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ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

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Foreword

This multi-part European Telecommunication Standard (ETS) has been produced by the Equipment Engineering (EE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This standard is concerned with environmental conditions and environmental tests for telecommunications equipment and comprises two main parts, each with subdivisions:

- ETS 300 019-1: "Classification of environmental conditions".

  This part of the standard, Part 1, specifies different standardised environmental classes covering climatic and biological conditions, chemically and mechanically active substances and mechanical conditions during storage, transportation and in use.

- ETS 300 019-2: "Specification of environmental tests".

  This part of the standard will specify the test requirements for the different environmental classes.

Each part of the standard is divided into sub-parts. Sub-part 1-0 will form a general overview of Part 1. This sub-part, Sub-part 1-3, deals with stationary use at weatherprotected locations.

This part of the standard, (Part 1) was submitted to Public Enquiry as prETS 300 019 Part B. The original Part A is to be published as ETSI Technical Report ETR 035 entitled: "Equipment Engineering (EE); Environmental engineering Guidance and terminology".

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1 Scope

The purpose of this sub-part is to define the classes of environmental conditions and their severities to which equipment may be exposed at specified locations. The severities specified are those which will have a low probability of being exceeded; generally less than 1 %.

This sub-part applies to equipment installed for stationary use at weatherprotected locations during:

- normal operation;

- exchange or installation construction;

- repair and maintenance.

2 Normative references

This ETS contains, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETR 035: "Equipment Engineering (EE); Environmental engineering Guidance and terminology".

[2] IEC Publication 721-3-0 : "Introduction".

[3] IEC Publication 721-3-3 : "Stationary use at weatherprotected locations".

[4] IEC Publication 68-2-27 : "Test Ea: Shock".

3 Definitions

Stationary use: The equipment is mounted firmly on the structure, or on mounting devices, or it is permanently placed at a certain site. It is not intended for portable use - but short periods of handling during erection work, down time, maintenance and repair at the location are included.

Weatherprotected location: A location at which the product is protected from weather.

- **Totally weatherprotected location** (enclosed location):
  direct weather influences are totally excluded,

- **partly weatherprotected location** (sheltered location):
  direct weather influences are not completely excluded.

Climate-controlling system: A system that controls or influences climate, acting at least on one climatic parameter in one direction.

Heating system: A system that controls or influences climate by increasing the air temperature only. This can decrease the relative humidity.

Cooling system: A system that controls or influences climate by decreasing the air temperature only. This can decrease the absolute humidity.

Forced ventilation system: A system that controls or influences climate by introducing outdoor air into the room or expelling air out of the room.

Air conditioning system: A system that fully and automatically controls the climatic parameters air temperature and humidity by heating, cooling, humidifying and dehumidifying.

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

Absolute humidity: The mass of water vapour in grammes which is associated with one cubic metre of dry air in an air/water vapour mixture.

4 Environmental classes

The classes shown in parentheses, e.g. (3C1), may be selected for special applications.

4.1 Class 3.1: Temperature-controlled locations

This class is a combination of classes 3K3/3Z2/3Z4/3B1/3C2(3C1)/3S2/3M1 in IEC standard 721-3-3 [3].

This class applies to a permanently temperature controlled enclosed location. Humidity is usually not controlled. The climatogram is shown in figure 1.

Heating, cooling, forced ventilation and humidification are used as necessary 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 applies 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 minimise 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);

