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**Equipment Engineering (EE);
Environmental conditions and environmental tests for
telecommunications equipment
Part 1-1: Classification of environmental conditions
Storage**

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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 the 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 specifies 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 1-1, deals with storage.

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 of this standard is to define the classes of environmental conditions and their severities to which equipment may be exposed during storage. 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 %.

NOTE 1: Temporary storage during transport is included in Sub-part 1-2: Transportation.

NOTE 2: If the equipment is packaged, the environmental conditions apply to the packaging protecting the equipment.

2 Normative references

This ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this ETS only when incorporated into 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 721-3-1: "Storage".
- [3] IEC Publication 68-2-27: "Test Ea: Shock".
- [4] IEC Publication 721-2-4: "Solar radiation and temperature".

3 Definitions

In this sub-part of this standard, the following definitions apply:

Storage: The equipment is placed at a certain site for long periods but is not intended for use during these periods.

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

- **Totally weatherprotected location:** Direct weather influences are totally excluded.
- **Partly weatherprotected location:** Direct weather influences are not completely excluded.

Non-weatherprotected location: A location at which equipment is not protected from direct weather influences.

4 Environmental classes

The classes shown in parentheses, e.g. (1C1), may be selected for special applications.

4.1 Class 1.1: Weatherprotected, partly temperature-controlled storage locations

This class is a combination of classes 1K3/1Z2/1B1/1C2(1C1)/1S2/1M2 in IEC Publication 721-3-1 [2].

This class applies to weatherprotected partly temperature controlled storage. Humidity is usually not controlled. The climatogram is shown in figure 1.

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 storage locations:

- where equipment may be exposed to solar radiation and heat radiation. It may also be exposed to movements of the surrounding air due to draughts in buildings, e.g. through open windows. It is not subjected to precipitation and water from sources other than rain;
- without particular risks by biological attacks. This includes protective measures, e.g. special package design, or storing at locations of such construction that mould growth, 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 dust or sand, but not situated in proximity to dust or sand sources;
- with vibration of low significance and insignificant shock.

The conditions of this class may occur in ordinary storage rooms for frost-resistant products.

