

**BRITISH STANDARD****BS EN
60721-3-7 : 1993
IEC 721-3-7 :
1987**

Classification of environmental conditions

**Part 3. Classification of groups of environmental
parameters and their severities**

Section 3.7 Portable and non-stationary use

The European Standard EN 60721-3-7 : 1993 has the status of a
British Standard

Classification des conditions d'environnement
Partie 3. Classification des groupements des
agents d'environnement et leurs sévérités
Section 3.7 Utilisation en déplacement

Klassifizierung von Umweltbedingungen
Teil 3. Klassen von Einflußgrößen
Abschnitt 3.7 Ortsveränderlicher Einsatz

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National foreword

This Section of BS 7527 has been prepared under the direction of the General Electrotechnical Standards Policy Committee. It is identical with IEC Publication 721-3-7 : 1987 'Classification of environmental conditions Part 3 : Classification of groups of environmental parameters and their severities. Portable and non-stationary use', published by the International Electrotechnical Commission (IEC).

In 1993 the European Committee for Electrotechnical Standardization (CENELEC) accepted IEC 721-3-7 : 1987, together with Amendment 1 : 1991, as European Standard EN 60721-3-7 : 1993. As a consequence of implementing the European Standard this British Standard is renumbered as BS EN 60721-3-7 and any reference to BS 7527 : Section 3.7 should be read as a reference to BS EN 60721-3-7.

This Section of BS 7527 implements CENELEC Harmonization Document (HD) 478.3.7 S1.

For the purposes of this British Standard, any references to IEC page numbers in the text should be ignored.

Other Parts of this British Standard are as follows.

- Part 1 Environmental parameters and their severities
- Part 2 Environmental conditions appearing in nature
 - Section 2.1 Temperature and humidity
 - Section 2.2 Precipitation and wind
 - Section 2.3 Air pressure
 - Section 2.4 Solar radiation and temperature
 - Section 2.5 Dust, sand, salt mist
 - Section 2.6 Earthquake vibration and shock
 - Section 2.7 Fauna and flora
- Part 3 Classification of groups of environmental parameters and their severities
 - Section 3.0 Introduction
 - Section 3.1 Storage
 - Section 3.2 Transportation
 - Section 3.3 Stationary use at weatherprotected locations
 - Section 3.4 Stationary use at non-weatherprotected locations
 - Section 3.5 Ground vehicle installations
 - Section 3.6 Ship environment

Cross-references

International standard	Corresponding British Standard
IEC 721-1 : 1990	BS 7527 Classification of environmental conditions Part 1 : 1991 Environmental parameters and their severities (Identical)
IEC 721-2-1 : 1982	Section 2.1 : 1991 Temperature and humidity (Identical)
IEC 721-3-0 : 1984	Section 3.0 : 1991 Introduction (Identical)
IEC 721-3-2 : 1985	Section 3.2 : 1991 Transportation (Identical)
IEC 721-3-3 : 1987	Section 3.3 : 1991 Stationary use of weatherprotected locations (Identical)
IEC 721-3-4 : 1987	Section 3.4 : 1991 Stationary use of non-weather protected locations (Identical)

The title of figure 1 includes the note 'For explanation see Sub-clause 5.3 of IEC Publication 721-1.' This should be read as 'For explanation see note 6 relating to table 1 of IEC 721-1 (1990).'

Compliance with a British Standard does not of itself confer immunity from legal obligations.



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Classification of environmental conditions
Part 3: Classification of groups of environmental parameters and
their severities
Portable and non-stationary use

(IEC 721-3-7 : 1987 + A1 : 1991)

Classification des conditions d'environnement
Troisième partie: Classification des groupements
des agents d'environnement et de leurs sévérités
Utilisation en déplacement
(CEI 721-3-7 : 1987 + A1 : 1991)

Klassifizierung von Umweltbedingungen
Teil 3: Klassen von Umwelteinflußgrößen und
deren Grenzwerte
Ortsveränderlicher Einsatz
(IEC 721-3-7 : 1987 + A1 : 1991)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
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Foreword

At the request of the 72 Technical Board, the text of the International Standard IEC 721-3-7 : 1987 and its amendment 1 : 1991 was submitted to the CENELEC members for formal vote.