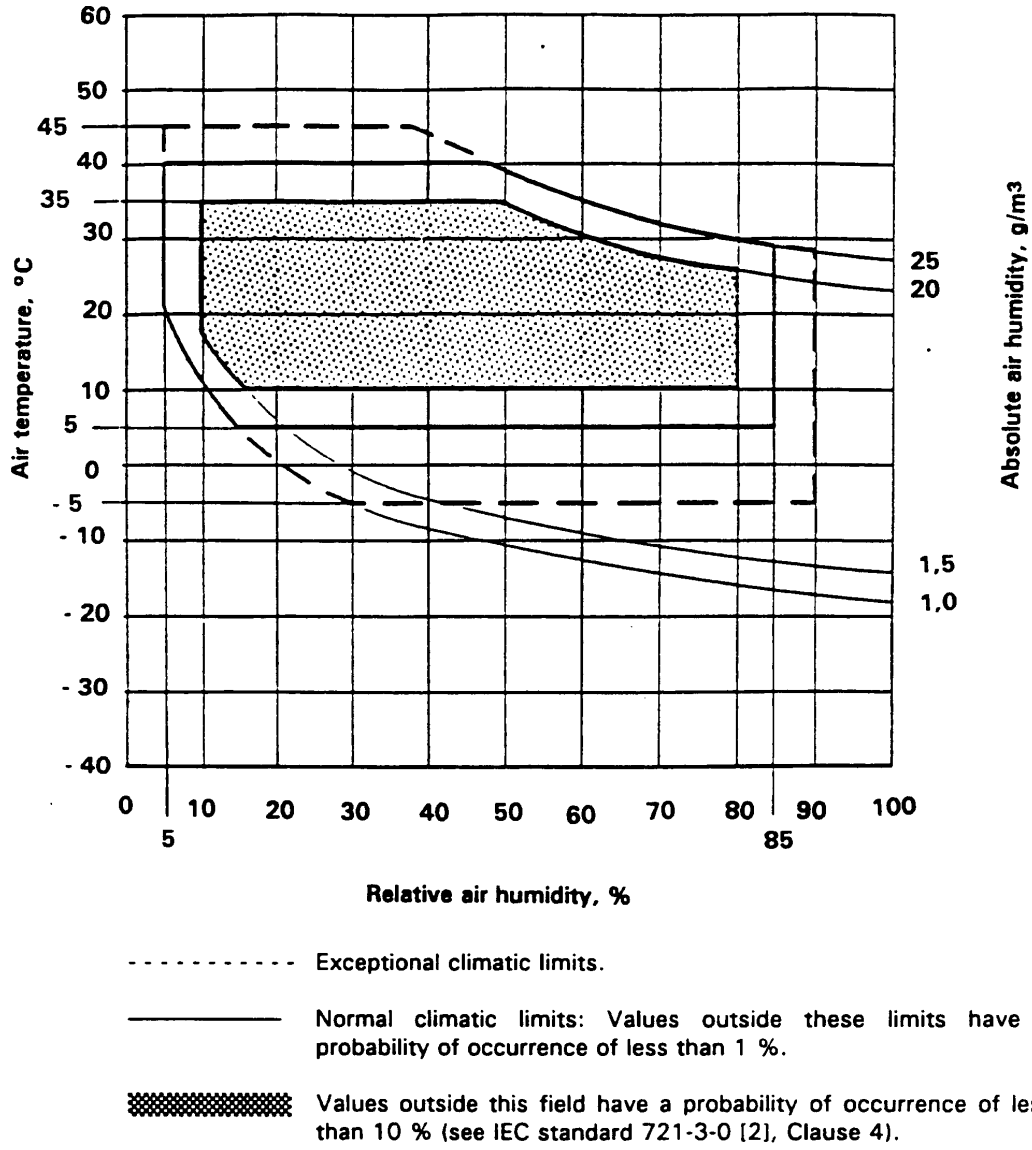
- offices;

- shops;

- workshops for electronic assemblies and other electrotechnical products;

- telecommunication centres;

- storage rooms for valuable and sensitive products.



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

Figure 1: Climatogram for Class 3.1: Temperature-controlled locations

4.2 Class 3.2: Partly temperature-controlled locations

This class is a combination of classes 3K5/3Z2/3Z4/3B2/3C2(3C1)/3S3/3M2 in IEC standard 721-3-3 [3].

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.

This class applies 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 and to water from sources other than rain and icing. 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.

NOTE: Underground spaces, manholes, etc.: Class 3.2 can be used in these locations although the distribution and duration of severities are different. The relative humidity exceeds 95 % RH for more than 1 % of the time and may reach 100 % RH. This may become a separate class in the future.

