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

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

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

Introduction This Japanese Industrial Standard was prepared based on IEC 60721-3-7 *Classification of environmental conditions—Part 3 : Classification of groups of environmental parameters and their severities. Section 7 : Portable and non-stationary use* published in 1995 as the second edition without changing the technical contents. The amendment was also edited uniting in a body.

The matters underlined with dots in this Standard are not included in the original International Standard.

Informative reference : The above-mentioned number of IEC Standards is given on the basis of the new numbering system for IEC Standards which has been practiced since January 1, 1997. By this system the standard published before the said date was replaced with the new number constituted by adding 60000 to the old number. This system made change only for the number and not the contents.

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 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 60721-3.

Informative reference : IEC 60721-3 is a series Standard titled *Classification of environmental conditions—Part 3 : Classification of groups of environmental parameters and their severities*.

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.

Remarks : The International Standard corresponding to this Standard is as follows.

IEC 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*

2 Normative references The following normative documents contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below.

JIS C 0110 : 1995 *Classification of environmental conditions Part 1 : Classification of environmental parameters and their severities*

Remarks : Identical to IEC 60721-1 : 1990 *Classification of environmental conditions—Part 1 : Classification of environmental parameters and their severities*.

JIS C 0111 : 1995 *Classification of environmental conditions Part 2 : Environmental conditions appearing in nature Temperature and humidity*

Remarks : Identical to IEC 60721-2-1 : 1982 *Classification of environmental conditions—Part 2 : Environmental conditions appearing in nature. Section 1 : Temperature and humidity*.

JIS C 0112 : 1995 *Classification of environmental conditions Part 3 : Classification of groups of environmental parameters and their severities Introduction*

Remarks : Identical to IEC 60721-3-0 : 1984 *Classification of environmental conditions—Part 3 : Classification of groups of environmental parameters and their severities. Section 0 : Introduction.*

IEC 60721-3-2 : 1985 *Classification of environmental conditions—Part 3 : Classification of groups of environmental parameters and their severities. Section 2 : Transportation*

JIS C 0116 : 1997 *Classification of environmental conditions Part 3 : Classification of groups of environmental parameters and their severities Section 3 : Stationary use at weatherprotected locations*

Remarks : Identical to IEC 60721-3-3 : 1994 *Classification of environmental conditions—Part 3 : Classification of groups of environmental parameters and their severities. Section 3 : Stationary use at weatherprotected locations.*

JIS C 0117 : 1997 *Classification of environmental conditions Part 3 : Classification of groups of environmental parameters and their severities Section 4 : Stationary use at non-weatherprotected locations*

Remarks : Identical to IEC 60721-3-4 : 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 JIS C 0110, 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.

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 JIS C 0112 (IEC 60721-3-0)

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 **JIS C 0112** 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 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 1 to 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 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. (The classification of this climatic conditions is given in Annex A.) 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.

The climatic conditions in tropical areas 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 and breathing of casing, 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 system. 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 materials, 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 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 3C3 and 3C4, 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.

Remarks : 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 JIS C 0110).

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 30 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 ⁽⁶⁾						
		7K1	7K2	7K3	7K4	7K5	7K6 ⁽⁶⁾	7K7 ⁽⁶⁾
a) Low air temperature	°C	+5	-5	-25	-40	-65	+5	-20
b) High air temperature	°C	+40 ⁽⁷⁾	+45 ⁽⁷⁾	+70	+70	-65	+40	+55
c) Low relative humidity ⁽¹⁾	%	5	5	5	5	4	30	4
d) High relative humidity ⁽¹⁾	%	85	95	100	100	100	100	100
e) Low absolute humidity ⁽¹⁾	g/m ³	1	1	0.5	0.1	0.003	6	0.9
f) High absolute humidity ⁽¹⁾	g/m ³	25	29	48	62	78	36	27
g) Rapid change of air temperature	°C/min	+5/+25	-5/+25	-25/ +30	-40/ +30	-65/ +30	+5/ +30	-20/ +30
h) Low air pressure ⁽²⁾	kPa	70	70	70	70	30	70	70
i) High air pressure ⁽³⁾	kPa	106	106	106	106	106	106	106
j) Rate of change of air pressure	kPa/min	Negligible	Negligible	Negligible	Negligible	6	6	6
k) Solair radiation	W/m ²	700	700	1 120	1 120	1 120	1 120	1 120
l) Heat radiation	None	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾
m) Movement of surrounding air	m/s	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾
n) Condensation	None	Yes	Yes	Yes	Yes	Yes	Yes	Yes
o) Precipitation (rain, snow, hail, etc.)	None	No	No	Yes	Yes	Yes	Yes	Yes
p) Rain intensity	mm/min	None	None	6	6	15	15	15
q) Low rain temperature ⁽⁴⁾	°C	None	None	+5	+5	+5	+5	+5
r) Water from sources other than rain	None	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾	⁽⁶⁾
s) Ice and frost formation	None	No	Yes	Yes	Yes	Yes	Yes	Yes

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

⁽²⁾ 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 same restricted applications at lower altitudes, a value may be selected from Table 2.

