ETSI EN 300 019-1-4 V3.1.1 (2026-05)

EUROPEAN STANDARD

Environmental Engineering (EE);
Environmental conditions and environmental tests
for telecommunications equipment;
Part 1: Classification of environmental conditions;
Sub-part 4: Stationary use at non-weatherprotected locations

Reference
REN/EE-017014

Keywords
environment, equipment practice, testing

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Environmental Engineering (EE).

The present document is part 1, sub-part 4 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.

National transposition dates	
Date of adoption of this EN:	13 May 2026
Date of latest announcement of this EN (doa):	31 August 2026
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	28 February 2027
Date of withdrawal of any conflicting National Standard (dow):	28 February 2027

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 purpose of the present document is to define a class of environmental conditions and their severities to which equipment may be exposed. Only severe conditions, which may be harmful to the equipment, are included. 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 non-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] ETSI EN 300 019-1-3: "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".

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.

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 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.

[i.1] Void.

[i.2] IEC 60721-3-4:2019: "Classification of environmental conditions - Part 3-4: Classification of groups of environmental parameters and their severities - Stationary use at non-weatherprotected locations".

[i.3] Void.

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

[i.5] IEC 60721-2-6:2022: "Classification of environmental conditions - Part 2-6: Environmental conditions appearing in nature - Earthquake vibration and shock".

[i.6] IEC 60068-3-3:2019: "Environmental testing - Part 3-3: Supporting documentation and guidance - Seismic test methods for equipment".

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 grammes which is associated with one cubic metre of dry air in an air/water vapour mixture

non-weatherprotected location: location at which the equipment is not protected from direct weather influences

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

sheltered location: location at which a product is covered by a structure to protect it from direct meteorological conditions, i.e. direct sunlight, heavy rain

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

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

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

4.0 General

The classes shown in parentheses, e.g. (C3), may be selected for special applications.

These classes shall apply to a non-weatherprotected location.

These classes shall apply to locations:

- which are directly exposed to an open-air climate, including solar radiation, movement of the surrounding air, precipitation and water jets; splashing water;
- where mould growth, or attacks by animals but excluding 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. It also applies to coastal areas;

NOTE 1: At locations in the immediate neighbourhood of industrial sources with chemical emissions either special precautions should be taken or a special chemical class should be chosen.

- in areas with sand or dust sources, including urban areas;

NOTE 2: At locations in geographical areas with wind-driven sand or dust in air special precautions should be taken or a special class for mechanically active substances should be chosen.

- where transmitted vibrations are experienced from machines or passing vehicles. Higher level shocks may be experienced e.g. from adjacent machines.

NOTE 3: More severe mechanical conditions are to be expected for equipment intended for public use. Special requirements should be stated for such equipment, e.g. protection against vandalism.

If earthquake conditions can be expected, the conditions stated in clause 5.6 apply.

Two groups of classes are considered:

- Classes 4.10 and 4.11 for sheltered non-weatherprotected locations.
- Classes 4.12, 4.13 and 4.14 for Open-air non-weatherprotected locations.

4.1 Class 4.10: sheltered non-weatherprotected locations in tropical, arid, temperate, and cold climatic classification

4.1.0 Class 4.10 full temperature range

Class 4.10 applies to sheltered non-weatherprotected locations in tropical, arid, temperate, and cold climatic classification with the thermal effects from solar radiation encompassed.

Class 4.10 is a combination of classes 4K23/4Z1/4Z2/4B2//4S10(4S11)/4M12 in IEC 60721-3-4 [i.2] and C2 in ISO 9223 [i.4]. The environmental conditions defined in clause 5 shall apply for the environmental tests.