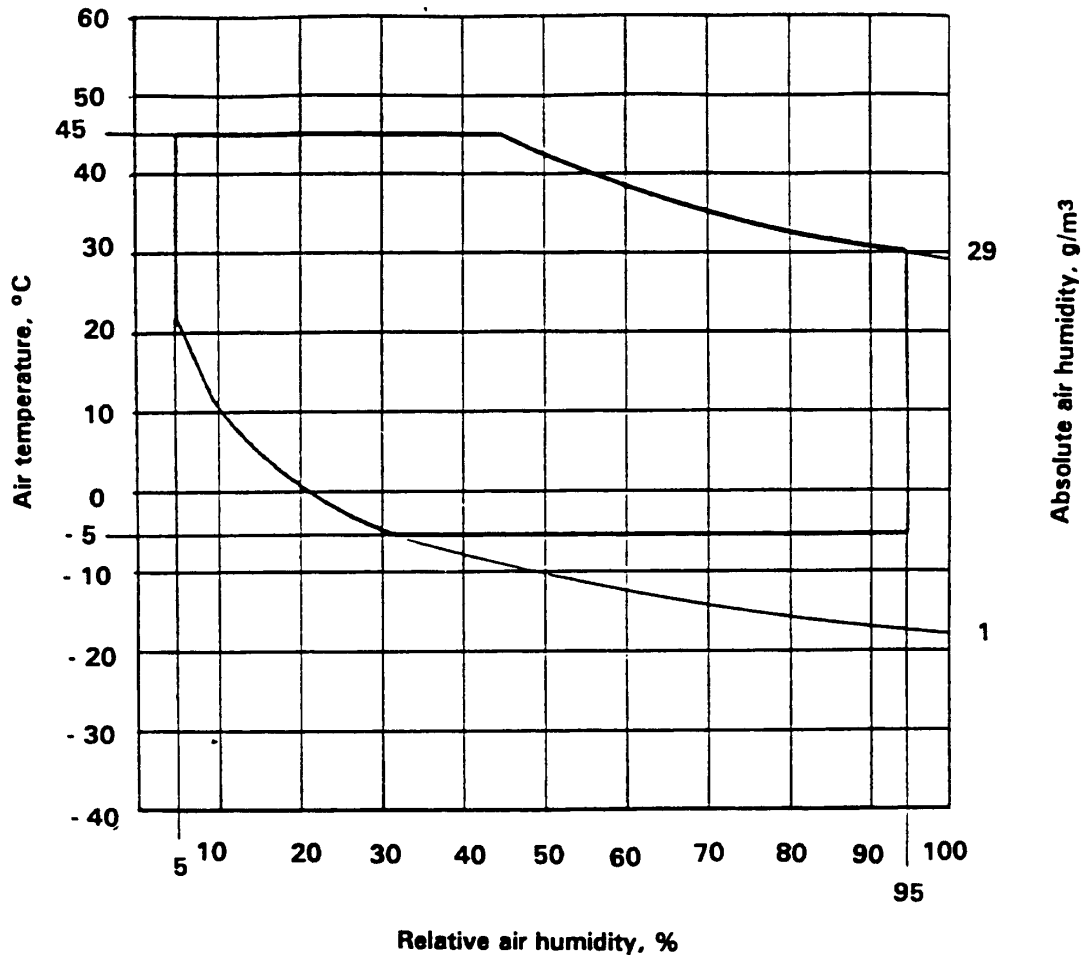


Figure 2: Climatogram for class 3.2: Partly temperature-controlled locations

4.3 Class 3.3: Not temperature-controlled locations

This class is a combination of classes 3K6/3Z2/3Z4/3Z7/3B2/3C2(3C1)/3S3/3M2 in IEC Publication 721-3-3 [3].

This class applies to a weatherprotected 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 applies 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. It may temporarily be subjected to limited wind-driven precipitation, including snow;

- 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.

