

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 60721-3-7:1995 has the status of a
British Standard

ICS 19.040

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee GEL/50, Environmental testing of electrotechnical products, to panel GEL/50/-/1, Coordination of IEC/TC 75 work, upon which the following bodies were represented:

Federation of the Electronics Industry
Society of Motor Manufacturers and Traders Limited

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 February 1996

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The following BSI references relate to the work on this standard:
Committee reference GEL/50/-/1
Draft for comment 93/209314 DC

ISBN 0 580 25138 1

Amendments issued since publication

Amd. No.	Date	Comments
9515	June 1997	Indicated by a sideline in the margin

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National foreword

This Section of BS EN 60721 has been prepared by panel GEI/50/-/1 and is the English language version of EN 60721-3-7:1995 *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 7: Portable and non-stationary use* including amendment A1:1997, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 721-3-7:1995 including Amendment 1:1996 published by the International Electrotechnical Commission (IEC). This standard supersedes BS EN 60721-3-7:1993 which is withdrawn.

Cross-references

Publication referred to	Corresponding British Standard
HD 478.1 S2:1994 ^a (IEC 721-1:1990)	BS EN 60721 <i>Classification of environmental conditions</i> Part 1:1996 <i>Environmental parameters and their severities</i>
HD 478.2.1 S1:1989 (IEC 721-2-1:1982)	BS 7527 <i>Classification of environmental conditions</i> Part 2 <i>Environmental conditions appearing in nature</i> Section 2.1:1991 <i>Temperature and humidity</i> BS EN 60721 <i>Classification of environmental conditions</i> Part 3 <i>Classification of groups of environmental parameters and their severities</i>
EN 60721-3-0:1993 (IEC 721-3-0:1984)	Section 3.0:1993 <i>Introduction</i>
EN 60721-3-2:1993 (IEC 721-3-2:1985)	Section 3.2:1993 <i>Transportation</i>
EN 60721-3-3:1995 (IEC 721-3-3:1994)	Section 3.3:1995 <i>Stationary use at weatherprotected locations</i>
EN 60721-3-4:1995 (IEC 721-3-4:1995)	Section 3.4:1995 <i>Stationary use at non-weatherprotected locations</i>

^a HD 478.1 S2 has now been converted into EN 60721-1:1995 and this has been implemented as BS EN 60721-1:1996.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 30, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

English version

Classification of environmental conditions
Part 3: Classification of groups of environmental
parameters and their severities
Section 7: Portable and non-stationary use

(includes amendment A1:1997)
(IEC 721-3-7:1995 + A1:1996)

Classifications des conditions d'environnement
Partie 3: Classification des groupements des
agents d'environnement et de leurs sévérités
Section 7: Utilisation en déplacement
(inclut l'amendement A1:1997)
(CEI 721-3-7:1995 + A1:1996)

Klassifizierung von Umweltbedingungen
Teil 3: Klassen von Umwelteinflußgroßen und
deren Grenzwerte
Hauptabschnitt 7: Ortsveränderlicher Einsatz
(enthält Änderung A1:1997)
(IEC 721-3-7:1995 + A1:1996)

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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
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 75(CO)105 + 105A, future amendment to IEC 721-3-7, prepared by IEC TC 75, Classification of environmental conditions, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A3 to EN 60721-3-7:1993 on 1994-10-04.

The text of this document, together with that of IEC 721-3-7:1987 and its amendments 1:1991 and 2:1993, was published by IEC as the second edition of IEC 721-3-7 in January 1995. According to a decision of principle taken by the Technical Board of CENELEC, the approval of EN 60721-3-7:1993/A3 has been converted into the approval of a new EN 60721-3-7.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-01-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-01-01

Annexes designated “normative” are part of the body of the standard. Annexes designated “informative” are given for information only. In this standard, Annex ZA is normative and Annex A, Annex B, Annex C and Annex D are informative. Annex ZA has been added by CENELEC.

Foreword to amendment A1

The text of document 75/283/FDIS, future amendment 1 to IEC 721-3-7:1995, prepared by IEC TC 75, Classification of environmental conditions, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60721-3-7:1995 on 1996-12-09.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-09-01

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1 Scope

This standard classifies groups of environmental parameters and their severities to which products are subjected during portable and non-stationary use, including periods of transfer, down time, maintenance and repair.

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 sections of IEC 721-3.

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.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of IEC 721-3. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this section of IEC 721-3 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 721-1:1990, *Classification of environmental conditions — Part 1: Environmental parameters and their severities*.

Amendment 1 (1992)

IEC 721-2-1:1982, *Classification of environmental conditions — Part 2: Environmental conditions appearing in nature — Section 1: Temperature and humidity*.

Amendment 1 (1987)

IEC 721-3-0:1984, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 0: Introduction*.

Amendment 1 (1987)

IEC 721-3-2:1985, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 2: Transportation*.

Amendment 1 (1991),

Amendment 2 (1993)

IEC 721-3-3:1994, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 3: Stationary use at weatherprotected locations*.

IEC 721-3-4:1995, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 4: Stationary use at non-weatherprotected locations*.

3 Definitions

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

3.1

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

3.2

weatherprotected location

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

— *totally weatherprotected location*
(enclosed location): direct weather influences are totally excluded;

— *partially weatherprotected location*
(sheltered location): direct weather influences are not completely excluded.