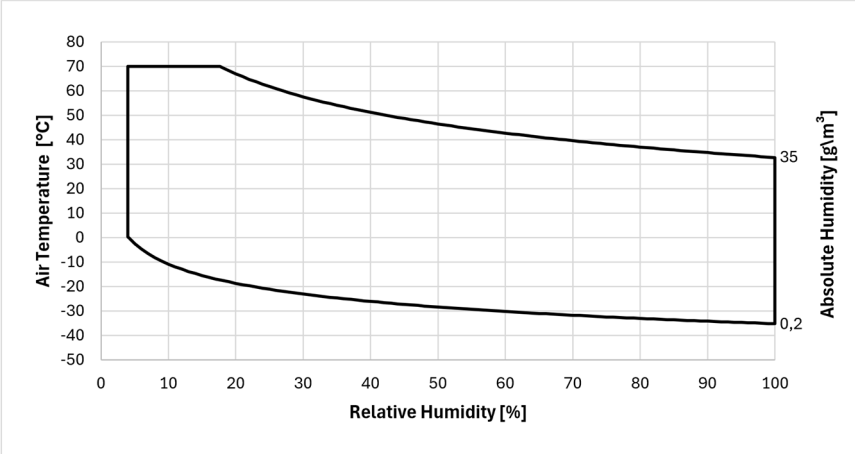

Figure 1: Climatogram for class 4.10: sheltered non-weatherprotected locations

4.1.1 Class 4.10L: sheltered non-weatherprotected locations in cold climatic classification

Class 4.10L applies to sheltered non-weatherprotected locations in cold climatic classification with the thermal effects from solar radiation encompassed.

Class 4.10L is a combination of classes 4K23(low temperature)/4K25(high temperature)/4Z1/4Z2/4B2//4S10(4S11)/4M12 in IEC 60721-3-4 [i.2] and C2 in ISO 9223 [i.4]. The environmental conditions defined in clause 5 shall apply for the environmental tests.

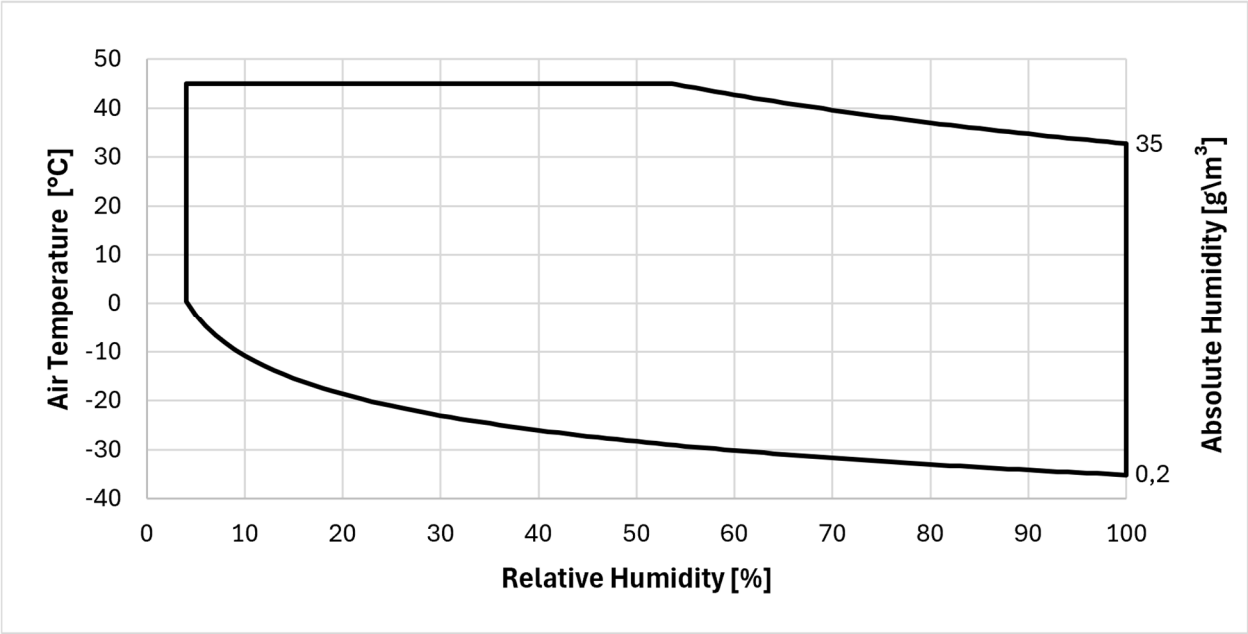

Figure 2: Climatogram for class 4.10L: sheltered non-weatherprotected locations in cold climatic classification