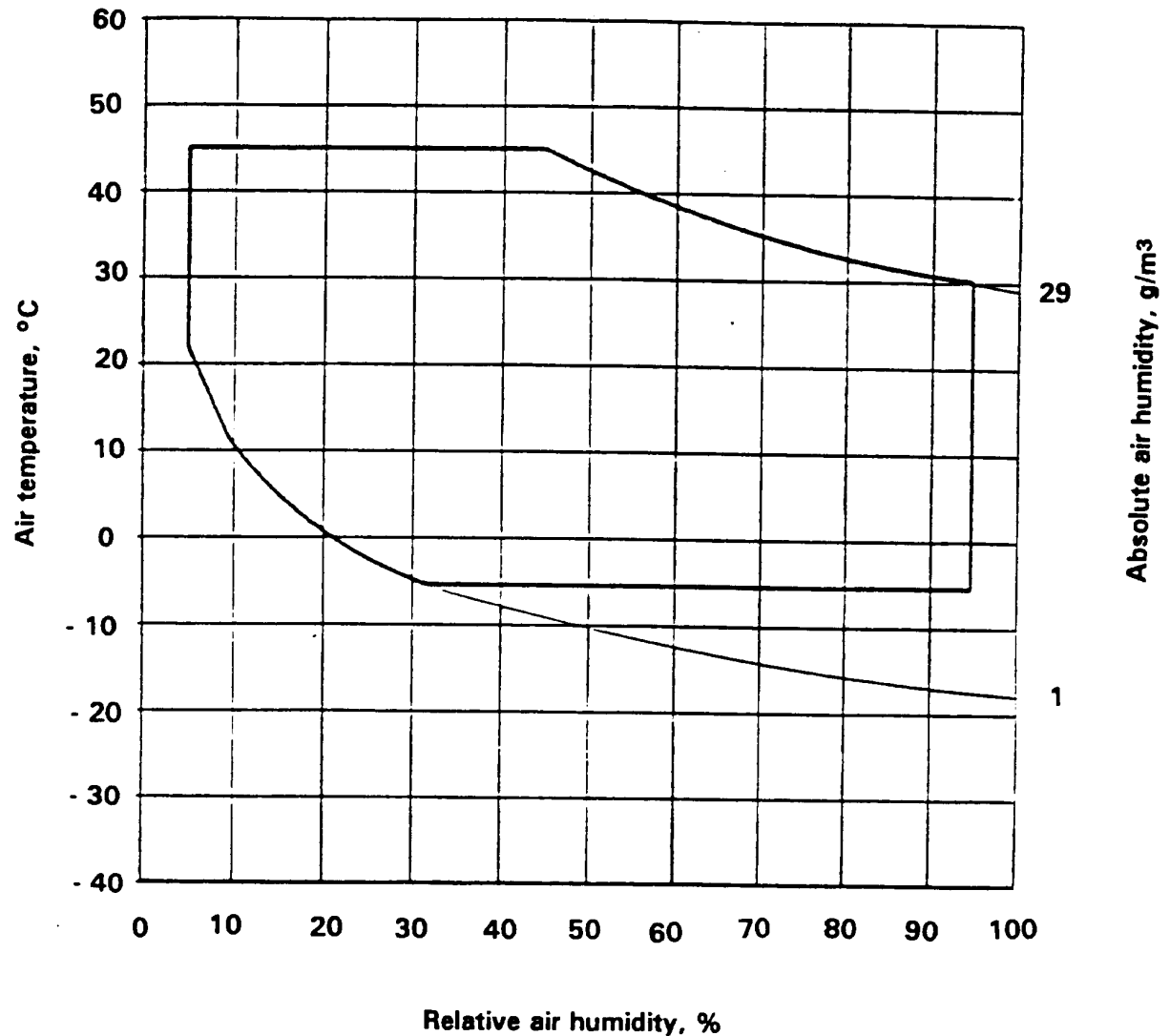


Figure 1: Climatogram for class 1.1 - Weatherprotected, partly temperature-controlled storage locations

4.2 Class 1.2: Weatherprotected, not temperature-controlled storage locations

This class is a combination of classes 1K4/1Z2/1Z3/1Z5/1B2/1C2(1C1)/1S3/1M2 in IEC Publication 721-3-1 [2].

This class applies to weatherprotected storage having neither temperature nor humidity control. The location may have openings directly to the open air, i.e. it may be only partly weatherprotected. The climatogram is shown in figure 2.

This class applies to storage locations:

- where equipment may be exposed to solar radiation and temporarily to heat radiation. They may also 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, dripping water and to icing. They may also 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 areas with sources of sand or dust, including urban areas;
- with vibration of low significance and insignificant shock.

The conditions of this class may occur in:

- unattended buildings;
- some entrances of buildings;
- some garages and shacks.