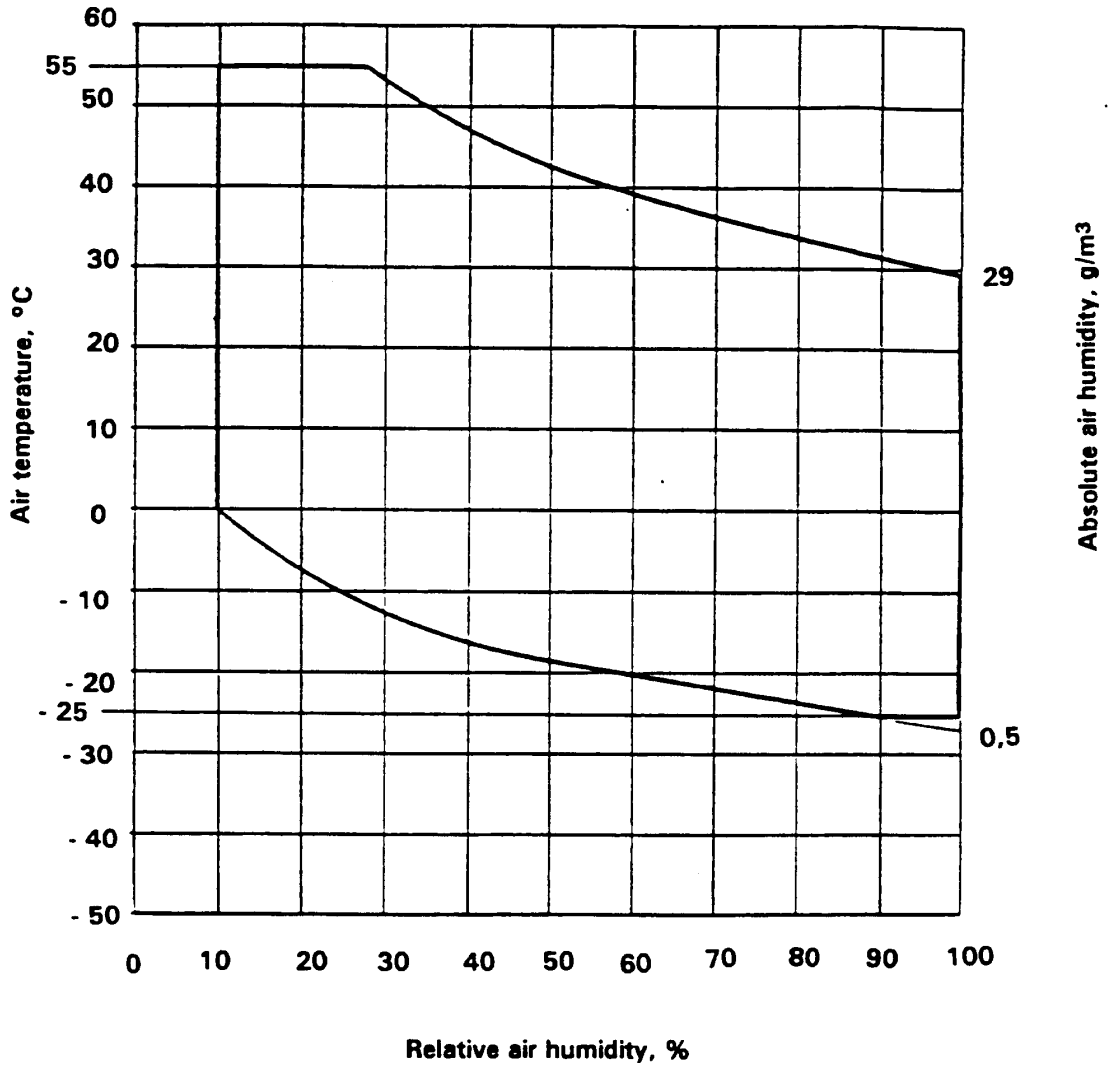


Figure 3: Climatogram for class 3.3: Not temperature controlled locations

4.4 Class 3.4: Sites with heat-trap

This class is a combination of classes 3K7/3Z2/3Z4/3Z7/3Z8/3B2/3C2(3C3)/3S3/3M5 in IEC Publication 721-3-3 [3].

This class applies to a weather protected 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 effect of direct solar radiation and heat trap conditions exist. The climatogram is shown in figure 4.

This class applies to locations:

- where installed equipment may also be exposed temporarily to solar radiation and temporarily to heat radiation. They may be exposed to movements of the surrounding air due to draughts e.g. through doors, windows or other openings. They may be subjected to condensed water and to water from sources other than rain and to icing. They may be subjected to limited wind-driven precipitation including snow;

- 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;

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

- in close proximity to sources of sand or dust;

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

  NOTE: These requirements do not cover intentional damage by vandals.

The conditions of this class may be found in:

- some sheds;

- shacks;

- lofts;

- telephone booths;

- some buildings.