3.3

non-weatherprotected location

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

4 General

For further general guidance, see IEC 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 IEC 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.

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 Table 1 to Table 6.

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 worldwide conditions of use, due to local influences of open-air climate, construction of buildings, mounting, process conditions, etc. (See also clause 6.)

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

Annex 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.

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

Annex 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 worldwide 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.

Climatic conditions in tropical areas as specified in classes 7K6 and 7K7 are explained in Annex E.

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 variation 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 mounting 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, water from sources other than rain, high air temperature and low air pressure may occur with any of their severities in combination with any of the other climatic conditions, these special conditions are specified in Table 2. 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 3 are typical, but may not be complete.

5.4 Chemically active substances

Contamination of natural atmosphere is mainly caused by chemical emission from industrial activities, motor-driven vehicles and heating systems. A further chemical influence is caused by aerosols of sea 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 6.1.3 of IEC 721-1.

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

6 Sets of environmental condition class combinations

As indicated in clause 5 the classification allows a number of possible combinations of environmental conditions bearing on products wherever used. The number of possibilities, and thus the flexibility, is therefore very great. In practice, however, this flexibility is not always an advantage when, for instance, environmental condition specifications for a certain location are drawn up by different parties, invariably producing small but disturbing divergences.

In order to limit the possibilities to general cases, standard sets of class combinations may be selected from Table 7. For a given location or product, reference may then be made to this standard, for example IE72. Only when conditions are not considered to be covered by this specification, is reference made to each class as indicated in clause 5. Alternatively, if some severities of parameters deviate from that or those of the class combination, this should be expressed by the addition to the set designation of the following phrase: “but ... (parameter) ... (severity and unit)”, for example IE72 but sand 300 mg/m³.

Annex D gives a summary of conditions covered by the sets of class combinations.

Table 1 — Classification of climatic conditions

Environmental parameter	Unit	Class ^f						
		7K1	7K2	7K3	7K4	4K5	7K6 ^h	7K7 ^h
a) <i>Low air temperature</i>	°C	+ 5	– 5	– 25	– 40	– 65	+ 5	– 20
b) <i>High air temperature</i>	°C	+ 40 ^g	+ 45 ^g	+ 70	+ 70	+ 85	+ 40	+ 55
c) <i>Low relative humidity^a</i>	%	5	5	5	5	4	30	4
d) <i>High relative humidity^a</i>	%	85	95	100	100	100	100	100
e) <i>Low absolute humidity^a</i>	g/m ³	1	1	0,5	0,1	0,003	6	0,9
f) <i>High absolute humidity^a</i>	g/m ³	25	29	48	62	78	36	27
g) <i>Rapid change of air temperature</i>	°C/°C	+ 5/+ 25	– 5/+ 25	– 25/+ 30	– 40/+ 30	– 65/+ 30	+ 5/+ 30	– 20/+ 30
h) <i>Low air pressure^b</i>	kPa	70	70	70	70	30	70	70
i) <i>High air pressure^c</i>	kPa	106	106	106	106	106	106	106
j) <i>Rate of change of air pressure</i>	kPa/min	Negligible	Negligible	Negligible	Negligible	6	6	6
k) <i>Solar radiation</i>	W/m ²	700	700	1 120	1 120	1 120	1 120	1 120
l) <i>Heat radiation</i>	None	e	e	e	e	e	e	e
m) <i>Movement of surrounding air</i>	m/s	e	e	e	e	e	e	e
n) <i>Condensation</i>	None	Yes	Yes	Yes	Yes	Yes	Yes	Yes
o) <i>Precipitation (rain, snow, hail, etc.)</i>	None	No	No	Yes	Yes	Yes	Yes	Yes
p) <i>Rain intensity</i>	mm/min	None	None	6	6	15	15	15
q) <i>Low rain temperature^d</i>	°C	None	None	+ 5	+ 5	+ 5	+ 5	+ 5
r) <i>Water from sources other than rain</i>	None	e	e	e	e	e	e	e
s) <i>Ice and frost formation</i>	None	No	Yes	Yes	Yes	Yes	Yes	Yes

^a 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 1 do not occur simultaneously. See Annex B for the relationship between air temperature and humidity.

^b The value of 70 kPa represents a limit for open-air conditions, normally at an altitude of 3 000 m. In some geographical areas products may be used at higher altitudes. For some restricted applications at lower altitudes, a value may be selected from Table 2.

^c Conditions in mines are not considered.

^d This rain temperature should be considered together with high air temperature b) and solar radiation k). The cooling effects of the rain has to be considered in connection with the surface temperature of the product.

^e Conditions occurring at the location concerned to be selected from Table 2.

^f The climatic classes of this standard include and over climatic classes of IEC 721-3-2, IEC 721-3-3 and CEI 721-3-4 as follows:

7K1 covers 2K1 and 3K3

7K3 covers 2K3 and 3K6 and 4K1

7K5 covers 2K5 and 3K8 and 4K4

7K7 covers 1K11, 3K10 and 4K6

7K2 covers 2K1 and 3K5

7K4 covers 2K4 and 3K7 and 4K2

7K6 covers 1K10, 3K9 and 4K5

^g If applicable, a special value may be selected from Table 2.

^h Further information on classes 7K6 (tropical damp) and 7K7 (tropical dry) is given in Annex E