4.1.2 Class 4.10H: sheltered non-weatherprotected locations in tropical, arid, temperate climatic classification

Class 4.10H applies to sheltered non-weatherprotected locations in locations in tropical, arid, temperate climatic classification with the thermal effects from solar radiation encompassed.

Class 4.10H is a combination of classes 4K26(low temperature)/4K23(high temperature)/4Z1/4Z2/4B2//4S10(4S11)/4M12 in IEC 60721-3-4 [i.2] and C2 in ISO 9223 [i.4]. The environmental conditions defined in clause 5 shall apply for the environmental tests.

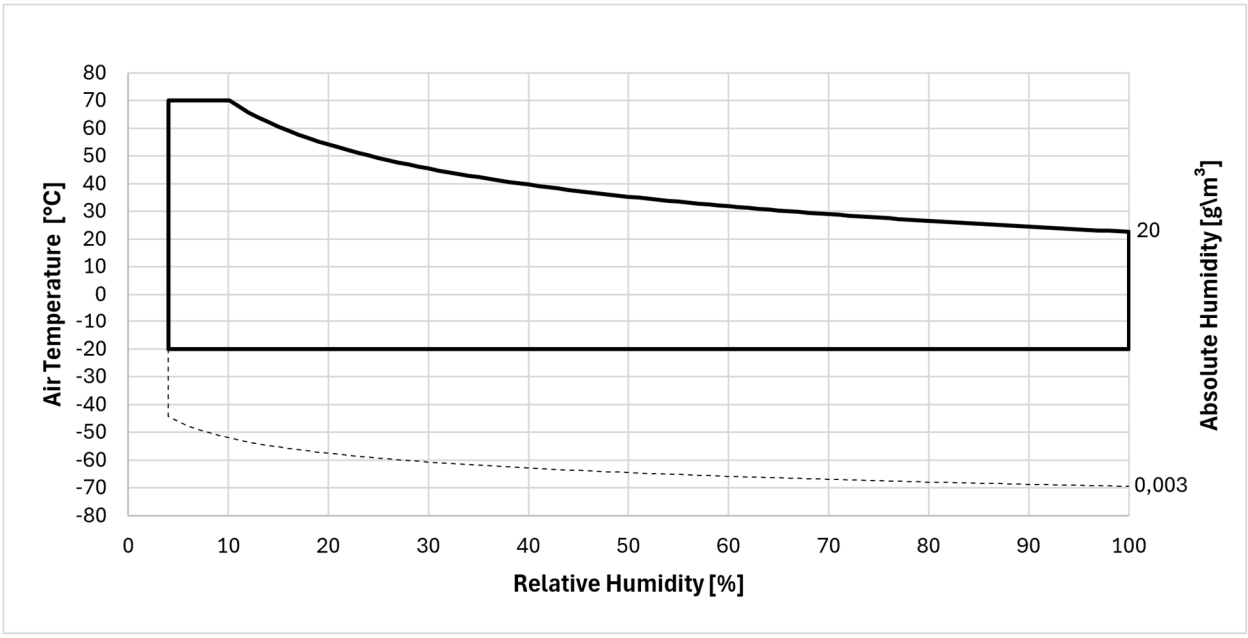

Figure 3: Climatogram for class 4.10H: sheltered non-weatherprotected locations in tropical, arid, temperate climatic classification

4.2 Class 4.11: Open-air non-weatherprotected locations in the tropical climatic

Class 4.11 applies to open-air locations in the tropical climatic classification.

