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INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.240

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MECHANICAL STRUCTURES FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – OUTDOOR ENCLOSURES –

Part 1: Design guidelines

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 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. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2020. This edition constitutes a technical revision.

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

- a) added references to the environmental conditions defined by ETSI EN 300 019-1 and IEC 60721-2 series;
- b) reference made to the correct test specifications;
- c) addition of laser hazard warning in case opto-electronic equipment is used.

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

Draft	Report on voting
48D/752/CDV	48D/758/RVC

Full information on the voting for its approval 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 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/publications.

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.

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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 the IEC 61969 series are empty enclosures for outdoor locations, to be equipped with application-specific combinations of electrical and electronic equipment, and to be used at non-weatherprotected locations above ground.

The IEC 61969 series consists of:

- a design guidelines general part: IEC 61969-1;
- a coordination dimensions standard: IEC 61969-2;
- an environmental requirements and tests, safety aspects standard: IEC 61969-3.

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

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 for electrical and electronic equipment 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-weatherprotected 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 can be, but is not limited to, subracks or chassis in accordance with the IEC 60917 series or IEC 60297 series. A typical outdoor enclosure is shown in Figure 1.

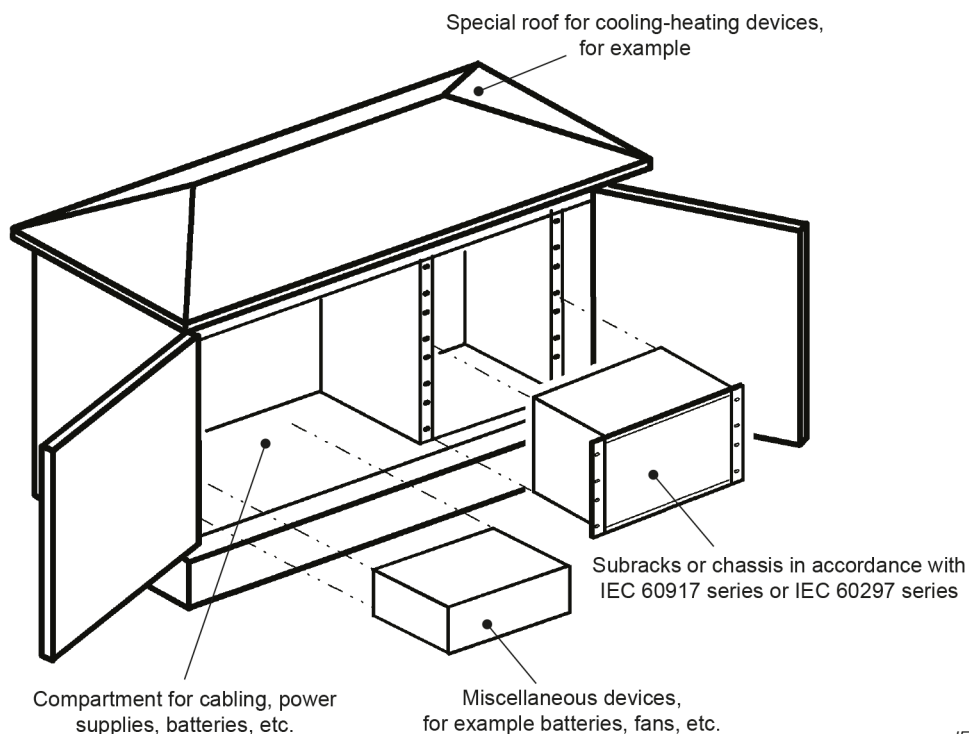


Figure 1 – Typical outdoor enclosure

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

IEC 60754-2, *Test on gases evolved during combustion of materials from cables – Part 2: Determination of acidity (by pH measurement) and conductivity*

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

~~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 61034-1, *Measurement of smoke density of cables burning under defined conditions – Part 1: Test apparatus*

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 electrical and electronic equipment – Tests for IEC 60917 and IEC 60297 series – Part 1: Environmental requirements, test setups 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 IEC 60297 – Part 3: Electromagnetic shielding performance tests for cabinets and subracks*

IEC 61969-2, *Mechanical structures for electronic equipment – Outdoor enclosures – Part 2: Coordination dimensions*

IEC 61969-3, *Mechanical structures for electrical and electronic equipment – Outdoor enclosures – Part 3: Environmental requirements, tests and safety aspects*

