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EUROPEAN STANDARD

Environmental Engineering (EE);
Environmental conditions and environmental tests
for telecommunications equipment;
Part 1: Classification of environmental conditions;
Sub-part 3: Stationary use at weatherprotected locations

Reference
REN/EE-017013

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Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Environmental Engineering (EE), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI.

The present document is part 1, sub-part 3 of a multi-part deliverable covering the classification of environmental conditions and environmental tests for telecommunications equipment, as identified below:

Part 1: "Classification of environmental conditions": (see note 1)

Sub-part 0: "Introduction";

Sub-part 1: "Storage";

Sub-part 2: "Transportation";

Sub-part 3: "Stationary use at weatherprotected locations";

Sub-part 4: "Stationary use at non-weatherprotected locations";

Sub-part 5: "Ground vehicle installations";

Sub-part 6: "Ship environments";

Sub-part 7: "Portable and non-stationary use";

Sub-part 8: "Stationary use at underground locations";

Part 2: "Specification of environmental tests" (see note 2).

NOTE 1: Specifies different standardized environmental classes covering climatic and biological conditions, chemically and mechanically active substances and mechanical conditions during storage, transportation and in use. Sub-part 1-0 forms a general overview of part 1.

NOTE 2: Specifies the recommended test severities and test methods for the different environmental classes.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document defines classes of environmental conditions and their severities to which telecommunication equipment may be exposed. The severities specified are those which will have a low probability of being exceeded; generally less than 1 % of the operating time in a year.

The present document applies to equipment mounted for stationary use including periods of erection work, down time, maintenance and repair at weatherprotected locations defined in clause 5.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found in the ETSI docbox.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are necessary for the application of the present document.

[1] IEC 60721-2-6:2022: "Classification of environmental conditions - Part 2-6: Environmental conditions appearing in nature - Earthquake vibration and shock".

[2] IEC 60721-3-3:2019: "Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weatherprotected locations".

[3] IEC 60068-3-3:2019: "Environmental testing - Part 3-3: Supporting documentation and guidance - Seismic test methods for equipment".

[4] ISO 9223:2012: "Corrosion of metals and alloys — Corrosivity of atmospheres — Classification, determination and estimation".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

Not applicable.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

absolute humidity: mass of water vapour in grams which is associated with one cubic metre of dry air in an air/water vapour mixture

cooling system: system that controls or influences climate by decreasing the air temperature only

NOTE: This can decrease the absolute humidity.

data centre: all buildings, facilities, offices and rooms which contain enterprise servers, server communication equipment, cooling equipment and power equipment, and provide some form of data service

NOTE: E.g. large scale mission critical facilities all the way down to small server rooms located in office buildings.

heating system: system that controls or influences climate by increasing the air temperature only

NOTE: This can decrease the relative humidity.

relative humidity: ratio of the partial pressure of the water vapour in moist air at a given temperature, to the partial pressure of the water vapour in saturated air at the same temperature

stationary use: use of equipment which is mounted firmly on a structure, or on mounting devices, or permanently placed at a certain site

NOTE: It is not intended for portable use, but short periods of handling during erection works and for which down time, maintenance and repair at the location are included.

weatherprotected location: location at which the equipment is protected from direct weather influences

EXAMPLE 1: Totally weatherprotected location (enclosed location):
direct weather influences are totally excluded.

EXAMPLE 2: Partly weatherprotected location (sheltered location):
direct weather influences are not completely excluded.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

RS	Response Spectrum
UV	UltraViolet
ZPA	Zero Period Acceleration

4 Environmental classes

4.1 Class 3.10: Temperature-controlled enclosed locations having no humidity control

Class 3.10 is a combination of classes 3K22/3Z2/3B1/3S6/3M11 in IEC 60721-3-3 [2], and C1 in ISO 9223 [4], see Tables 1 to 6 in clause 5.

The climatogram is shown in Figure 1.

Seismic environment: **zone 4** as defined in IEC 60721-2-6 [1]. Option zone 4 (modified Mercalli scale ≥ 9): if earthquake conditions are specified by the customer, the conditions stated in clause 5.6 apply.

This class shall apply to a permanently temperature controlled enclosed location. Humidity usually not controlled. The climatogram is shown in Figure 1. Exceptional conditions may apply in specific cases (e.g. external extreme environmental conditions) and these exceptional conditions are shown in Figure 1 where they are described as 3.10E in clause 5.1 but this is not a separate class.