The text of the reference document was approved by CENELEC as EN 60721-3-7 on 9 March 1993.

This European Standard replaces HD 478.3.7 S1 : 1989.

The following dates were fixed:

- latest date of publication of
an identical national standard (dop) 1994-03-01
- latest date of withdrawal of
conflicting national standards (dow) 1994-03-01

Annexes designated 'normative' are part of the body of the standard. In this standard, annex ZA is normative.

CLASSIFICATION OF ENVIRONMENTAL CONDITIONS

Part 3: Classification of groups of environmental parameters and their severities

Portable and non-stationary use

1. Scope

This standard classifies groups of environmental parameters and their severities to which products are subjected during portable and non-stationary use.

The environmental conditions covered by these groups include:

- the environmental conditions at locations where the product may be placed or used temporarily;
- the change of environmental parameters due to change of location;
- the environmental conditions related to transfer of the product between different locations.

The environmental conditions classified do not take into account the use profile of the product, i.e. whether the product is used only during a temporary stationary state, during the state of transfer or arbitrarily.

The conditions of portable and non-stationary use to which products may be exposed include land-based and offshore, weatherprotected and non-weatherprotected locations. The conditions further include transfer which is a part of the portable and non-stationary use.

The environmental conditions specified in this standard are limited to those which may directly affect the performance of products. Only environmental conditions as such are considered. No special description of the effects of these conditions on the product is given.

Environmental conditions directly related to fire or explosion hazards and conditions related to ionizing radiation are excluded. Any other unforeseen incidents are also excluded. The possibility of their occurrence should be taken into account in special cases.

Microclimate within a product is not included.

Conditions of stationary use, use in vehicles and ships, and conditions of storage and transportation are given in other parts of IEC Publication 721.

2. Object

To classify environmental parameters and their severities to which a product for portable and non-stationary use may be exposed under its use conditions, including periods of transfer, down time, maintenance and repair.

A limited number of classes of environmental conditions is given, covering a broad field of application. The user of this standard should select the lowest classification necessary for covering the conditions of the intended use.

3. General

For further general guidance, see IEC Publication 721-3-0.

Products in portable and non-stationary use are sometimes transferred from one location to another without being switched on. During this transfer the environmental conditions bearing on the product may affect the product in a different way than during operation. If environmental conditions during operation are considered separately from those during transfer, another class, e.g. a lower one, may be selected for this part of the use.

The severities specified are those which will have a low probability of being exceeded. All specified values are maximum or limit values. These values may be reached but do not occur permanently. Depending on the local situation there may be different frequencies of occurrence related to a certain period of time. Such frequencies of occurrence should be considered for any environmental parameter. They should additionally be specified if applicable. Information on duration and frequency of occurrence is given in Amendment No. 1 to Publication 721-3-0 as Clause 6.

Attention is drawn to the fact that combinations of the environmental parameters given may increase the effect on a product. This applies especially to the presence of high relative humidity in addition to biological conditions or to conditions of chemically or mechanically active substances.

The environmental conditions present at a location may be affected by other influences, e.g. heat dissipation sources, special process conditions, etc.

Measurements of the environmental conditions present at a location should be made at a representative point in the vicinity of the product.

It is recognized that extreme or special environmental conditions may exist. Specifications for products to operate under such special conditions are a matter of negotiation between supplier and user.

4. Definitions

In addition to the definitions in Clause 3 of IEC Publication 721-1, the following definitions apply to this standard:

4.1 *portable and non-stationary use*

The product is frequently moved from place to place. During transfer there is no special packaging for the product. The total transfer time may amount to a significant portion of the product's lifetime. The product is not permanently mounted on any structure or placed at a fixed site. The product may be operated while being either in a stationary or in a transfer state.