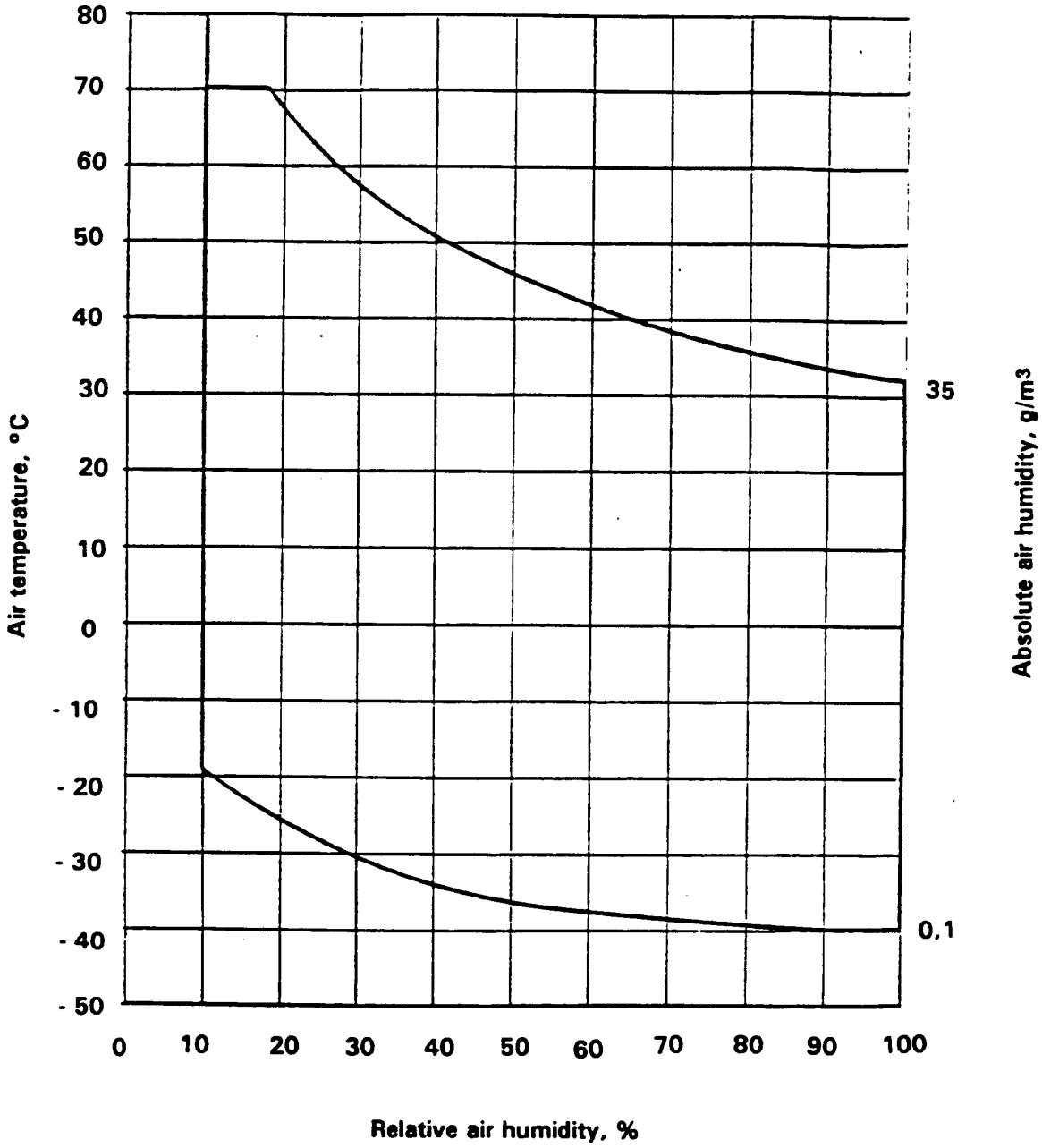


Figure 4: Climatogram for class 3.4: Sites with heat-trap

4.5 Class 3.5: Sheltered locations

This class is a combination of IEC classes 3K7 low/3Z2/3Z6/3Z7/3Z8/3B2/3C2(3C3)/3S3/3M5 in IEC Publication 721-3-3 [3].

This class applies to a shelter where direct solar radiation and heat-trap conditions do not exist. The climatogram is shown in figure 5.

This class applies to locations:

- where installed equipment may be exposed to heat radiation from the roof or walls heated by the sun. They may be exposed to movement of the surrounding air through openings. They may be subjected to condensed water and to water from sources other than rain and to icing. They may be subjected to limited wind-driven precipitation including snow;

- 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;

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

- in close proximity to sources of sand or dust;

- where transmitted vibrations are experienced from machines or passing vehicles. Higher shock levels may be experienced, e.g. from adjacent machines.

  NOTE: For equipment intended for public use more severe mechanical conditions are expected. Special requirements should be used for such equipment. These requirements do not cover intentional damage by vandals.

The conditions of this class may be found in:

- some sheds;

- open telephone booths;

- under single roofs, e.g. carports.