NOTE: The exceptional conditions described as 3.10E in Figure 1 are not defined in IEC 60721-3-3 [2].

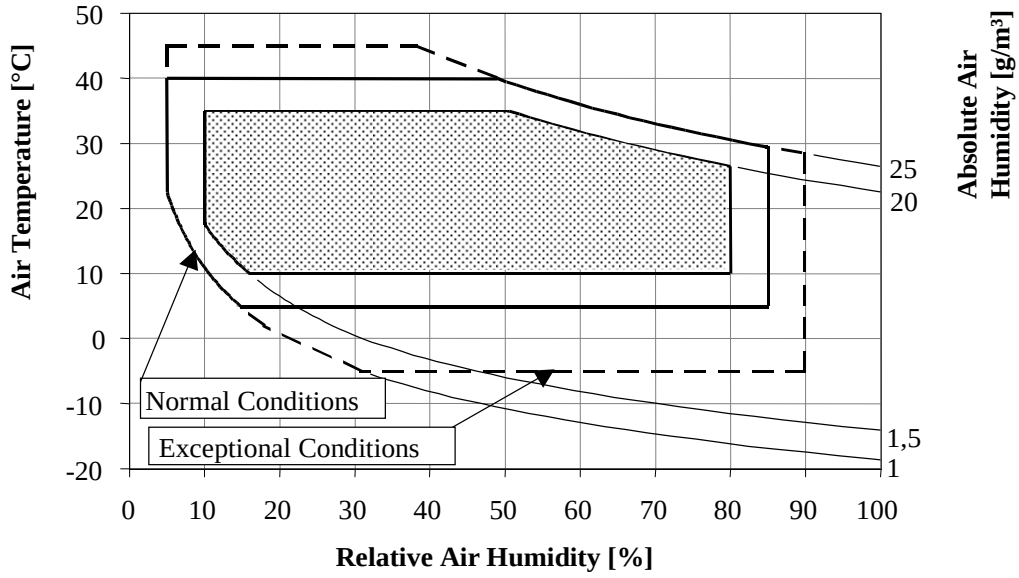
Heating or cooling are used to maintain the required conditions - especially where there is a significant difference between the room environment and the external ambient. The climate-controlling systems could be periodically switched on or off but extremely high or low temperatures are prevented.

This class shall apply to locations:

- where installed equipment may be exposed to solar radiation and to heat radiation. It may also be exposed to movements of the surrounding air due to draughts in buildings. They are not subjected to condensed water, precipitation, water from sources other than rain or icing;
- without particular risks of biological attacks. This includes protective measures, e.g. special product design, or installations at locations of such construction that mould growth and attacks by animals, etc., are not probable;
- with normal levels of contaminants experienced in urban areas with industrial activities scattered over the whole area and/or with heavy traffic;
- without special precautions to minimize the presence of sand or dust, but which are not situated in proximity to sources of sand or dust;
- with insignificant vibration and shock.

The conditions of this class may be found in:

- normal living or working areas, e.g. living rooms, rooms for general use (theatres, restaurants);
- offices;
- shops;
- workshops for electronic assemblies and other electrotechnical products;
- telecommunication centres;
- storage rooms for valuable and sensitive products;
- data centres;
- computer halls.



Values outside this field have a probability of occurrence of less than 10 % of the operating time in a year

Exceptional climatic limits (class 3.10E).

Normal climatic limits of class 3.10: Values outside these limits have a probability of occurrence of less than 1 % of the operating time in a year.

NOTE: Exceptional conditions may occur following the failure of the temperature controlling system.

Figure 1: Climatogram for Class 3.10: Temperature-controlled enclosed locations

4.2 Class 3.11: Enclosed locations having no temperature or humidity control

This class is a combination of classes 3K23/3Z2/3B2//3S7/3M12 in IEC 60721-3-3 [2] , and C2 in ISO 9223 [4], see Tables 1 to 6 in clause 5.

The contamination of the natural atmosphere is mainly caused by chemical emissions from industrial activities, motor-driven vehicles, and heating systems, see clause 5.3.

Seismic environment: **zone 4** as defined in IEC 60721-2-6 [1]. Option zone 4 (modified Mercalli scale ≥ 9): if earthquake conditions are specified by the customer, the conditions stated in clause 5.6 apply.

This class applies to an enclosed location having neither temperature nor humidity control. The climatogram is shown in Figure 2.

Heating may be used to raise low temperatures especially where there is a significant difference between the conditions of this class and the open-air climate. Building construction is designed to avoid extremely high temperatures. Installed products may be subjected to formation of ice.

