

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Mechanical structures for electronic equipment – Outdoor enclosures –
Part 3: Environmental requirements, tests and safety aspects**

**Structures mécaniques pour équipement électronique – Enveloppes de
plein air –
Partie 3: Exigences environnementales, essais et aspects de la sécurité**



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IEC 61969-3

Edition 2.0 2011-11

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

M

ICS 31.240

ISBN 978-2-88912-761-0

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MECHANICAL STRUCTURES FOR ELECTRONIC EQUIPMENT –
OUTDOOR ENCLOSURES –****Part 3: Environmental requirements, tests and safety aspects**

FOREWORD

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International Standard IEC 61969-3 has been prepared by subcommittee 48D: Mechanical structures for electronic equipment, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

This second edition cancels and replaces the first edition issued in 2001. It constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows.

Table 1 and Table 6 have been extended with requirements and tests, relevant for outdoor conditions.

The text of this standard is based on the following documents:

FDIS	Report on voting
48D/483/FDIS	48D/497/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

A list of all parts of IEC 61969 series, under the general title *Mechanical structures for electronic equipment – Outdoor enclosures*, can be found on the IEC website.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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INTRODUCTION

IEC 61969-3 Ed.2.0 provides basic environmental test requirements to be used in the absence of local regulatory or application specific environmental test requirements. This provides manufacturers and users of generic outdoor enclosure solutions with minimum performance compliance criteria; thermal solutions pending on the environment an outdoor enclosure is subjected to. Since forced air heat dissipation and acoustic noise are closely related, noise limitations are typically defined by local regulatory limitations.

Typically, it becomes the responsibility of the outdoor enclosure vendor to provide a solution for thermal management within the local regulatory noise limitations.

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MECHANICAL STRUCTURES FOR ELECTRONIC EQUIPMENT – OUTDOOR ENCLOSURES –

Part 3: Environmental requirements, tests and safety aspects

1 Scope

This part of IEC 61969 specifies a set of basic environmental requirements and tests, as well as safety aspects for outdoor enclosures under conditions of non-weatherprotected locations above ground.

The purpose of this standard is to define a minimum level of environmental performance in order to meet requirements of storage, transport and final installation. It is the intention to establish basic environmental performance criteria for outdoor enclosure compliance.

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 60068 (all parts), *Environmental testing*

IEC 60417, *Graphical symbols for use on equipment*

[https://standards.iteh.ai/catalog/standards/sist/c7891453-bef9-4448-b94c-](https://standards.iteh.ai/catalog/standards/sist/c7891453-bef9-4448-b94c-780139f87d6/iec-61969-3-2011)

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

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

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

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

IEC 61010, *Safety requirements for electrical equipment for measurement, control, and laboratory use*

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

IEC 61439-5, *Low-voltage switchgear and control gear 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 60297 – Part 2: Seismic tests for cabinets and racks*

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*

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 2533, *Standard atmosphere*

ISO 3744, *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane*

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

ISO 4892-2, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ETSI EN 300019-2-2, *Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-2: Specification of environmental tests; Transportation*
<http://standards.iteh.ai/catalog/standards/sist/c7891453-bef9-4448-b94c-780139f8f7d6/iec-61969-3-2011>

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

3.2

non-weatherprotected location

place with direct weather influence

4 Classification of environmental conditions

The environmental conditions are derived from IEC 60721-3-4, with the focus on empty outdoor enclosures relevant requirements.

Class 1: Non-weatherprotected location: Covers all regions with a moderate climate.

Class 2: Non-weatherprotected locations, extended: Covers all regions with severe climate.

The individual outdoor enclosure product solution tested to these basic environmental test requirements my claim compliance to either Class 1 or Class 2 or a combination of Class1/Class2.

5 Test conditions

5.1 General

The basic test conditions shown in Table 1; Table 2; Table 3 and Table 4 reflect typical outdoor enclosure environments to be endured.

5.2 Climatic tests

Table 1 – Climatic conditions for environmental classes 1 and 2

	Environmental parameters	Test severity		Duration	IEC method
		Class 1	Class 2		
a	Low air temperature	-45 °C	-65 °C	16 h	60068-2-1; A
b	High air temperature	80 °C	90 °C	16 h	60068-2-2: B
c	Damp heat	30 °C, 93 %	30 °C, 93 %	96 h	60068-2-78: Cb
d	Rate of change of temperature	-50 °C to + 23 °C 1 °C/min	-50 °C to + 23 °C 1 °C/min	2 cycles	60068-2-14: Nb
e	Solar radiation	1 120 W/m ²	1 120 W/m ²	72 h/ 40 °C	60068-2-5 Sa
f	Condensation	40 °C 90 % to 100 % RH	40 °C 90 % to 100 % RH	96 h	60068-2-30: Db
g	Precipitation (rain, snow, hail, dust, etc.)	IP 54	IP 55	-	60529
h	Movement of the surrounding air	50 m/s	60 m/s	-	-
i	Formation of ice and frost	Yes	Yes	-	-
j	Ultraviolet degradation test	Yes	Yes	-	ISO 4892-2

NOTE For comparable conditions the International Standard Air, in accordance to ISO 2533 (15 °C at 1 013, 25 hPa) shall be used.