4.2 *weatherprotected location*

A location at which the product is protected from weather influences:

- *totally weatherprotected location*: direct weather influences are totally excluded;
(enclosed location)
- *partially weatherprotected location*: direct weather influences are not completely
(sheltered location) excluded.

4.3 *non-weatherprotected location*

A location at which the product is not protected from direct weather influences.

5. Classification of groups of environmental parameters and their severities

A number of classes for climatic conditions (K), special climatic conditions (Z), biological conditions (B), chemically active substances (C), mechanically active substances (S) and mechanical conditions (M) are specified in Tables I to VI.

This classification allows a number of possible combinations of environmental conditions, which bear upon products wherever used. It represents the real situation in respect of world-wide conditions of use, due to local influences of open-air climate, construction of buildings, mounting, process conditions, etc.

A class of conditions normally includes all classes with lower severity digits.

For certain parameters it has not yet been possible to specify quantitative severities.

For a given use or product, reference should be made to the total set of classes, e.g.

7K2/7Z1/7Z4/7B1/7C2/7S1/7M4

Appendix A explains the basis of the classes. It contains a summary of the conditions covered by each class and gives a survey of conditions affecting the choice of environmental parameters and their severities.

Appendix B contains a climatogram showing the interdependence of air temperature, relative humidity and absolute humidity.

Appendix C gives three examples for practical application of this classification.

5.1 *Climatic conditions*

The climatic conditions specified for classes 7K1 to 7K5 represent the conditions of portable and non-stationary use of products. They have been experienced world-wide over a long period of time taking into account all the parameters that can influence them, e.g. external (open-air) climatic conditions, type of building construction, temperature/humidity controlling systems, means of transfer and internal conditions, e.g. heat dissipation from other equipment, presence of humans, etc. The conditions should cover all normal cases, but not exceptional events.

When selecting appropriate classes attention should be paid to the fact that the climatic conditions inside buildings depend on the outside (open-air) conditions, especially air temperature and solar radiation, and the type of building construction. Walls with good thermal insulation or high thermal capacity can consistently smooth the peaks of outside air temperature variations between day and night, or exceptionally for a longer period. Walls with poor thermal insulation or low thermal capacity cannot have that effect, and peaks can be magnified due to the effect of solar radiation during the day and to the effect of building radiation at night. The effect of solar radiation can be increased by either heat-trap or greenhouse effects.

At non-weatherprotected locations the influence from special climatic conditions constitutes a more significant share of the effects bearing upon a product and its functional parts than at weatherprotected locations. Particularly the effects from temperature change, solar radiation, precipitation, air velocity, and wind-chill should be considered in this respect.

The severity of these effects may be influenced e.g. by constructional details (sort and thickness of material, colour of surface, sealing or breathing of casings, product heating, etc.), and by operating details (selection of operating site, consideration of degree of exposure to prevailing wind and weather, etc.).

5.2 *Special climatic conditions*

As in practice parameters such as heat radiation, movement of surrounding air and water from sources other than rain may occur with any of their severities in combination with any of the other climatic conditions, these special conditions are specified in Table II. In this case an assumption of the coincidence of events of increasing severity would lead to unnecessary overdesign.

5.3 *Biological conditions*

No quantitative severities have been specified for these conditions. The specified parameters of Table III are typical, but may not be complete.

5.4 *Chemically active substances*

Contamination of natural atmosphere is mainly caused by chemical emissions from industrial activities, motor-driven vehicles and heating systems. A further chemical influence is caused by aerosols of salts. The contamination may affect the function and the materials of products.

The values given in this classification have been experienced in surveys for several years. Maximum values are given, because direct influence of higher concentrations over a short period normally causes more damage to material, which cannot regenerate. Mean values are given additionally, because their influence may be important for the long-term effect on internal parts of the products.

