, racks, subracks and chassis	EN 61587-1	-

Publication	Year	Title	EN/HD	Year
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	-	Mechanical structures for electronic equipment - Tests for IEC 60917 and IEC 60297 - Part 3: Electromagnetic shielding performance tests for cabinets, racks and subracks	EN 61587-3	-
IEC 61969	Series	Mechanical structures for electronic equipment - Outdoor enclosures	EN 61969-1	Series
IEC 62194	-	Method of evaluating the thermal performance of enclosures	EN 62194	-
IEC 62262	-	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)	EN 62262	-
IEC 62305-4	-	Protection against lightning - Part 4: Electrical and electronic systems within structures	EN 62305-4	-
ISO 3864	-	Safety colours and safety signs	-	-
ISO 7779	-	Acoustics - Measurement of airborne noise emitted by information technology and telecommunications equipment	EN ISO 7779	-
ISO 1518-1	-	Paints and varnishes - Determination of scratch resistance - Part 1: Constant-loading method	EN ISO 1518-1	-
ETS 300753	-	Equipment Engineering (EE) - Acoustic noise emitted by telecommunications equipment	-	-
ETS 300019-1-4	-	Equipment Engineering (EE) - Environmental conditions and environmental test for telecommunications equipment - Part 1-4: Classification of environmental conditions - Stationary use at non-weatherprotected locations	-	-
ETS 300194-2-4	-	Equipment Engineering (EE) - Environmental conditions and environmental tests for telecommunications equipment - Part 2-4: Specification of environmental tests - Stationary use at non-weatherprotected locations	-	-

CONTENTS

INTRODUCTION

This standard is intended as a generic guide for the development of further standards. The products covered are empty enclosures to be equipped with application-specific solutions to be used at non-weather protected locations above ground. This standard is followed by a co-ordination dimension standard (IEC 61969-2 Ed 2) and an environmental requirements and tests, safety aspect standard (IEC 61969-3 Ed 2).

MECHANICAL STRUCTURES FOR ELECTRONIC EQUIPMENT – OUTDOOR ENCLOSURES –

Part 1: Design guidelines

1 Scope

This part of IEC 61969 contains design guidelines for outdoor enclosures and is applicable over a wide field of mechanical, electromechanical and electronic equipment and its installation where a modular design is used. The objective of this standard is to provide an overview of specifications for enclosures focused on requirements for outdoor applications for stationary use at non-weather protected locations. These enclosures are considered to contain any equipment and provide protection for the outdoor installed facilities against unwanted environmental impacts. The installed equipment may be, but is not limited to, subracks according to IEC 60917-2-2 or IEC 60297-3-101. A typical outdoor enclosure is shown in Figure 1.

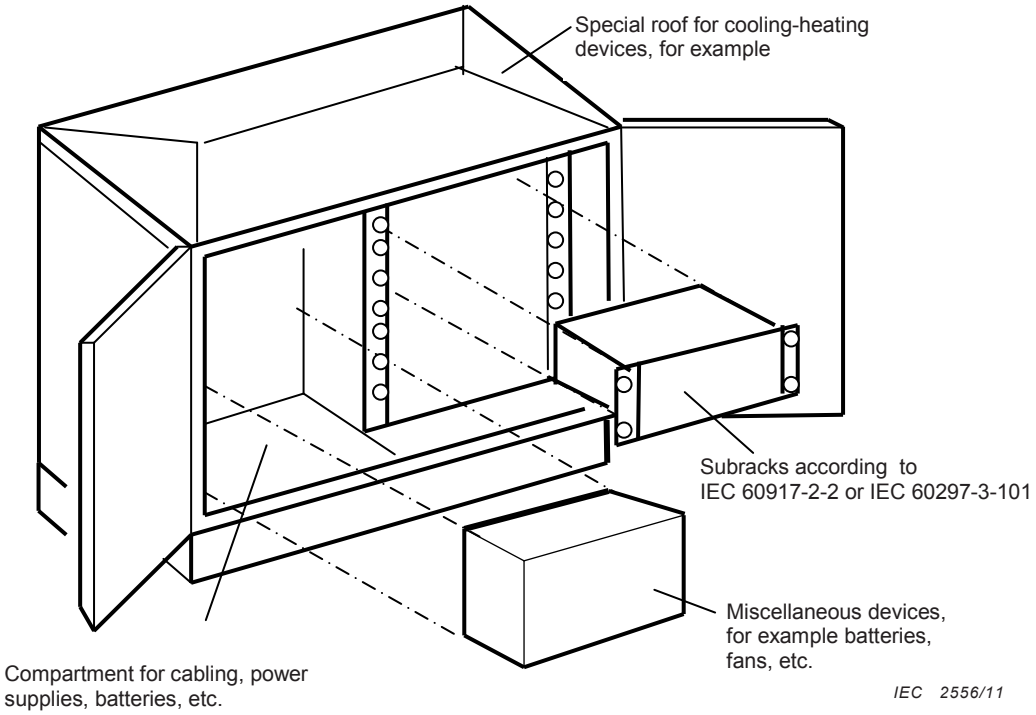

Figure 1 – Typical outdoor enclosure

2 Normative references

The following referenced documents are indispensable for the application 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 60050-581, *International Electrotechnical Vocabulary (IEV) – Part 581: Electromechanical components and mechanical structures for electronic equipment*