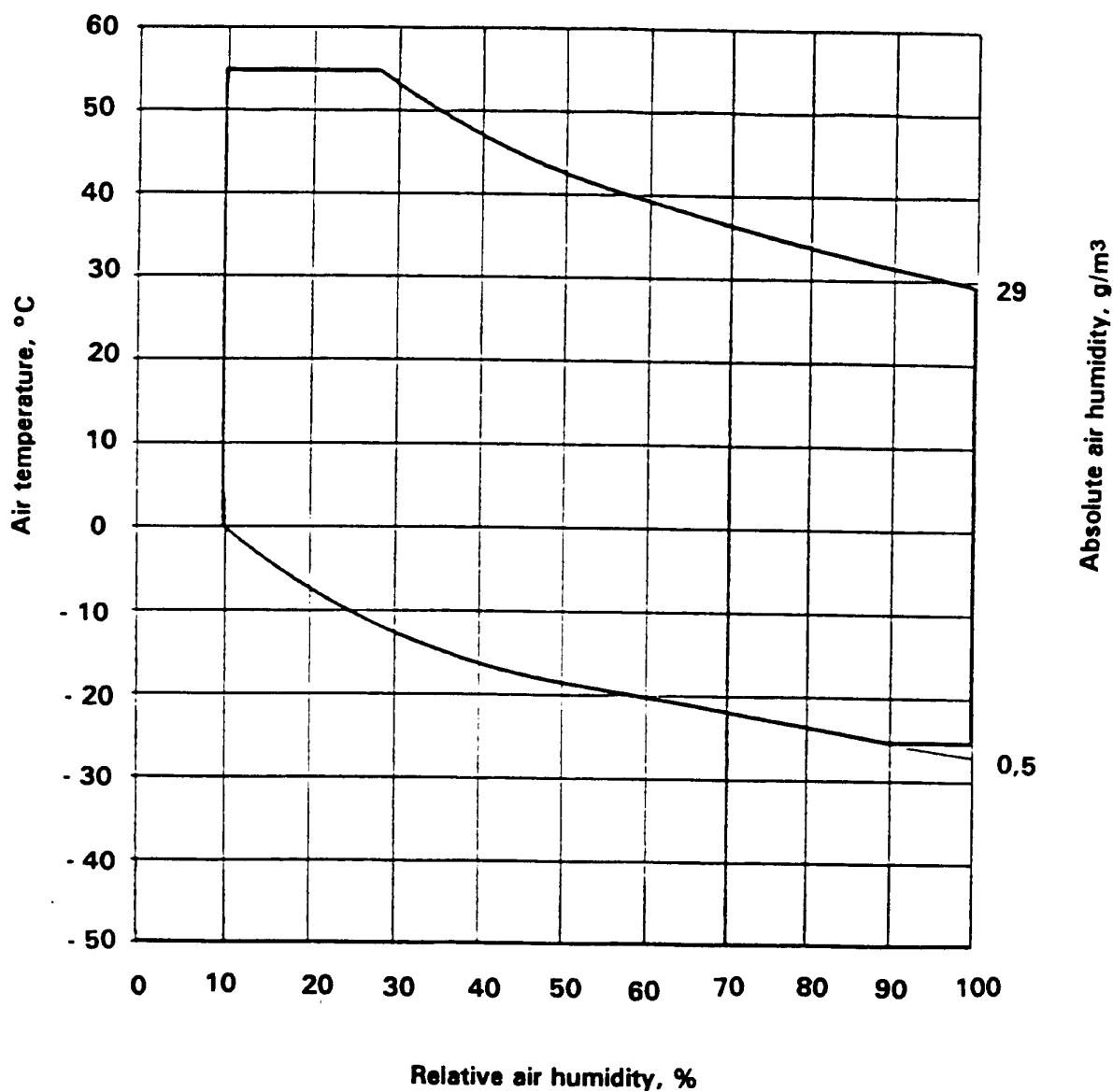


Figure 2: Climatogram for class 1.2: Weatherprotected, not temperature-controlled storage locations

4.3 Class 1.3: Non-weatherprotected storage locations; class 1.3E: non-weatherprotected storage locations - extended

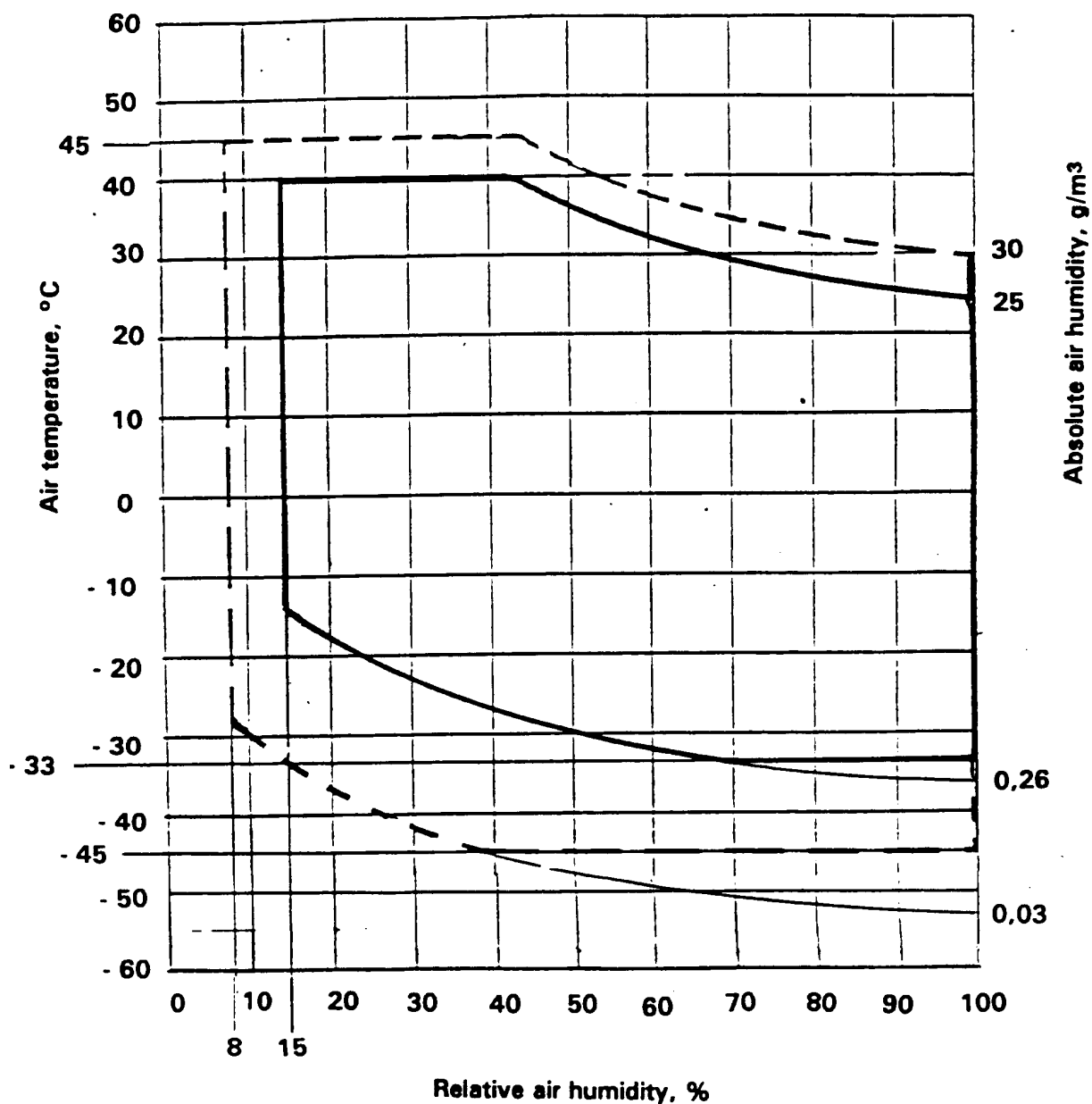
Class 1.3 is a combination of classes 1K8/1Z1/1Z4/1B2/1C2/1S3/1M3(1M4) ¹⁾ in IEC Publication 721-3-1 [2]. Class 1.3E is a combination of classes 1Z1/1Z4/1B2/1C2/1S3/1M3(1M4) ¹⁾ in IEC Publication 721-3-1 [2] and the severities given in subclause 5.1.