This class shall apply to locations:

- where installed equipment may be exposed to solar radiation and heat radiation. They may also be exposed to movements of the surrounding air due to draughts in buildings, e.g. through open windows. They may be subjected to condensed water. They are not subjected to precipitation;
- where mould growth or attacks by animals, except termites, may occur;
- with normal levels of contaminants experienced in urban areas with industrial activities scattered over the whole area and/or with heavy traffic;

- in close proximity to sources of sand or dust;
- with vibration of low significance, e.g. for products fastened to light supporting structures subjected to negligible vibrations.

The conditions of this class may be found in:

- entrances and staircases of buildings;
- garages;
- cellars;
- certain workshops;
- buildings in factories and industrial process plants;
- unattended equipment stations;
- certain telecommunication buildings;
- ordinary storage rooms for frost resistant products and farm buildings, etc.

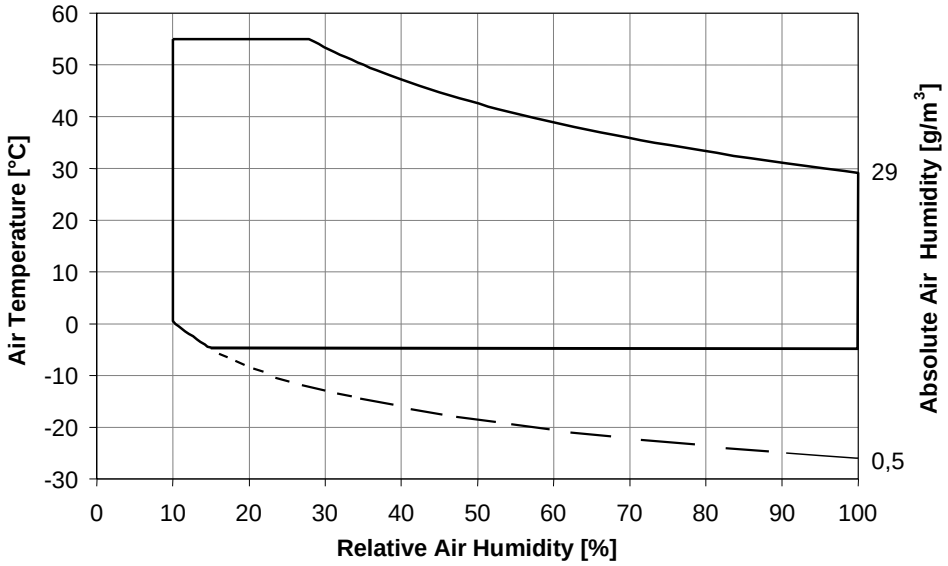


Figure 2: Climatogram for class 3.11: Enclosed locations having no temperature or humidity control

4.3 Class 3.12: Locations having neither temperature nor humidity control

This class is a combination of classes 3K24/3Z2/3B2//3S7/3M12 in IEC 60721-3-3 [2], and C2 in ISO 9223 [4], see Tables 1 to 6 in clause 5. The contamination of the natural atmosphere is mainly caused by chemical emissions from industrial activities, motor-driven vehicles, and heating systems, see clause 5.3.

Seismic environment: **zone 4** as defined in IEC 60721-2-6 [1], Option zone 4 (modified Mercalli scale ≥ 9): if earthquake conditions are specified by the customer, the conditions stated in clause 5.6 apply.

This class shall apply to a location having neither temperature nor humidity control. The location may have openings directly to the open air, i.e. may be only partially-weather protected. The climatogram is shown in Figure 3.

The climatic conditions of this class may be affected to a varying extent by the conditions of the open-air climate and the construction of the building.

This class shall apply to locations:

- where installed equipment may be exposed to solar radiation and temporarily to heat radiation. It may also be exposed to movements of the surrounding air due to draughts e.g. through doors, windows or other openings. It may be subjected to condensed water, to water from sources other than rain and to icing;
- where mould growth, or attacks by animals, except termites, may occur;
- with normal levels of contaminants experienced in urban areas with industrial activities scattered over the whole area and/or with heavy traffic;
- in close proximity to sources of sand or dust;
- with vibration of low significance, e.g. for products fastened to light supporting structures subjected to negligible vibrations.

The conditions of this class may be found in:

- some entrances to buildings;
- some garages;
- some shacks;
- unattended buildings, etc.