In practice not all contaminants (parameters) classified in this standard are present simultaneously. Furthermore, the probability is low that the concentrations of those contaminants really present increase simultaneously and homogeneously. Depending on the local situation, there are often higher values of one contaminant only. The values

specified for class 7C1 will normally be experienced in rural areas and areas with low industrial activities. The values specified for class 7C2 are experienced in urban areas. Therefore the severity of each of these two classes should be considered as the requirements for the combined effect of all parameters stated. The severities of classes 7C3 and 7C4, however, cannot be considered as the requirements for the combined effect of all parameters stated in order to avoid any uneconomical overdesign. For these classes it is possible to select only the severities of those single parameters which might be relevant in the case of application. If single parameters of the classes 7C3 and 7C4 are selected for the description of the chemically active substances present at a location, for all other parameters which are not specially named, the severities of class 7C2 are valid.

Note. — Chemically active liquids and chemically active solids other than sea salts or road salts are not considered in this standard.

5.5 *Mechanically active substances*

Sand and dust are classified together, as the effects caused by these environmental conditions are similar.

5.6 *Mechanical conditions*

The conditions of vibration (sinusoidal) are classified by severity levels of acceleration and displacement amplitudes in high and low frequency ranges respectively.

Random vibration is classified by severity levels of acceleration spectral density in frequency ranges.

Non-stationary vibration including shock is classified by using the first order undamped maximax shock response spectrum. See Sub-clause 5.3.1 of IEC Publication 721-1.

The conditions of free fall are classified by severity levels of fall heights depending on the mass of the product.

TABLE I
Classification of climatic conditions

Environmental parameter	Unit	Class ^{a)}				
		7K1	7K2	7K3	7K4	7K5
a) Low air temperature	°C	+5	−5	−25	−40	−65
b) High air temperature	°C	+40	+45	+70	+70	+85
c) Low relative humidity ¹⁾	%	5	5	5	5	4
d) High relative humidity ¹⁾	%	85	95	100	100	100
e) Low absolute humidity ¹⁾	g/m ³	1	1	0.5	0.1	0.003
f) High absolute humidity ¹⁾	g/m ³	25	29	48	62	78
g) Rapid change of air temperature	°C/°C	+5/+25	−5/+25	−25/+30	−40/+30	−65/+30
h) Low air pressure ²⁾	kPa	70	70	70	70	30
i) High air pressure ³⁾	kPa	106	106	106	106	106
j) Rate of change of air pressure	kPa/min	Negligible	Negligible	Negligible	Negligible	6
k) Solar radiation	W/m ²	700	700	1120	1120	1120
l) Heat radiation	None	s)	s)	s)	s)	s)
m) Movement of surrounding air	m/s	s)	s)	s)	s)	s)
n) Condensation	None	Yes	Yes	Yes	Yes	Yes
o) Precipitation (rain, snow, hail, etc.)	None	No	No	Yes	Yes	Yes
p) Rain intensity	mm/min	None	None	6	6	15
q) Low rain temperature ⁴⁾	°C	None	None	+5	+5	+5
r) Water from sources other than rain	None	s)	s)	s)	s)	s)
s) Ice and frost formation	None	No	Yes	Yes	Yes	Yes

¹⁾ The low and high relative humidities are limited by the low and high absolute humidities, so that for environmental parameters a) and c), or b) and d), the severities given in Table I do not occur simultaneously. See Appendix B for the relationship between air temperature and humidity.

²⁾ The value of 70 kPa represents a limit value for open-air conditions, normally at an altitude of 3000 m. In some geographical areas products may be used at higher altitudes.

³⁾ Conditions in mines are not considered.

⁴⁾ 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 product.

⁵⁾ Conditions occurring at the location concerned to be selected from Table II.

^{a)} The climatic classes of this standard include and cover climatic classes of IEC Publications 721-3-2, 721-3-3 and 721-3-4 as follows:

7K1 covers 2K1 and 3K3

7K3 covers 2K3 and 3K6 and 4K1

7K5 covers 2K5 and 3K8 and 4K4

7K2 covers 2K1 and 3K5

7K4 covers 2K4 and 3K7 and 4K2