This class applies to storage which is not protected from direct weather influences. The climatology is shown in figure 3.

This class applies to storage locations:

- which are directly exposed to an open-air climate including solar radiation, movement of the surrounding air, precipitation and water jets;
- 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;
- in areas with sources of sand or dust, including urban areas;
- with significant vibration and shock, e.g. transmitted from machines or passing vehicles in the vicinity, etc.

¹⁾ If more severe mechanical conditions are expected, IEC class 1M4 may be chosen.



"-----": Climatic limits for class 1.3

"-----": Climatic limits for class 1.3 E

Figure 3: Climatogram for class 1.3 and 1.3 E: Non-weatherprotected storage locations

5 Environmental conditions

5.1 Climatic conditions

Table 1: Climatic conditions for environmental classes 1.1 to 1.3E

| Environmental parameter | Unit | 1.1 | Class 1.2 | 1.3 | 1.3E |
|---|------------------|----------------|-----------------|------------------|------------------|
| a) Low air temperature (NOTE 1) | °C | -5 (NOTE 8) | - 25 | - 33 (NOTE 9) | - 45 (NOTE 9) |
| b) High air temperature (NOTE 1) | °C | 45 | 55 | 40 | 45 |
| c) Low relative humidity (NOTE 1) | % | 5 | 10 | 15 | 8 |
| d) High relative humidity (NOTE 1) | % | 95 | 100 | 100 | 100 |
| e) Low absolute humidity (NOTE 1) | g/m ³ | 1 | 0,5 | 0,26 | 0,03 |
| f) High absolute humidity (NOTE 1) | g/m ³ | 29 | 29 | 25 | 30 |
| g) Rain intensity | mm/min | no | no | 6 | 15 |
| h) Rate of change of temp. (NOTE 2) | °C/min | 0,5 | 0,5 | 0,5 | 0,5 |
| i) Low air pressure (NOTE 3) | kPa | 70 | 70 | 70 | 70 |
| j) High air pressure (NOTE 4) | kPa | 106 | 106 | 106 | 106 |
| k) Solar radiation | W/m ² | 700 | 1120 | 1120 | 1120 |
| l) Heat radiation | W/m ² | (NOTE 7) | (NOTE 7) | neglig. | neglig. |
| m) Movement of the surrounding air | m/s | 1,0 | 30 | 50 | 50 |
| n) Conditions of condensation | none | yes | yes | yes | yes |
| o) Conditions of precipitation (rain, snow, hail, etc.) | none | no | (NOTE 6) yes | yes | yes |
| p) Low rain temperature (NOTE 5) | °C | no | no | 5 | 5 |
| q) Conditions from water from sources other than rain | none | no | dripp. water | splash. water | splash. water |
| r) Conditions of icing and frosting | none | yes (NOTE 8) | yes | yes | yes |
| Climatogram | | 1 | 2 | 3 | 3 |
| <p>NOTE 1: For simultaneous occurrence of parameters a) to f) see figures 1 to 3.</p> <p>NOTE 2: Averaged over a period of 5 minutes.</p> <p>NOTE 3: 70 kPa represent a limit value for open-air storage, normally at about 3 000 m.</p> <p>NOTE 4: Conditions in mines are not considered.</p> <p>NOTE 5: This rain temperature should be considered together with high air temperature b) and solar radiation k). The cooling effect of the rain has to be considered in connection with the surface temperature of the equipment.</p> <p>NOTE 6: Applies to wind-driven precipitation.</p> <p>NOTE 7: Conditions of heat radiation, e.g. in the vicinity of room heating systems.</p> <p>NOTE 8: For certain items storage conditions must be maintained above 5 °C</p> <p>NOTE 9: On cloudless nights an object exposed to atmospheric radiation will radiate more heat than it receives off the surface, compared to the ambient air temperature. In practice (under extreme conditions) the surface may come down to a temperature in the order of 10 °C to 20 °C below ambient air temperature, when the ambient air temperature ranges from + 20 °C to - 30 °C (see IEC Publication 721-2-4 [4]).</p> | | | | | |