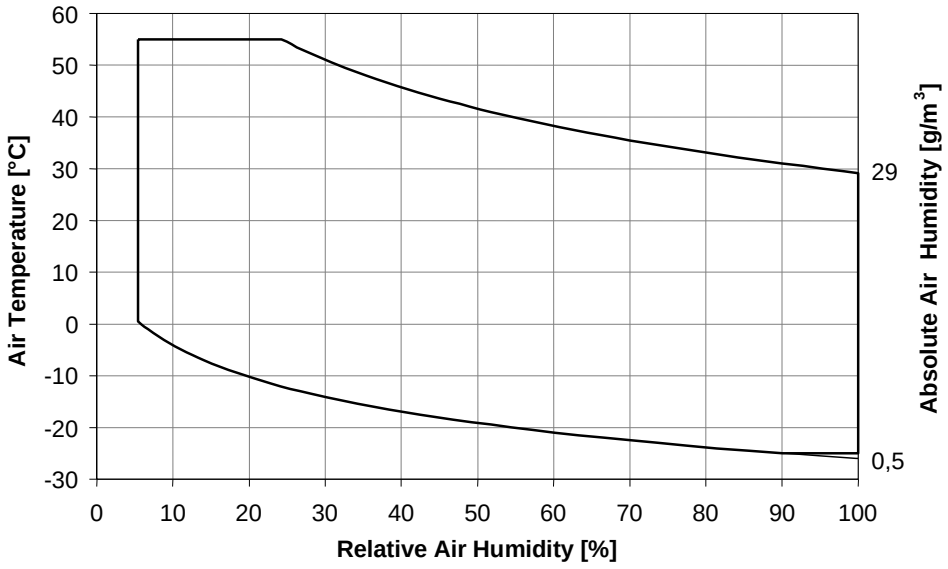


Figure 3: Climatogram for class 3.12: Locations having neither temperature nor humidity control

5 Environmental conditions

5.1 Climatic conditions

Table 1: Climate parameters for environmental classes 3.10 to 3.12

Environmental parameter	Unit	Class			
		3.10	**3.10E**	**3.11**	**3.12**
Low air temperature	°C	+5	-5	-5	-25
High air temperature	°C	+40	+45	+55	+55
Low relative humidity (see note 1)	%	5	5	10	5
High relative humidity (see note 1)	%	85	90	100	100
Low absolute humidity (see note 1)	g/m^3	1	1	0,5	0,5
High absolute humidity (see note 1)	g/m^3	25	25	29	29
Rate of change of temperature (see note 2)	°C/min	0,5	0,5	0,5	0,5
Low air pressure (see note 3)	kPA	70	70	70	70
High air pressure	kPA	106	106	106	106
Solar radiation (see note 3)	W/m^2	700	700	700	700
Heat radiation	Not specified	(see note 5)	(see note 5)	(see note 5)	(see note 5)
Movement of surrounding air (see note 4)	m/s	1,0	1,0	1,0	5,0
Condensation	Not specified	No (see note 6)	No (see note 6)	Yes	Yes
Water from sources other than rain	Not specified	No	No	Dripping water	Dripping water
Formation of ice and frost (including freeze-thaw)	Not specified	No	No	Yes	Yes

NOTE 1: The low and high relative humidity severities are limited by the low and high absolute humidity and high and low temperature. The extreme severities of relative humidity, absolute humidity and temperature cannot occur simultaneously. See Annex A of IEC 60721-3-3 [2].
NOTE 2: Averaged over a period of time of 5 min.
NOTE 3: Secondary effects from the solar radiation behave as heating effect.
NOTE 4: A cooling system based on non-assisted convection may be disturbed by adverse movement of surrounding air.
NOTE 5: Heat radiation, for example in the vicinity of room heating systems.
NOTE 6: Limited to no occurrence of condensation.

5.2 Biological conditions

Table 2: Biological conditions for environmental classes 3.10 to 3.12

Environmental parameters		Unit	Class	
			3.10	**3.11 to 3.12**
a)	Flora	none	-	presence of mould, fungus, etc.
b)	Fauna	none	-	presence of rodents and other animals harmful to products but excluding termites

5.3 Chemically active substances

The contamination of the natural atmosphere is mainly caused by chemical emissions from industrial activities, motor-driven vehicles, and heating systems. Details regarding the categorization of these conditions may be found in ISO 9223 [4].