Class 4.11 is a combination of classes 4K25/4Z15/4Z16/4B2(4B3)/4S12/4M12 in IEC 60721-3-4 [i.2] and C2(C3) in ISO 9223 [i.4]. The environmental conditions defined in clause 5 shall apply for the environmental tests.

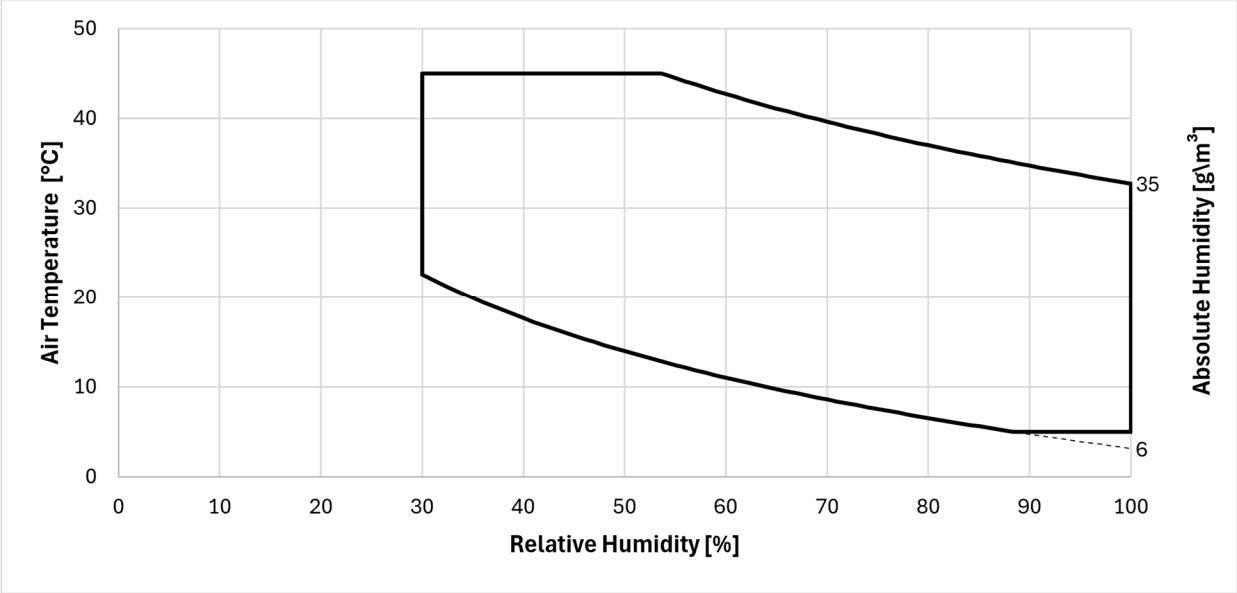

Figure 4: Climatogram for class 4.11: Open-air non-weatherprotected locations in the tropical climatic

4.3 Class 4.12: Open-air non-weatherprotected locations in the arid and temperate climatic classification

Class 4.12 applies to open-air locations in the arid and temperate climatic classifications.

Class 4.12 is a combination of classes 4K26/4Z15/4Z16/4B2/4S12/4M12 in IEC 60721-3-4 [i.2] and C2(C3) in ISO 9223 [i.4]. The environmental conditions defined in clause 5 shall apply for the environmental tests.