IEC 62194, *Method 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*

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

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

ISO 3864-2, *Graphical symbols – Safety colours and safety signs – Part 2: Design principles for product safety labels*

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

ETSI EN 300 019-1-2, *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-2: Classification of environmental conditions; Transportation*

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

ETSI EN 300 019-2-2, *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-2: Specification of environmental tests; Transportation*

ETSI EN 300 019-2-4, ~~Equipment~~ *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-4: Specification of environmental tests – Stationary use at non-weatherprotected locations*

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

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Structures mécaniques pour équipement électrique et électronique –
Enveloppes de plein air –
Partie 1: Lignes directrices pour la conception**



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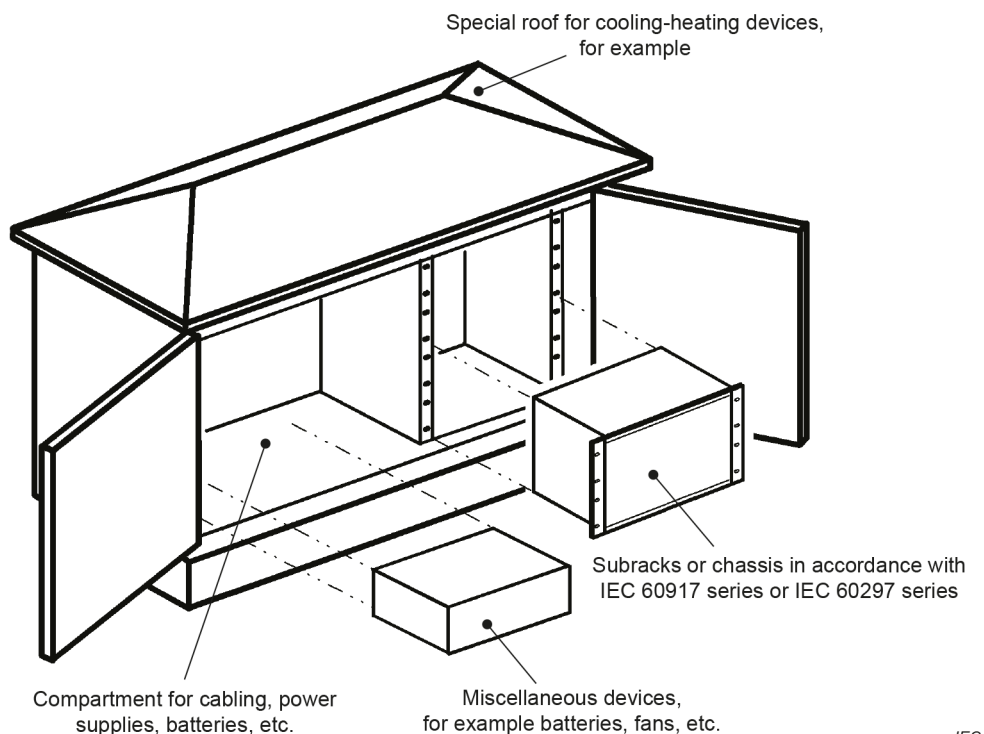


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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

STRUCTURES MÉCANIQUES POUR ÉQUIPEMENT ÉLECTRIQUE ET ÉLECTRONIQUE – ENVELOPPES DE PLEIN AIR –

Partie 1: Lignes directrices pour la conception

AVANT-PROPOS

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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L'IEC 61969-1 a été établie par le sous-comité 48D: Structures mécaniques pour les équipements électriques et électroniques, du comité d'études 48 de l'IEC: Connecteurs électriques et structures mécaniques pour les équipements électriques et électroniques. Il s'agit d'une Norme internationale.

Cette quatrième édition annule et remplace la troisième édition parue en 2020. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) ajout de références aux conditions d'environnement définies par les séries ETSI EN 300 019-1 et IEC 60721-2;
- b) référence aux spécifications d'essai correctes;

c) ajout d'un avertissement de danger laser en cas d'utilisation d'équipement optoélectronique.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
48D/752/CDV	48D/758/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications/.

Une liste de toutes les parties de la série IEC 61969, publiées sous le titre général *Structures mécaniques pour équipement électrique et électronique – Enveloppes de plein air*, se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

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- amendé.