Table 3: Chemically active substances for environmental classes 3.10, 3.11 and 3.12 (see note 1)

Environmental parameter		Unit	Class			
			3.10, 3.11, 3.12		Special (C3) (see note 12)	
			min value	max value	min value	max. value
a)	Salt mist	none	sea salts, road salts			
b)	Sulphur dioxide (SO_2) (see note 2)	µg/m^3	2	15	50	400
c)	Nitrogen dioxide (NO_2) (see note 3)	µg/m^3	2	25	20	150
d)	Nitric acid (HNO_3) (see note 4)	µg/m^3	0,1	0,7	0,5	4
e)	Ozone (O_3) (see note 5)	µg/m^3	20	90	20	90
f)	Hydrogen sulphide(H_2S) (see note 6)	µg/m^3	1	5	20	250
g)	Chlorine (Cl_2) (see note 7)	µg/m^3	0,1		20	
h)	Chlorine ion Cl^- (see note 8)	µg/m^3	0,1	200	300	1 500
i)	Ammonia (NH_3) (see note 9)	µg/m^3	Up to 20		Up to 3 000	
j)	Particles PM_{10} (see note 10)	µg/m^3	10	25	30	70
k)	Particles (dust deposits)	mg/m^2	450	1 500	1 000	6 000
l)	Soot (see note 11)	mg/m^2	Up to 5		Up to 75	

NOTE 1: This table shows the values derived from ISO 9223 [4] for the rural area instead the class C3 are the values derived from ISO 9223 [4] for the industrial environment and rural when no data are given for industrial environment.
NOTE 2: The main sources for SO_2 are the use of coal and oil and emissions from industrial plants.
NOTE 3: Traffic is the main source for NO_2 emissions.
NOTE 4: HNO3 is correlated with NO_2. High concentrations of NO_2, organic compounds and UV light increase the concentration.
NOTE 5: O_3 is formed in the atmosphere by an interactions among sunlight, oxygen and pollutants. The concentrations are higher in polluted rural atmospheres and lower in high-traffic urban areas.
NOTE 6: There are some natural sources, for instance swamps and volcanic activities. The pulp and paper industry and farming give the highest concentrations.
NOTE 7: The main source is emissions from the pulp and paper industry.
NOTE 8: The main sources are the ocean and de-icing of roads.
NOTE 9: Fertilization in the agricultural area source and emissions from industry and food production can give the highest average values.
NOTE 10: In rural area is largely inert components, In urban area is due to high-concentration of traffic and corrosive components. In industrial area are emissions from production.
NOTE 11: Coal and wood burning is a major source. Diesel soot from cars is another source.
NOTE 12: It is not mandatory to consider the special class as a requirement for the combined effect of all parameters stated. If applicable, values of single parameters may be selected from these classes. In this case the severities of class 4.10 are valid for all parameters not especially named. The special class C3 can be applied for industrial plants.

5.4 Mechanically active substances

Table 4: Mechanically active substances for environmental classes 3.10 to 3.12

Environmental parameters		Unit	Class	
			3.10	3.11 and 3.12
a)	Setting (sedimentary) dust	mg/(m^{2}d)	6	Note
b)	Turbulent (suspended) dust	mg/(m^{2}h)	no	600
c)	Windblown dust	mg/(m^{2}h)	no	no
NOTE: Encompassed within turbulent (suspended) dust.				

5.5 Mechanical conditions

Table 5: Mechanical conditions for the environmental classes 3.10 to 3.12

Environmental parameter	Unit	Class		
		3.10		3.11 and 3.12
Stationary vibration, random: acceleration spectral density	$(m/s^2)^2/Hz$		0,01	0,1
Frequency range	Hz		5 to 200	5 to 200
Shock	m/s^2		No	20

5.6 Earthquake conditions

The dynamic environment which an equipment experiences during an earthquake depends on several parameters including the intensity of the ground motion, the structural characteristics of the building, the elevation of the equipment in the building and the characteristics of the structures used to support and house the equipment itself.

The most common method for specifying seismic conditions taking into account all these parameters is through the definition of a Response Spectrum (RS).

A RS is the graphical representation of the maximum response (i.e. acceleration) of an array of single degree-of-freedom oscillators as a function of oscillator frequency, in response to an applied transient base motion.

In other words the RS may be used to describe the motion that equipment is expected to experience at its mounting during a postulated seismic event.

To define an RS it is necessary to define the base motion and the characteristics of the array of the single degree-of-freedom oscillators, including their damping ratio.

The high frequency asymptotic value of the acceleration of the response spectrum is normally called Zero Period Acceleration (ZPA) and represents the largest peak value of acceleration of the base motion.