Following the test, compliance is checked by visual inspection of the internal and external parts; no rust, cracking or other deterioration shall be detected with impact to the required function; no ingress of water. Hinges, locks and handles for example shall be in operating condition. The test in accordance with Table 1, item i shall prove that access to the internal equipment is possible without causing permanent degradation of protection levels.

5.3 Biological tests

Table 2 – Biological tests

	Environmental parameters	Test severity		Purpose	IEC method
		Class 1	Class 2		
a	Flora: Presence of mould, fungus, etc.	Yes	Yes	To check the material for resistance	60068-2-10
b	Fauna: Presence of rodents and others harmful to the equipment	Yes, but without termites	Yes, but with termites		

Following the test, compliance is checked by visual inspection.

5.4 Tests of resistance against chemically active substances

Table 3 – Tests of resistance against chemically active substances

(Similar to IEC 60721-3-4, Class 4C2)

	Environmental parameters	Test severity		Duration	IEC method
		Class 1 Mean value	Class 2 Maximum value		
a	Salts: Sea and road salt mist	Yes, at 35 °C, 5 % NaCl		4 days	60068-2-11; Ka
b	Sulphur dioxide ^a	0,3 mg/m ³ 0,11 cm ³ /m ³	1,0 mg/m ³ 0,37 cm ³ /m ³	10 days	60068-2-60; Ke
c	Hydrogen sulphide ^a	0,1 mg/m ³ 0,071 cm ³ /m ³	0,5 mg/m ³ 0,36 cm ³ /m ³		
d	Chlorine ^a	0,1 mg/m ³ 0,034 cm ³ /m	0,3 mg/m ³ 0,1 cm ³ /m ³		
e	Nitrogen oxides ^a	0,5 mg/m ³ 0,26 cm ³ /m ³	1,0 mg/m ³ 0,52 cm ³ /m ³		
^a The tests may be performed by a four component mixture of these gases. Tests of Table 3 may be combined with tests of Table 1.					

Following the test, compliance is checked by visual inspection of the outside of the used materials or coatings. Surface corrosion of the protective enclosure is allowed. The enclosure design shall provide protection for electromagnetic gaskets and earthing contacts where no corrosion is permitted.

5.5 Tests of resistance against mechanically active substances

Table 4 – Tests of resistance against mechanically active substances

	Environmental parameters	Test severity Classes 1 and 2	IEC method
a	Sand	IP 50 (see note)	60529
b	Dust (suspension)		
c	Dust (sedimentation)		
NOTE No measurable dust shall have entered the enclosure (this assessment is more severe than IEC 60529).			

Following the test, compliance is checked by visual inspection.

6 Mechanical tests

6.1 General

The purpose of these mechanical tests is to ensure that the outdoor enclosure will withstand handling, storage, transport and protect installed equipment from exposure to mechanical stress. For seismic compliance see Clause 8. Installations in public areas typically require compliance to more severe local regulatory laws. These and any additional application

specific requirements need to be observed. Should the outdoor enclosure be installed in a public place the power input requirements may have to be in compliance with IEC 61439-5.

6.2 Dynamic test

The dynamic tests of an outdoor enclosure shall be conducted under the intended transport condition. Since outdoor enclosure dynamic transport stress is considerably more severe than typical handling and storage stress no further dynamic tests are required. For the purpose of this test no transport packing material is used. The outdoor enclosure shall be mounted to the shock/vibration table by using the intended ground/floor mounting features. For the purpose of the dynamic test the outdoor enclosure static load shall be agreed between the vendor and user.

The chosen severity classes are similar to IEC 60721-3-2, class 2M1.

Table 5 – Vibration and shock test

	Environmental parameters	Test severity		IEC method/ ETSI EN
		Class 1 (controlled transport condition)	Class 2 (limited transport condition)	
a	Vibration, sinusoidal 3 axes, 10 cycles	2-9 Hz/3, 5 mm displacement 9-200 Hz/10 m/s ² acceleration 200-500 Hz/15 m/s ² acceleration	5-9 Hz/3.5 mm displacement 9-200 Hz/10 m/s ² acceleration 200-500 Hz/15 m/s ² acceleration	60068-2-6: Fc
b ¹⁾	Vibration, random	-	5-20 Hz: 1 m ² /s ⁴ /Hz 20-200 Hz: -3 dB/oct	ETSI EN 300019-2-2 Class 2.3
c	Shock , 1/2 sine wave vertical axes only No of shocks: 3	Peak acceleration 100 m/s ² Time: 11 ms	Peak acceleration 100 m/s ² Time: 11 ms	60068-2-27: Ea Shock response spectrum type I
d	Free fall: enclosure mass < 20 kg 20 kg to 100 kg > 100 kg	0, 25 m 0, 25 m 0, 10 m	1, 25 m 1, 00 m 0, 25 m	60068-2-32: Ed

¹⁾ Alternative test.

Following the test, no deformation or damage of parts that effect form, fit and function shall be found.

6.3 Lifting and stiffness test

If lifting eyes are provided the performance test as per IEC 61587-1 shall be applied.

Following the test, no deformation or damage of parts that effect form, fit and function shall be found.