5.2 Biological conditions

Table 2: Biological conditions for environmental classes 1.1 to 1.3 E.

| Environmental | Class | | |
|---------------|-------|------------|--|
| parameter | Unit | 1.1 | 1.2, 1.3, 1.3 E |
| a) Flora | None | Negligible | Presence of mould, fungus, etc. |
| b) Fauna | None | Negligible | Presence of rodents and other animals harmful to equipment but excluding termites. |

5.3 Chemically active substances

Table 3: Chemically active substances for environmental classes 1.1 to 1.3 E.

| Environmental parameter | Unit (NOTE 2) | Class 1.1 to 1.3 E | | Special (1C1) (NOTE 1) for classes 1.1 and 1.2 |
|---|--|---------------------------------|------------------------|--|
| | | Mean value (NOTE 3) | Maximum value (NOTE 4) | maximum value (NOTE 4) |
| a) Salts | none | sea (NOTE 5) and road salt mist | | |
| b) Sulphur dioxide | mg/m ³ cm ³ /m ³ | 0,3 0,11 | 1,0 0,37 | 0,1 0,037 |
| c) Hydrogen sulphide | mg/m ³ cm ³ /m ³ | 0,1 0,071 | 0,5 0,36 | 0,01 0,0071 |
| d) Chlorine | mg/m ³ cm ³ /m ³ | 0,1 0,034 | 0,3 0,1 | 0,1 0,034 |
| e) Hydrogen chloride | mg/m ³ cm ³ /m ³ | 0,1 0,066 | 0,5 0,33 | 0,1 0,066 |
| f) Hydrogen fluoride | mg/m ³ cm ³ /m ³ | 0,01 0,012 | 0,03 0,036 | 0,003 0,0036 |
| g) Ammonia | mg/m ³ cm ³ /m ³ | 1,0 1,4 | 3,0 4,2 | 0,3 0,42 |
| h) Ozone | mg/m ³ cm ³ /m ³ | 0,05 0,025 | 0,1 0,05 | 0,01 0,005 |
| i) Nitrogen oxides (NOTE 6) | mg/m ³ cm ³ /m ³ | 0,5 0,26 | 1,0 0,52 | 0,1 0,052 |
| NOTE 1: Because of the low probability of simultaneous occurrence of these gases at the levels of IEC class 1C2, the values of 1C1 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 a temperature of 20 °C and a pressure of 101,3 kPa. The table uses rounded values. | | | | |
| NOTE 3: Mean values are the average values (long term values) to be expected. | | | | |
| NOTE 4: Maximum values are limit or peak values, occurring over a period of time of not more than 30 minutes per day. | | | | |
| NOTE 5: Sea salt mist may be present at sheltered locations in coastal areas. | | | | |
| NOTE 6: Expressed as equivalent values of nitrogen dioxide. | | | | |

