

# INTERNATIONAL STANDARD



**Mechanical structures for electrical and electronic equipment –  
Outdoor enclosures –  
Part 1: Design guidelines**

WITHDRAWN

Document Preview

IEC 61969-1:2020

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IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

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# INTERNATIONAL STANDARD



**Mechanical structures for electrical and electronic equipment –  
Outdoor enclosures –  
Part 1: Design guidelines**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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International Standard IEC 61969-1 has been prepared by subcommittee 48D: Mechanical structures for electrical and electronic equipment, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

This third edition cancels and replaces the second edition published in 2011. This edition constitutes a technical revision.

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

- a) alignment with the content of ETSI EN 300 019 and IEC 60721 series latest editions, particularly with the actualization of climate conditions;
- b) new requirements added to reflect market requirements on environmental issues;
- c) improvement on terminology and overall editorial improvement.

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

FDIS	Report on voting
48D/720/FDIS	48D/723/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 61969 series, published under the general title *Mechanical structures for electrical and electronic equipment – Outdoor enclosures*, 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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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- withdrawn,
- replaced by a revised edition, or
- amended.

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## INTRODUCTION

This part of IEC 61969 is intended as a generic guide for the development of further parts within this series of standards, and it provides design guidelines for outdoor enclosures.

The products covered by IEC 61969 (all parts) are empty enclosures for outdoor locations, to be equipped with application-specific ~~solutions~~ combinations of electrical and electronic equipment, and to be used at non-weather protected locations above ground. ~~This standard is followed by~~

IEC 61969 (all parts) consists of:

- a design guidelines general part (IEC 61969-1);
- a coordination dimension standard (IEC 61969-2 ~~Ed 2~~);
- an environmental requirements and tests, safety aspects standard (IEC 61969-3 ~~Ed 2~~).

IEC 61969-2 and IEC 61969-3 should be read in conjunction with this document.

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# MECHANICAL STRUCTURES FOR ELECTRICAL AND 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 objectives of this document are:

- to provide an overview of specifications for enclosures focused on requirements for outdoor applications for stationary use at non-weather protected locations, and
- to achieve product integrity under outdoor conditions and to ease product selection for the sourcing of outdoor enclosures from different vendors.

These enclosures are considered to contain any equipment and provide protection for the outdoor installed facilities against unwanted environmental impacts. The installed equipment ~~may~~ can be, but is not limited to, subracks or chassis according to IEC 60917-2-2 (all parts) or IEC 60297-3-101 (all parts). A typical outdoor enclosure is shown in Figure 1.

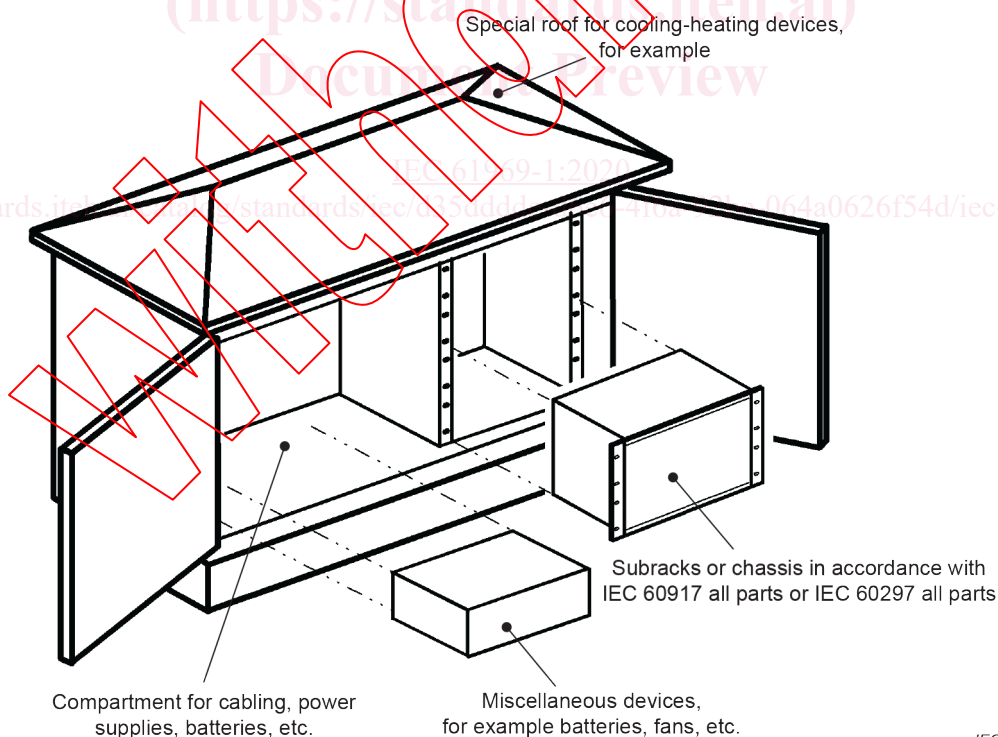


Figure 1 – Typical outdoor enclosure



## 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 60050-581, International Electrotechnical Vocabulary (IEV) – Part 581: Electromechanical components and mechanical structures for electronic equipment~~