INTRODUCTION

La présente partie de l'IEC 61969 est destinée à servir de guide générique pour le développement d'autres parties au sein de cette série de normes, et fournit des lignes directrices pour la conception d'enveloppes de plein air.

Les produits couverts par la série IEC 61969 sont les enveloppes vides pour les emplacements de plein air, destinées à être équipées de combinaisons d'équipements électriques et électroniques spécifiques à l'application, et à être utilisées dans des emplacements non protégés contre les intempéries au-dessus du sol.

La série IEC 61969 comprend:

- une partie générale qui donne les lignes directrices pour la conception: IEC 61969-1;
- une norme qui traite des dimensions de coordination: IEC 61969-2;
- une norme qui traite des exigences et des essais d'environnement et des aspects liés à la sécurité: IEC 61969-3.

Il convient de lire l'IEC 61969-2 et l'IEC 61969-3 conjointement avec le présent document.

STRUCTURES MÉCANIQUES POUR ÉQUIPEMENT ÉLECTRIQUE ET ÉLECTRONIQUE – ENVELOPPES DE PLEIN AIR –

Partie 1: Lignes directrices pour la conception

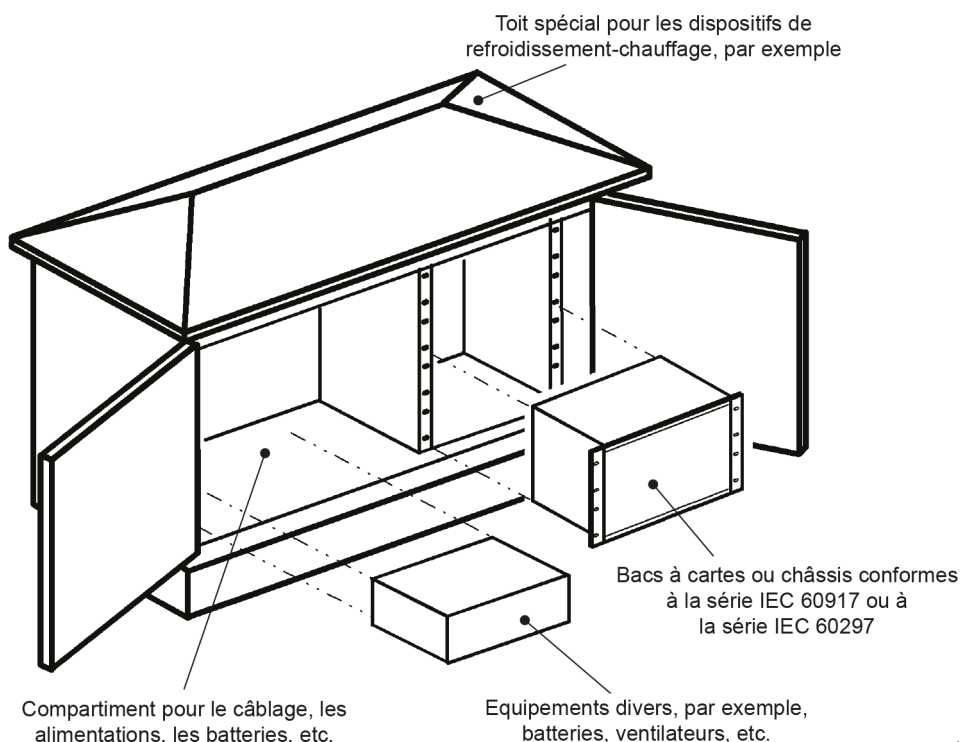
1 Domaine d'application

La présente partie de l'IEC 61969 fournit des lignes directrices pour la conception des enveloppes de plein air pour équipements électriques et électroniques et s'applique à une grande variété d'équipements mécaniques, électromécaniques et électroniques et à leur installation en configuration modulaire.

Le présent document est destiné:

- à fournir une vue d'ensemble des spécifications applicables aux enveloppes, portant essentiellement sur les exigences propres aux applications de plein air pour une utilisation à poste fixe à des emplacements non protégés contre les intempéries; et
- à assurer l'intégrité du produit dans des conditions extérieures et à faciliter le choix du produit lors de l'approvisionnement en enveloppes de plein air auprès des différents fournisseurs.

Ces enveloppes sont supposées contenir tous types d'équipements et protéger les installations situées en plein air contre les effets indésirables dus à l'environnement. L'équipement installé peut, entre autres, être constitué de bacs ou de châssis conformes à la série IEC 60917 ou à la série IEC 60297. Une enveloppe de plein air typique est représentée à la Figure 1.