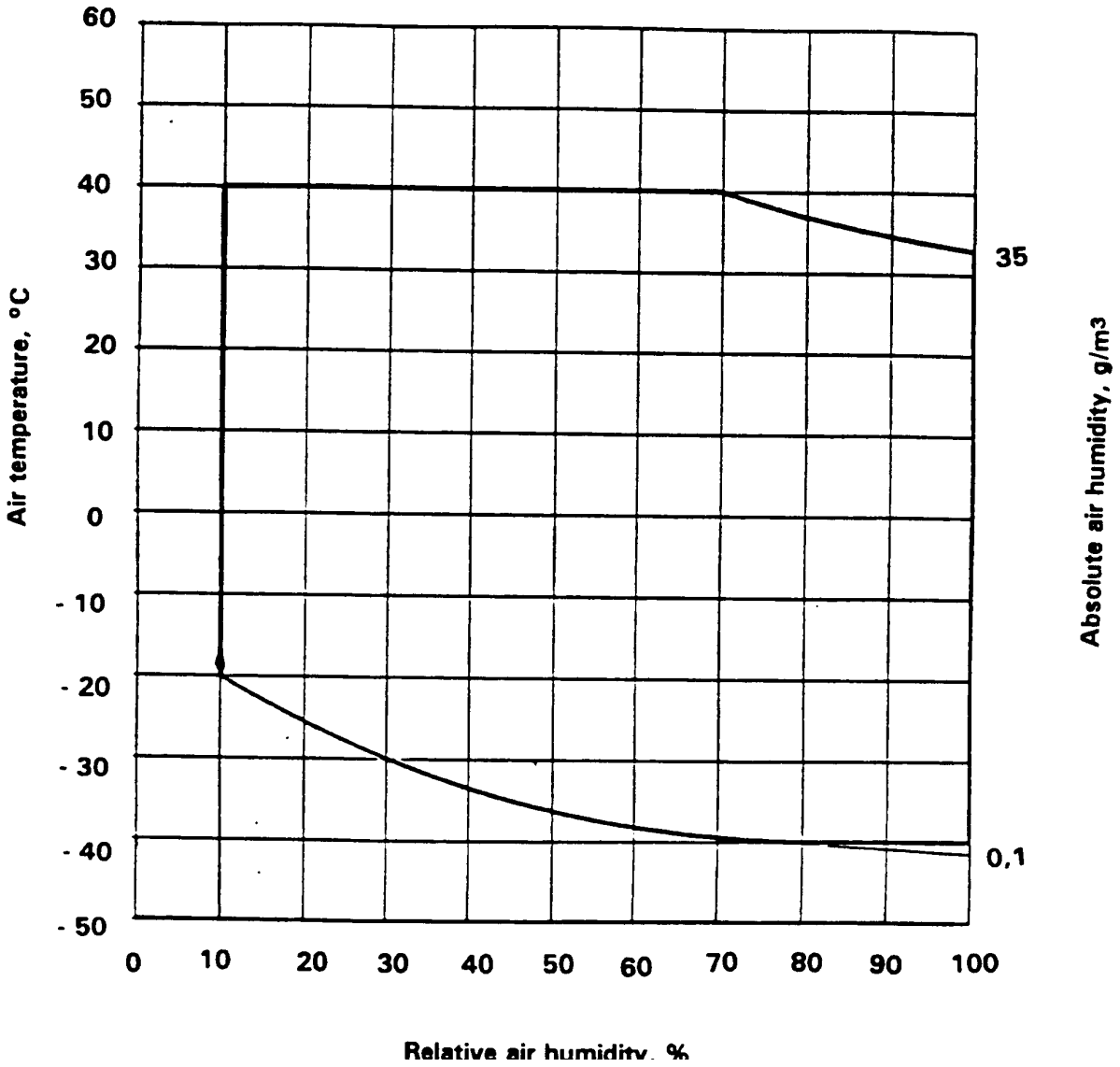


Figure 5: Climatogram for class 3.5: Sheltered locations

5 Environmental conditions

5.1 Climatic conditions

Table 1: Climate parameters for environmental classes 3.1 to 3.5.

Environmental parameter	Unit	Class					
		3.1	3.1E	3.2	3.3	3.4	3.5
a) low air temperature	°C	+5	-5	-5	-25	-40	-40
b) high air temperature	°C	40	45	45	55	70	40 (NOTE 5)
c) low relative humidity	%	5	5	5	10	10	10
d) high relative humidity	%	85	90	95	100	100	100
e) low absolute humidity	g/m^3	1		1	0,5	0,1	0,1
f) high absolute humidity	g/m^3	25		29	29	35	35
g) rate of change of temperature (NOTE 1)	°C/min	0,5		0,5	0,5	1,0	1,0
h) low air pressure	kPa	70		70	70	70	70
i) high air pressure (NOTE 2)	kPa	106		106	106	106	106
j) solar radiation	W/m^2	700		700	1120	1120	---
k) heat radiation	W/m^2	600		600	600 (NOTE 4)	600 (NOTE 4)	600 (NOTE 6)
l) movement of the surrounding air (NOTE 3)	m/s	5		5	5	5	30
m) conditions of condensation	none	no		yes	yes	yes	yes
n) conditions of wind-driven rain,snow,hail, etc.	none	no		no	yes (NOTE 4)	yes	yes
o) conditions of water from sources other than rain	none	no		no	dripping	dripping spraying	dripping spraying
p) conditions of icing	none	no		yes	yes	yes	yes
Climatogram, figure		1		2	3	4	5

NOTE 1: Averaged over a period of 5 minutes.