In the absence of a detailed knowledge of the possible seismic motion, the ZPA value can be obtained by the following formula (see IEC 60068-3-3 [3]):

$$ZPA = a_f = a_g \times K \times D \times G$$

where:

a_f floor acceleration;

a_g *ground acceleration* that depends on the intensity of the earthquake;

K *superelevation factor* that takes into account the amplification of the ground acceleration resulting from the vibrational behaviour of buildings and structures;

D *direction factor* that takes into consideration possible intensity differences of the seismic motion between the horizontal and vertical axes;

G *geometric factor*; normally specified among testing parameters when single axis excitation is used for testing to take into account the interaction, due to installation location, along the different axes of the equipment of simultaneous multi-directional input vibrations.

The parameter severities that shall be used for classes 3.10 to 3.12 are shown in Table 6.

The severities have been chosen from those stated in IEC 60068-3-3 [3].

Table 6: Earthquake parameters for classes 3.10 to 3.12

Parameter	Description	Severity
Earthquake intensity	strong to very strong earthquakes (Richter scale magnitude > 7, Modified Mercalli intensity scale > IX)	A_g = 5 m/s^2
Superelevation factor	installations on stiff structures connected rigidly to buildings	K = 2
Direction factor	no intensity differences among axes	D_{xyz} = 1
Geometric factor	single-axis excitation with interaction with the other axes	G = 1,5

The corresponding Response Spectrum, assuming a damping ratio of the single degree-of-freedom oscillators N = 2 %, is described in Figure 4 and Table 7.

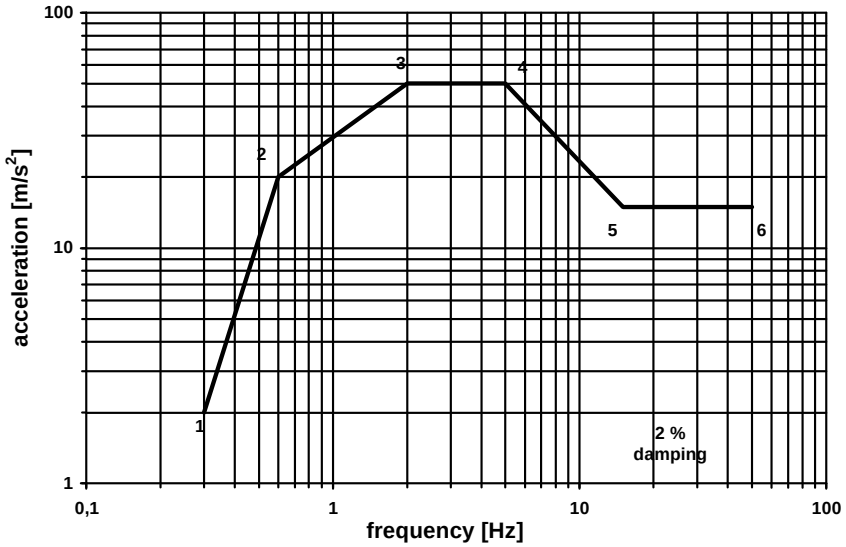


Figure 4: Earthquake Response Spectrum

Table 7: Acceleration co-ordinates for the Response Spectrum

Co-ordinate point	Frequency (Hz)	Values for upper floor acceleration (m/s^2)
1	0,3	2
2	0,6	20
3	2,0	50
4	5,0	50
5	15,0	15
6	50,0	15

Annex A (informative): Bibliography

- ETSI TR 100 035 (2004): "Equipment Engineering (EE); Environmental engineering Guidance and terminology".
- IEC 60721-3-0:2020: "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Introduction".

Annex B (informative): Change history

Version	Information about changes
3.1.1	The environmental classes have been revised based on the classification given in IEC 60 721-3-3: 2019. As the new classes are not comparable with the previous classes taken from IEC 60721-3-3: 2002, the new environmental classes have been defined with new numbers.

History

Version	Date	Status
Edition 1	February 1992	Publication as ETS 300 019-1-3
Amendment 1	June 1997	Amendment 1 to 1st Edition of ETS 300 019-1-3
V2.1.1	March 2003	Publication
V2.1.2	April 2003	Publication
V2.2.2	July 2004	Publication
V2.3.2	November 2009	Publication
V2.4.1	April 2014	Publication
V3.1.0	February 2026	EN Approval Procedure AP 20260513: 2026-02-12 to 2026-05-13