IEC

Figure 1 – Enveloppe de plein air typique

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60417, *Symboles graphiques utilisables sur le matériel* (disponible à l'adresse <http://www.graphical-symbols.info/equipment>)

IEC 60529, *Degrés de protection procurés par les enveloppes (Code IP)*

IEC 60695-11-10, *Essais relatifs aux risques du feu – Partie 11-10: Flammes d'essai – Méthodes d'essai horizontal et vertical à la flamme de 50 W*

IEC 60721-3-2, *Classification des conditions d'environnement – Partie 3-2: Classification des groupements des agents d'environnement et de leurs sévérités – Transport et manutention*

IEC 60721-3-4, *Classification des conditions d'environnement – Partie 3-4: Classification des groupements des agents d'environnement et de leurs sévérités – Utilisation à poste fixe, non protégé contre les intempéries*

IEC 60754-2, *Essai sur les gaz émis lors de la combustion des matériaux prélevés sur câbles – Partie 2: Détermination de la conductivité et de l'acidité (par mesure du pH)*

IEC 60825-1, *Sécurité des appareils à laser – Partie 1: Classification des matériels et exigences*

IEC 61034-1, *Mesure de la densité de fumées dégagées par des câbles brûlant dans des conditions définies – Partie 1: Appareillage d'essai*

IEC 61140, *Protection contre les chocs électriques – Aspects communs aux installations et aux matériels*

IEC 61439-5, *Ensembles d'appareillage à basse tension – Partie 5: Ensembles pour réseaux de distribution publique*

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

IEC 61587-2, *Structures mécaniques pour équipements électroniques – Essais pour la CEI 60917 et la CEI 60297 – Partie 2: Essais sismiques pour baies et bâtis*

IEC 61587-3, *Structures mécaniques pour équipement électronique – Essais pour la CEI 60917 et la CEI 60297 – Partie 3: Essais de performance du blindage électromagnétique pour les baies et les bacs à cartes*

IEC 61969-2, *Structures mécaniques pour équipement électronique – Enveloppes de plein air – Partie 2: Dimensions de coordination*

IEC 61969-3, *Structures mécaniques pour équipement électrique et électronique – Enveloppes de plein air – Partie 3: Exigences et essais d'environnement, et aspects liés à la sécurité*

IEC 62194, *Méthode d'évaluation de la performance thermique des enveloppes*

IEC 62262, *Degrés de protection procurés par les enveloppes de matériels électriques contre les impacts mécaniques externes (code IK)*

IEC 62305-4, *Protection contre la foudre – Partie 4: Réseaux de puissance et de communication dans les structures*

IEC 62368-1, *Équipements des technologies de l'audio/vidéo, de l'information et de la communication – Partie 1: Exigences de sécurité*

ISO 1518-1, *Peintures et vernis – Détermination de la résistance à la rayure – Partie 1: Méthode à charge constante*

ISO 3864-2, *Symboles graphiques – Couleurs de sécurité et signaux de sécurité – Partie 2: Principes de conception pour l'étiquetage de sécurité des produits*

ISO 7779, *Acoustique – Mesurage du bruit aérien émis par les équipements liés aux technologies de l'information et aux télécommunications*

ETSI EN 300 019-1-2, *Ingénierie de l'environnement (EE); Conditions et essais d'environnement des équipements de télécommunications; Partie 1-2: Classification des conditions d'environnement; Transport*

ETSI EN 300 019-1-4, *Ingénierie de l'environnement (EE); Conditions et essais d'environnement des équipements de télécommunications; Partie 1-4 Classification des conditions d'environnement; Utilisation fixe sur des sites non protégés contre les intempéries*

ETSI EN 300 019-2-2, *Ingénierie de l'environnement (EE); Conditions d'environnement et essais d'environnement des équipements de télécommunication; Partie 2-2: Spécification des essais d'environnement; Transport*

ETSI EN 300 019-2-4, *Ingénierie de l'environnement (EE); Conditions et essais d'environnement des équipements de télécommunications; Partie 2-4: Spécifications des essais environnementaux; Utilisation à poste fixe sur des sites non protégés contre les intempéries*

ETSI EN 300 753, *Ingénierie de l'environnement (EE); Bruit acoustique émis par les équipements de télécommunication*