NOTE 2: Conditions in mines are not considered.

NOTE 3: A cooling system based on non-assisted convection may be disturbed by adverse movement of the surrounding air.

NOTE 4: Temporarily.

NOTE 5: Direct solar radiation and heat-trap conditions do not exist.

NOTE 6: Secondary effect of solar radiation.

5.2 Biological conditions

Table 2: Biological conditions for environmental classes 3.1 to 3.5.

Environmental parameters	Unit	Class	
		3.1	3.2 to 3.5 (NOTE)
a) Flora	none	--	presence of mould, fungus, etc.
b) Fauna	none	--	presence of rodents and other animals harmful to products but excluding termites.

NOTE: At non-heated locations (class 3.3) only mould growth may be encountered.

5.3 Chemically active substances

Table 3a: Chemically active substances for environmental classes 3.1 to 3.3.

Environmental parameter	Unit (NOTE 2)	Class (NOTE 1)		
		3.1 to 3.3		special (3C1)
		mean (NOTE 4)	max (NOTE 5)	max (NOTE 5)
a) Salt mist		sea salts, road salts, excl. class 3.1 (NOTE 6)		
b) sulphur dioxide	mg/m^3	0,3	1,0	0,1
	cm^3/m^3	0,11	0,37	0,037
c) hydrogen sulphide	mg/m^3	0,1	0,5	0,01
	cm^3/m^3	0,071	0,36	0,0071
d) chlorine	mg/m^3	0,1	0,3	0,1
	cm^3/m^3	0,034	0,1	0,034
e) hydrochloric acid	mg/m^3	0,1	0,5	0,1
	cm^3/m^3	0,066	0,33	0,066
f) hydrofluoric acid	mg/m^3	0,01	0,03	0,003
	cm^3/m^3	0,012	0,036	0,0036
g) ammonia	mg/m^3	1,0	3,0	0,3
	cm^3/m^3	1,4	4,2	0,42
h) ozone	mg/m^3	0,05	0,1	0,01
	cm^3/m^3	0,025	0,05	0,005
i) nitrogen oxides (NOTE 7)	mg/m^3	0,5	1,0	0,1
	cm^3/m^3	0,26	0,52	0,052

See table 3b for NOTES.

Table 3b: Chemically active substances for environmental classes 3.4. and 3.5.

Environmental parameter	Unit (NOTE 2)	Class			
		3.4 and 3.5		special (3C3) (NOTE 3)	
		mean (NOTE 4)	max (NOTE 5)	mean (NOTE 4)	max (NOTE 5)
a) Salt mist		sea salts, road salts			
b) sulphur dioxide	mg/m^3	0,3	1,0	5,0	10
	cm^3/m^3	0,11	0,37	1,85	3,7
c) hydrogen sulphide	mg/m^3	0,1	0,5	3,0	10
	cm^3/m^3	0,071	0,36	2,1	7,1
d) chlorine	mg/m^3	0,1	0,3	0,3	1,0
	cm^3/m^3	0,034	0,1	0,1	0,34
e) hydrochloric acid	mg/m^3	0,1	0,5	1,0	5,0
	cm^3/m^3	0,066	0,33	0,66	3,3
f) hydrofluoric acid	mg/m^3	0,01	0,03	0,1	2,0
	cm^3/m^3	0,012	0,036	0,12	2,4
g) ammonia	mg/m^3	1,0	3,0	10	35
	cm^3/m^3	1,4	4,2	14	49
h) ozone	mg/m^3	0,05	0,1	0,1	0,3
	cm^3/m^3	0,025	0,05	0,05	0,15
i) nitrogen (NOTE 7) oxides	mg/m^3	0,5	1,0	3,0	9,0
	cm^3/m^3	0,26	0,52	1,56	4,68

NOTE 1: Because of the low probability of simultaneous occurrence of these gases at the levels of IEC class 3C2, the values of 3C1 are considered more appropriate to describe the long term environmental conditions.

NOTE 2: The values given in cm^3/m^3 have been calculated from the values given in mg/m^3 and refer to 20 °C. The table uses rounded values.

NOTE 3: It is not mandatory to consider the special class 3C3 as a requirement for the combined effect of all parameters stated. If applicable, values of single parameters may be selected from this special class. In such instances the values given for the classes 3.4 and 3.5 are valid for all parameters not especially named.