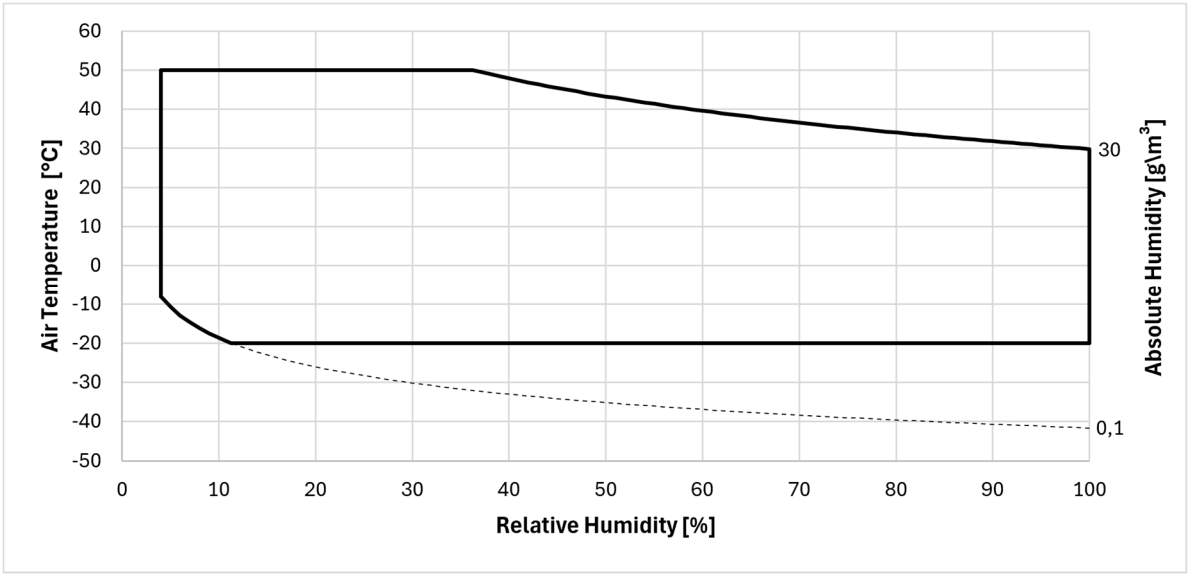

Figure 5: Climatogram for class 4.12: Open-air non-weatherprotected locations in the arid and temperate climatic classification

4.4 Class 4.13: Open-air non-weatherprotected locations in the cold and polar climatic classifications

Class 4.13 applies to open-air locations in in the cold and polar climatic classifications.

Class 4.13 is a combination of classes 4K27/4Z15/4Z16/4B2/4S12(4S13)/4M12 in IEC 60721-3-4 [i.2] and C2(C3) in ISO 9223 [i.4]. The environmental conditions defined in clause 5 shall apply for the environmental tests.