5.4 Mechanically active substances

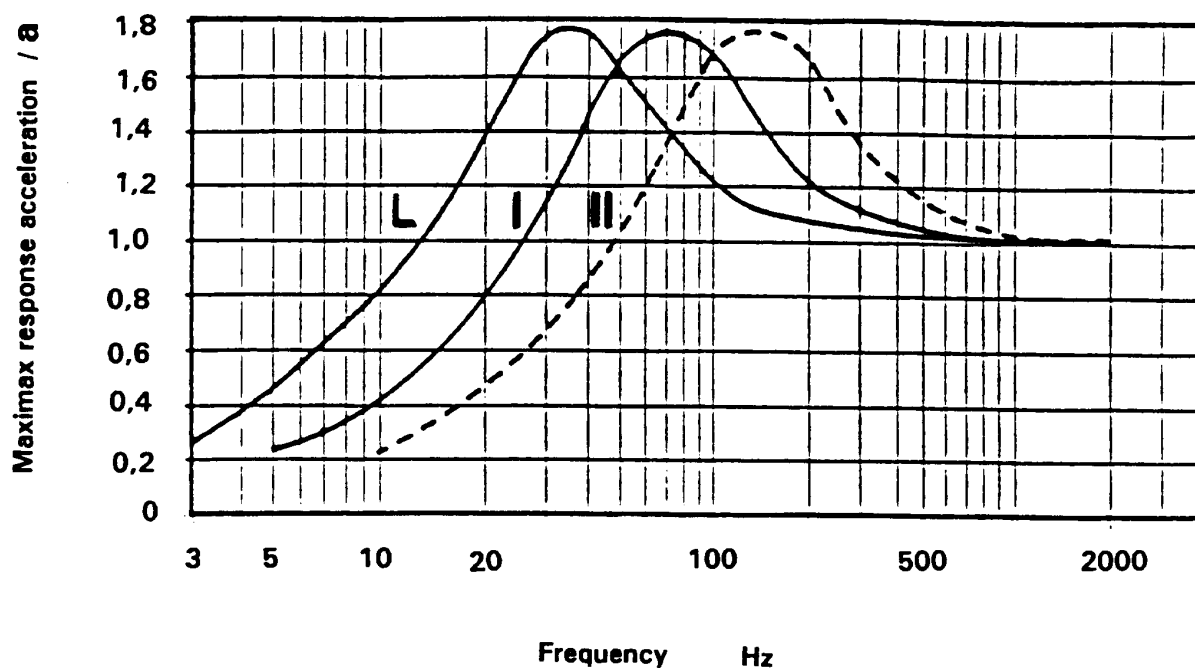
Table 4: Mechanically active substances for environmental classes 1.1 to 1.3 E.

| Environmental parameter | Unit | Class | |
|-------------------------|-----------------------|-------|----------------|
| | | 1.1 | 1.2, 1.3, 1.3E |
| a) Sand | mg/m ³ | 30 | 300 |
| b) Dust (Suspension) | mg/m ³ | 0,2 | 5,0 |
| c) Dust (Sedimentation) | mg/(m ² h) | 1,5 | 20 |

5.5 Mechanical conditions

Table 5: Mechanical conditions for environmental classes 1.1 to 1.3 E.

| Environmental parameter | Unit | Classes 1.1, 1.2 | Class 1.3, 1.3 E | Special (1M4) |
|---|--|-------------------------------|-----------------------------|-----------------------------|
| a) Stationary vibration, sinusoidal: displacement amplitude (NOTE 1) acceleration amplitude (NOTE 1) frequency range | mm m/s ² Hz | 1,5 2-9(NOTE 3) 5 9-200 | 3,0 10 2-9(NOTE 3) 9-200 | 7,0 20 2-9(NOTE 3) 9-200 |
| b) Non-stationary vibration, including shock: (NOTE 2) shock response spectrum I (Δ) peak acceleration shock response spectrum II (Δ) peak acceleration shock response spectrum L (Δ) peak acceleration | m/s ² m/s ² m/s ² | 40 | 100 | 250 |
| c) Static load | kPa | 5 | 5 | 5 |
| NOTE 1: Peak values. | | | | |
| NOTE 2: See figure 4. | | | | |
| NOTE 3: Cross-over frequency is a rounded value. | | | | |



Spectrum type L : Duration : 22 ms.

Spectrum type I : Duration : 11 ms.

Spectrum type II : Duration : 6 ms.

Figure 4: Model Shock Response Spectra (First Order Maximax Shock Response Spectra, see IEC Publication 721-3-1 [2]). For definition of Maximax see IEC Publication 68-2-27 [3].

History

| Document history | |
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