~~IEC 60068 (all parts), Environmental testing~~

IEC 60068-2-75, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/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*

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

IEC 60721-3-4, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Stationary use at non-weatherprotected locations*

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 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

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 series – Part 1: Climatic, mechanical tests* Environmental requirements, test set-up and safety aspects for cabinets, racks, subracks and chassis under indoor condition use and transportation

~~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 external mechanical impacts (IK code)*

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

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

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

ISO 3864-2, *Graphical symbols – Safety colours and safety signs*

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

ETSI EN 300 019-1-4, *Equipment Engineering (EE) – Environmental conditions and environmental tests for telecommunications equipment – Part 1-4: Classification of environmental conditions – Stationary use at non-weatherprotected locations*  
+ A1:1997

ETSI EN 300 194-2-4, *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

ETSI EN 300 753, *Equipment Engineering (EE) – Acoustic noise emitted by telecommunications equipment*

### 3 Terms and definitions

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

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

Note 1 to entry: An outdoor enclosure is applicable for wide field of equipment, (e.g. communication system, industrial or signal control, etc.)

Note 2 to entry: The typical installation locations of outdoor enclosures are shown in Figure 2.

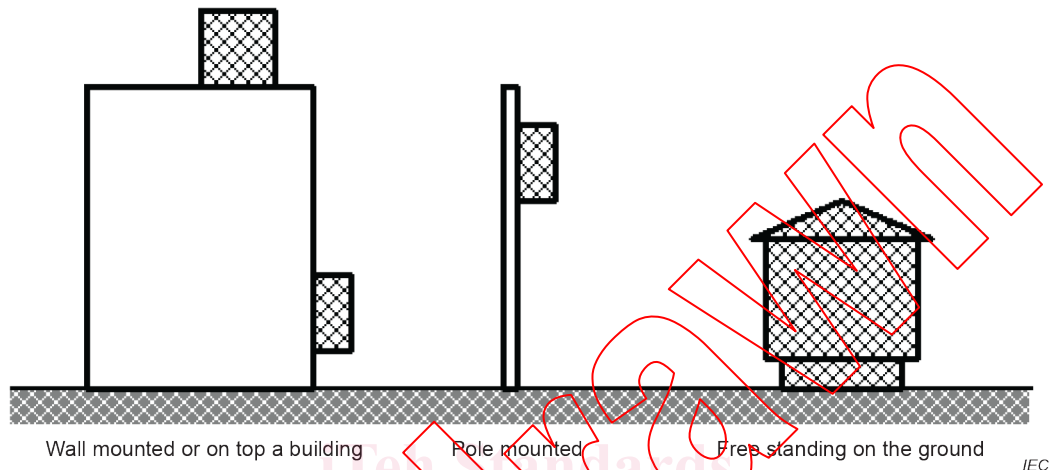


Figure 2 – Locations of outdoor enclosures

### 3.2 heat transfer rate

$k$

factor measured property with units of  $W/(m^2K)$ , a measure of the rate of heat transfer

Note 1 to entry: Detailed calculations for determination of the enclosure design dependent heat management properties, including the heat transfer rate, are described in IEC 62194.

### 3.3 static load

maximum mechanical load that an enclosure is able to sustain in static condition without mechanical failure, as the gross weight of enclosure including all deemed equipment, multiplied by a safety factor 1,25

## 4 Coordination 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, tests and safety aspects

### 5.1 Classification of environmental conditions

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

The selection of relevant requirements, as indicated in Table 1 and Table 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	ETSI EN 300 019-1-4	ETSI EN 300 019-2-4 or IEC 61587-1
Humidity	ETSI EN 300 019-1-4	ETSI EN 300 019-2-4or IEC 61587-1
Atmospheric pressure	ETSI EN 300 019-1-4	ETSI EN 300 019-2-4
Corrosive gases	ETSI EN 300 019-1-4	ETSI EN 300 019-2-4or IEC 61587-1
Corrosive liquids	ETSI EN 300 019-1-4	ETSI EN 300 019-2-4
Solar resistance	ETSI EN 300 019-1-4	ETSI EN 300 019-2-4
Biological resistance	ETSI EN 300 019-1-4	ETSI EN 300 019-2-4
Protection against rodents and birds	<del>ETS 300019-1-4</del> Requirements and tests may be part of the user specification	<del>ETS 300019-2-4</del>
Protection against insects and termites	<del>ETS 300019-1-4</del> Requirements and tests may be part of the user specification	<del>ETS 300019-2-4</del>
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	ETSI EN 300 753	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.		