IEC 60068 *(all parts), Environmental testing*

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

IEC 60950 (all parts), *Information technology equipment – Safety*

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

IEC 60417, *Graphical symbols for use on equipment*

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

IEC 60721 *(all parts), Classification of environmental conditions*

IEC 60825-1, *Safety of laser products – Part 1: Equipment specification and requirements*

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

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

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

IEC 61439-5, *Low-voltage switchgear and controlgear assemblies – Part 5: Assemblies for power distribution in public networks*

IEC 61587-1, *Mechanical structures for electronic equipment –Tests for IEC 60917 and IEC 60297 – Part 1: Climatic, mechanical tests and safety aspects for cabinets, racks, subracks and chassis*

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

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

IEC 61969 *(all parts) Mechanical structures for electronic equipment – Outdoor enclosures*

IEC 62194, *Methods of evaluating the thermal performance of enclosures*

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

IEC 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures*

ISO 3864, *Graphical symbols – Safety colours and safety signs*

ETS 300019-1-4, *Equipment Engineering (EE); Environmental conditions and environmental test for telecommunications equipment – Part 1-4: Classification of environmental conditions Stationary use at non-weatherprotected locations*
+ A1:1997

ETS 300194-2-4, *Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment – Part 2-4: Specification of environmental tests Stationary use at non-weatherprotected locations*
+ A1:1997

ETS 300753, *Equipment Engineering (EE); Acoustic noise emitted by telecommunications equipment*

ISO 7779, *Acoustics – Measurement of airborne noise emitted by information technology and telecommunications equipment*

ISO 1518-1, *Paints and varnishes – Determination of scratch resistance – Part 1: Constant-loading method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-581 and in the IEC 60917 series, as well as the following, apply.

3.1
outdoor enclosure
enclosure exposed to the outdoor environment, for stationary use at non-weatherprotected locations, for the protection of electronic equipment installed inside against outdoor environmental conditions

NOTE An outdoor enclosure is applicable for a wide field of equipment, e.g.: communication systems, industrial/signal controls, etc. The typical installation locations are shown in Figure 2.

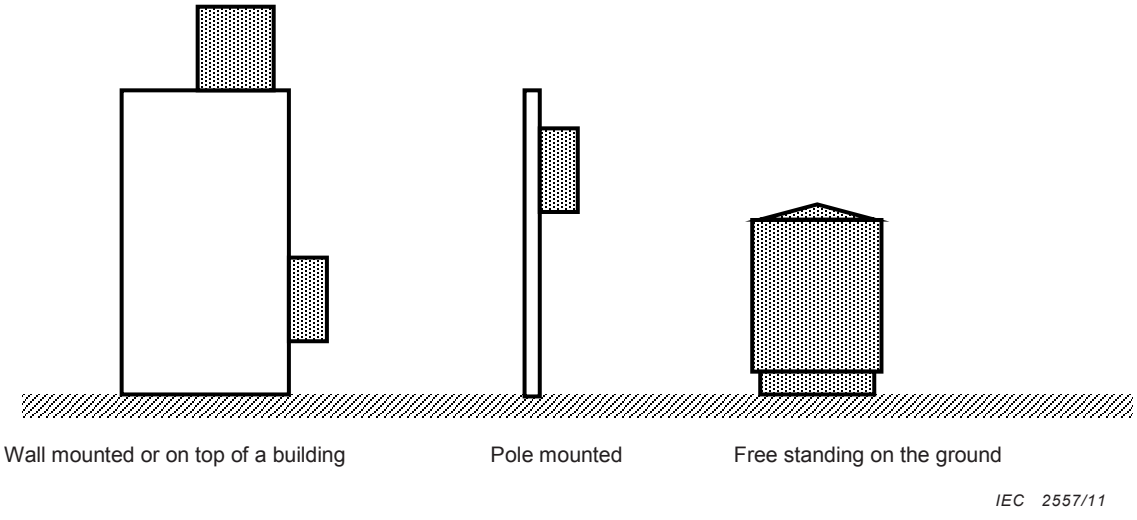

Figure 2 – Locations of outdoor enclosures

3.2
heat transfer rate *k*
factor measured W/m^{2}K as the rate of heat transfer

NOTE Detailed calculations for the determination of the enclosure design dependent heat management properties are described in IEC 62194.

4 Dimensions

The dimensions of outdoor enclosures consist of coordination dimensions as given in IEC 61969-2 Ed.2.0. The coordination dimensions provide the range and systematic stipulation of possible enclosure internal and external dimensions.

5 Environmental requirements and tests, safety aspects

5.1 Classification of environmental conditions

The classification of environmental conditions is based on requirements as defined in IEC 60721-3-2, IEC 60721-3-4 and the tests are in accordance with the relevant parts of IEC 60068.