NOTE 4: Mean values are the average values (long-term values) to be expected.

NOTE 5: Maximum values are limit or peak values occurring over a period of not more than 30 minutes per day.

NOTE 6: Salt mist may be present at sheltered locations of coastal areas and offshore sites.

NOTE 7: Expressed as the equivalent values of nitrogen dioxide.

5.4 Mechanically active substances

Table 4: Mechanically active substances for environmental classes 3.1 to 3.5.

Environmental parameters	Unit	Class	
		3.1	3.2.to 3.5 (NOTE)
a) Sand	mg/m^3	30	300
b) Dust (suspension)	mg/m^3	0,2	0,4
c) Dust (sedimentation)	$mg/(m^2h)$	1,5	15

NOTE: In locations where approved cleaning methods are used, e.g. in unheated telecommunication centres then the mechanically active substances of class 3.1 apply.

5.5 Mechanical conditions

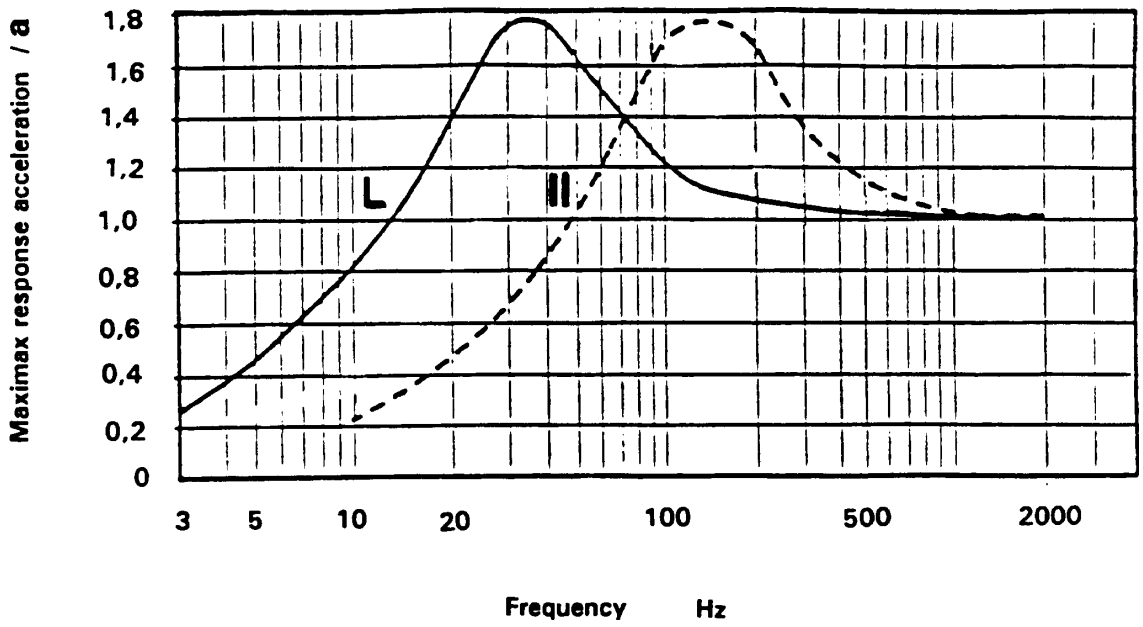
Table 5: Mechanical conditions for the environmental classes 3.1 to 3.5.

Environmental parameter	Unit	Class		
		3.1	3.2 and 3.3	3.4 and 3.5 (NOTE 1)
a) Stationary vibration, (NOTE 2) sinusoidal				
displacement amplitude	mm	0,3	1,5	3,0
acceleration amplitude	m/s^2	1	5	10
frequency range	Hz	2-9 9-200	2-9 9-200	2-9
b) non-stationary vibration, including shock (NOTE 3)				
shock response spectrum type L , peak acceleration (â)	m/s^2	40	40	--
shock response spectrum type II, peak acceleration (â)	m/s^2	--	--	250

NOTE 1: When the consequences of mechanical failure are minor, or the probability of high mechanical stresses is rare, the mechanical levels of IEC class 3M3 may be chosen.

NOTE 2: Units are peak displacement amplitude (mm), peak acceleration amplitude (m/s^2) and frequency range (Hz).

NOTE 3: See figure 6.



Spectrum type L: Duration: 22 ms.

Spectrum type II: Duration: 6 ms.

Figure 6: Model Shock Response Spectra (First Order Maximax Shock Response Spectra, see IEC Publication 721-3-3 [3]). For definition of Maximax see IEC Publication 68-2-27 [4].

History

Document history	
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