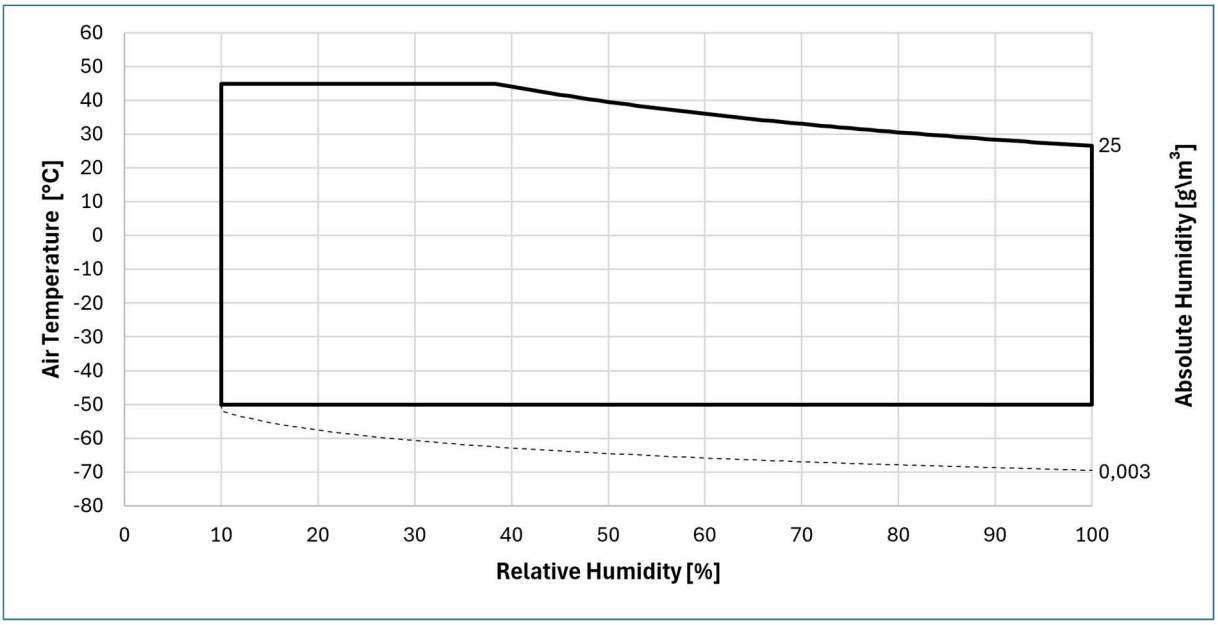

Figure 6: Climatogram for class 4.13: Open-air non-weatherprotected locations in the cold and polar climatic classifications

5 Environmental conditions

5.1 Climatic conditions

Table 1: Climatic conditions for environmental classes 4.10, 4.11, 4.12 and 4.13

Environmental parameter		Unit	Classification					
			Sheltered			Open-air		
			4.10	**4.10L**	**4.10H**	**4.11**	**4.12**	**4.13**
a)	Low air temperature (see note 1)	°C	-45	-50	-20	+5	-20	-50
b)	High air temperature	°C	+70	+45	+70	+45 (see note 8)	+50 (see note 8)	+45 (see note 8)
c)	Low relative humidity (see note 1)	%	4	4	4	30	4	10
d)	High relative humidity (see note 1)	%	100	100	100	100	100	100
e)	Low absolute humidity (see note 1)	g/m^3	0,2	0,2	0,003	6	0,1	0,003
f)	High absolute humidity (see note 1)	g/m^3	35	35	20	35	30	25
g)	Rate of change of temperature (see note 2)	°C/min	1	1	1	1	1	1
h)	Low air pressure (see note 3)	kPa	70	70	70	70	70	70
i)	High air pressure (see note 3)	kPa	106	106	106	106	106	106
j)	Solar radiation	W/m^2	(see note 7)	(see note 7)	(see note 7)	1 090 (see note 8)	1 090 (see note 8)	1 090 (see note 8)
k)	Heat radiation	W/m^2	(see note 7)	(see note 7)	(see note 7)	No	No	No
l)	Movement of surrounding air (see note 4)	m/s	50 (see note 4)	50 (see note 4)	50 (see note 4)	22	22	22
m)	Condensation	None	Yes	Yes	Yes	Yes	Yes	Yes
n)	Precipitation (rain, snow, hail, etc.)	None	Yes	Yes	Yes	Yes	Yes	Yes
o)	Rain intensity	mm/min	No	No	No	15	15	15
p)	Driving rain	m/s	No	No	No	18	18	18
q)	Snow load	Kg/m^2	No	No	No	No	(see note 6)	(see note 6)
r)	Low rain temperature (see note 5)	°C	No	No	No	+5	+5	+5
s)	Water from sources other than rain	None	Dripping water	Dripping water	Dripping water	(see note 9)	(see note 9)	(see note 9)
t)	Formation of ice and frost	None	Yes	Yes	Yes	Y (see note 10)	Yes (see note 10)	Yes (see note 10)

NOTE 1: The low and high relative humidity levels are limited by the low and high absolute humidity. See Annex A of IEC 60721-3-4 [i.2].
NOTE 2: Averaged over a period of 5 min.
NOTE 3: The value of 70 kPa represents a limit for open-air conditions, normally at an altitude of 3 000 m. In some geographical areas, open-air conditions may occur at higher altitudes. Conditions in mines are not considered.
NOTE 4: A cooling system based on non-assisted convection may be disturbed by adverse movement of surrounding air.
NOTE 5: This rain temperature should be considered together with high air temperature and solar radiation. The cooling effect of the rain should be considered in connection with the surface temperature of the product.
NOTE 6: Applies only to wind-driven precipitation at sheltered locations.
NOTE 7: Thermal effect of solar radiation is included in the temperature.
NOTE 8: Thermal effect of solar radiation is not included in the temperature.
NOTE 9: Sources of water other than rain are encompassed in driving rain.
NOTE 10: Formation of frost can occur due to heat radiation to a clear sky.