The selection of relevant requirements, as indicated in Tables 1 and 2, was made with the focus on outdoor specific conditions and, in addition on structural design and safety aspects. The purpose of this standard is to achieve product integrity under outdoor conditions and to ease product selection for the sourcing of outdoor enclosures from different vendors. For details see IEC 61969-3.

Table 1 – Environmental conditions

Requirement		Test specification
Temperature	ETS-300019-1-4	ETS-300019-2-4 or IEC 61587-1
Humidity	ETS-300019-1-4	ETS-300019-2-4 or IEC 61587-1
Atmospheric pressure	ETS-300019-1-4	ETS-300019-2-4
Corrosive gases	ETS-300019-1-4	ETS-300019-2-4 or IEC 61587-1
Corrosive liquids	ETS-300019-1-4	ETS-300019-2-4
Solar resistance	ETS-300019-1-4	ETS-300019-2-4
Biological resistance	ETS-300019-1-4	ETS-300019-2-4
Protection against rodents and birds	ETS-300019-1-4	ETS-300019-2-4
Protection against insects and termites	ETS-300019-1-4	ETS-300019-2-4
Weather resistance	Climatic conditions	Additional IEC 60529 for tightness
Thermal management	Requirements may be application specific	For thermal enclosure properties see IEC 62194
Acoustical noise suppression	ETS-300753	ISO 7779
Paint (colour, gloss, adhesion, flex, scratch, etc.)	May be part of the users specification For extreme conditions anti-graffiti may be required Paints and varnishes – Scratch test	ISO 1518-1, etc.
Heat transfer rate *k*	Methods of evaluating the thermal performance of enclosures IEC 62194	
NOTE For details about classifications of environmental conditions, see IEC 61969-3.		

Table 2 – Safety aspects

Requirement		Test specification
Earth bonding	The responsibility of the vendor is to provide sufficient conductivity between different parts of the enclosure and means for the earth bonding of equipment IEC 61140	Using IEC 60950 and IEC 61439-5 for equipped enclosure IEC 61010-1/IEC 60825-1
Lightning strike	To be observed in the total “Earth bonding” concept	IEC 62305-4
Mechanical safety	IK-Code according to IEC 62262	For testing IEC 60068-2-75
Vandalism	Requirements shall be part of the vendor specification	Tests may be part of the vendor specification
Warning labels	General warning, caution, risk of danger Caution, risk of life Caution, risk of electric shock Caution, hot surface	ISO 3864, B.3.1 ISO 3864, B.3.2 ISO 3864, B.3.6 IEC 60417
Security, vandalism protection	Requirements for the resistance of the enclosure and the locking devices against unauthorised access	Tests may be part of the user specifications
Flammability	Material properties may be specified by user	IEC 60695-11-10

5.2 Static load

The static load capacity definition of an outdoor enclosure shall be based on the intended transport and handling conditions as they occur at the place of erection. For safety reasons the maximum static load should be calculated with 1,25 times of the nominal load. Outdoor enclosures installed on ground are considered street enclosures typically for traffic controls which need special precautions against physical impacts. Pole- and wall- mounted enclosures may be out of the reach of persons whereas the weather impact may cause special precaution for the stability of the installation.

5.3 Dynamic stress

Dynamic stress shall be considered during transportation, handling at the place of installation and in respect to possible environmental impacts. If the enclosure is loaded with equipment the maximum weight should be specified by the vendor in respect to the classification of environmental conditions as under 5.1.

5.4 Seismic performance

In case of geographically defined earthquake zones a standard enclosure may be tested with internal mounted dummy loads simulating the equipment and structural anchoring simulating the place of installation. The results of such tests can be used as reference for the product offering by a standard enclosure vendor. But it does not exempt from final equipment testing. The test conditions are described in IEC 61587-2.

6 Electromagnetic shielding

In order to achieve electromagnetic compatibility of a final installation the enclosure may be part of the total shielding concept. As a pre-testing the shielding performance test may be performed in order to gain the required level of attenuation by the enclosure. The test set-up and the test procedure are described in IEC 61587-3.

7 Thermal management and acoustic noise suppression

The thermal management is the key for the survival of electronic equipment in general but especially if exposed to the outdoor environment. The heat transfer rate k is important for designing the outdoor enclosure because the value affects the temperature difference between inside and outside of the enclosure. As a prime measure the design concept shall be considered for the insulation against heat and cold from the outside environment. Next would be the measure for the heat dissipation from the inside out and, as a precaution against low external temperature requiring internal heating. Depending on the climate conditions and the heat generated inside the enclosure the thermal management may be resolved by passive cooling only. In case of exceeding temperature limits the enclosure may be fitted with active cooling devices, such as filter fans, air to air heat exchangers or air conditioners. For selection of the suitable active cooling the required energy consumption (cost factor and impact to the environment) and the local noise level limits should be carefully considered (regulatory requirements in rural and urban areas). For the method of enclosure thermal performance evaluations see IEC 62194.

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