5.2 Biological conditions

Table 2: Biological conditions for environmental classes 4.10, 4.11, 4.12 and 4.13

Environmental parameter	Unit	Class	
		4.10, 4.11, 4.12, 4.13	4.12 Special (4B3)
a) Flora	none	presence of mould, fungus, etc.	presence of mould, fungus, etc.
b) Fauna	none	presence of rodents and other animals harmful to products, excluding termites	presence of rodents and other animals harmful to products, including 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

Table 3: Chemically active substances for environmental classes 4.10, 4.11, 4.12 and 4.13 (see note 1)

Environmental parameter		Unit	Class			
			4.10, 4.10L, 4.10H, 4.11, 4.12, 4.13		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)	$\mu g/m^3$	2	15	50	400
c)	Nitrogen dioxide (NO_2) (see note 3)	$\mu g/m^3$	2	25	20	150
d)	Nitric acid (HNO_3) (see note 4)	$\mu g/m^3$	0,1	0,7	0,5	4
e)	Ozone (O_3) (see note 5)	$\mu g/m^3$	20	90	20	90
f)	Hydrogen sulphide(H_2S) (see note 6)	$\mu g/m^3$	1	5	20	250
g)	Chlorine (Cl_2) (see note 7)	$\mu g/m^3$	0,1		20	
h)	Chlorine ion Cl^- (see note 8)	$\mu g/m^3$	0,1	200	300	1 500
i)	Ammonia (NH_3) (see note 9)	$\mu g/m^3$	Up to 20		Up to 3 000	
j)	Particles PM_{10} (see note 10)	$\mu g/m^3$	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 [i.4] for the rural area instead the class C3 are the values derived from ISO 9223 [i.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 4.10, 4.11, 4.12 and 4.13

Environmental parameters	Unit	Class			
		4.10, 4.11	4.10, 4.11 Special (S11)	4.12, 4.13	4.13 Special (4S13)
a) Setting (sedimentary) dust	mg/(m^2.d)	6	6	See note 1	See note 2
b) Turbulence (suspended) dust	mg/(m^2.h)	No	No	600	See note 2
c) Windblow dust	mg/m^3	No	0,04	1	18
	m/s	No	No	No	13
d) Windblow sand	mg/m^3	No	0,04	1	18
	m/s	No	No	No	13
NOTE 1: Encompassed within turbulent (suspended) dust. NOTE 2: Encompassed within windblown dust.					

5.5 Mechanical conditions

Table 5: Mechanical conditions for environmental classes 4.10, 4.11, 4.12 and 4.13

Environmental parameter	Unit	Class
		4.10, 4.11, 4.12, 4.13
a) Stationary vibration, random acceleration spectral density	$(m/s^2)^2/Hz$	0,1
b) Frequency range	Hz	5 to 200
c) Shock	m/s^2	20

5.6 Earthquake conditions

If earthquake conditions are likely to occur then the conditions detailed below are applicable.

The parameters have been derived from methods stated in IEC 60068-3-3 [i.6] and environment zone 4 as defined in IEC 60721-2-6 [i.5].

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

The conditions hereafter stated refer only to equipment mounted at ground level or on structures of high rigidity. Earthquake conditions for equipment mounted on pylons, poles and any other non-rigid structures can differ significantly. For equipment mounted on top of buildings using a structure of high rigidity, the conditions and tests stated in ETSI EN 300 019-1-3 [1] shall apply.

The most common used way to specify seismic conditions is through the definition of a Response Spectrum (RS).

A RS is the graphical representation of the maximum responses (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 postulated 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 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 [i.6]):

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

where:

a_f *floor acceleration;*

a_g *ground acceleration* that depends on the intensity of the earthquake expressed as a peak value;

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.

Table 6: Earthquake parameters for classes from 4.10 to 4.13

Parameters	Description	Severity
Earthquake intensity	strong to very strong earthquakes (Richter scale magnitude > 7)	a_g = 5 m/s^2
Superelevation factor	mounting of equipment on rigid foundations or on structures of high rigidity	K = 1 (see note)
Direction factor	no intensity differences among axes	D_{xyz} = 1
Geometric factor	single-axis excitation with no interaction with the other axes	G = 1
NOTE: If the equipment is not mounted on structures of high rigidity, i.e. pylons, poles, etc., the structure should be included in the test, or a corrected Response Spectrum should be determined selecting the appropriate K value from those reported in IEC 60068-3-3 [i.6].		

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

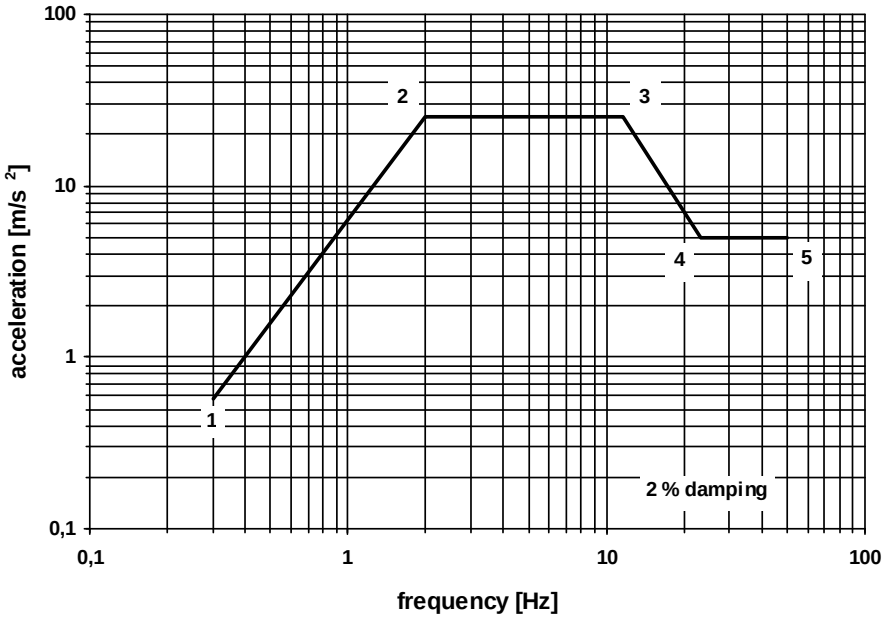

Figure 7: Earthquake Response Spectrum

Table 7: Acceleration co-ordinates for the Response Spectrum

Co-ordinate point	Frequency [Hz]	Ground acceleration [m/s^2]
1	0,3	0,57
2	2,0	25
3	11,6	25
4	23,0	5
5	50,0	5

Annex A (informative): Bibliography

- ETSI TR 100 035 (2004): "Equipment Engineering (EE); Environmental engineering; Guidance and terminology".

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 60 721-3-4: 2019. As the new classes are not comparable with the previous classes taken from IEC 60721-3-4: 1995, the new environmental classes have been defined with new numbers.

History

Version	Date	Status
Edition 1	February 1992	Publication as ETS 300 019-1-4
Amendment 1	June 1997	Amendment 1 to 1st edition of ETS 300 019-1-4
V2.1.1	March 2003	Publication
V2.1.2	April 2003	Publication
V2.2.1	April 2014	Publication
V3.1.0	February 2026	ENAP Process AP 20260513: 2026-02-12 to 2026-05-13
V3.1.1	May 2026	Publication