⁽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 effects 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 2.

⁽⁶⁾ The climatic classes of this Standard include and cover climatic of IEC 60721-3-2, JIS C 0116 and JIS C 0117 (IEC 60721-3-4) as follows:

7K1 : 2K1, 3K3 7K3 : 2K3, 3K6 and 4K1 7K5 : 2K5, 3K8 and 4K4 7K7 : 1K11, 3K10 and 4K6 7K2 : 2K1, 3K5 7K4 : 2K4, 3K7 and 4K2 7K6 : 1K10, 3K9 and 4K5

⁽⁷⁾ If applicable, a special value may be selected from Table 2.

⁽⁸⁾ The details of classes 7K6 (tropical area damp) and 7K7 (tropical area dry) are explained in Annex E.

Table 2 Classification of special climatic conditions

Environmental parameter	Class	Unit	Special condition Z
b) High air temperature	7Z14	°C	+55
h) Low air pressure ⁽¹¹⁾	7Z15	kPa	84
k) Heat radiation	7Z1	None	Negligible
	7Z2	None	Heat radiation, e.g. in the vicinity of heating systems
	7Z3	None	Heat radiation, e.g. in the vicinity of heating systems, commercial ovens or industrial furnaces
l) Movement of surrounding air ⁽⁹⁾	7Z4	m/s	5
	7Z5	m/s	10
	7Z6	m/s	30
	7Z7	m/s	50
o) Water from sources other than rain ⁽¹⁰⁾	7Z8	None	Negligible
	7Z9	None	Dripping water
	7Z10	None	Spraying water
	7Z11	None	Splashing water
	7Z12	None	Water jets
	7Z13	None	Water waves
Notes ⁽⁹⁾ A cooling system based on non-assisted convection may be disturbed by adverse movement of surrounding air. ⁽¹⁰⁾ Underwater conditions are not considered. ⁽¹¹⁾ Class 7Z15 corresponds to an altitude of approximately 1 400 m.			

Table 3 Classification of biological conditions

Environmental parameter	Unit	Class		
		7B1	7B2	7B3
a) Flora	None	Negligible	Presence of mould, fungus, etc.	Presence of mould, fungus, etc.
b) Fauna	None	Negligible	Presence of rodents and other animals harmful to products (excluding termites).	Presence of rodents and other animals harmful to products (including termites).

Table 4 Classification of chemically active substances

Environmental parameter	Unit ⁽¹²⁾	Class ⁽¹³⁾ , ⁽¹⁶⁾									
		7C1R	7C1L	7C1	7C2		7C3 ⁽¹⁴⁾		7C4 ⁽¹⁴⁾		
		Max. value	Max. value	Max. value	Mean value	Max. value	Mean value	Max. value	Mean value	Max. value	
a) Sea salts	None	Negligible	Negligible	Negligible ⁽¹⁵⁾	Salt mist		Salt mist		Salt mist		
b) Sulphur dioxide	mg/m ³ cm ³ / m ³	0.01 0.003 7	0.1 0.037	0.1 0.037	0.3 0.11	1.0 0.37	5.0 1.85	10 3.7	13 4.8	40 14.8	
c) Hydrogen sulphide	mg/m ³ cm ³ / m ³	0.001 5 0.001	0.01 0.007 1	0.01 0.007 1	0.1 0.071	0.5 0.36	3.0 2.1	10 7.1	14 9.9	70 49.7	
d) Chlorine	mg/m ³ cm ³ / m ³	0.001 0.000 34	0.01 0.003 4	0.1 0.034	0.1 0.034	0.3 0.1	0.3 0.1	1.0 0.34	0.6 0.2	3.0 1.0	
e) Hydrogen chloride	mg/m ³ cm ³ / m ³	0.001 0.000 66	0.01 0.006 6	0.1 0.066	0.1 0.066	0.5 0.33	1.0 0.66	5.0 3.3	1.0 0.66	5.0 3.3	
f) Hydrogen fluoride	mg/m ³ cm ³ / m ³	0.001 0.001 2	0.003 0.003 6	0.003 0.003 6	0.01 0.012	0.03 0.036	0.1 0.12	2.0 2.4	0.1 0.12	2.0 2.4	
g) Ammonia	mg/m ³ cm ³ / m ³	0.03 0.042	0.3 0.42	0.3 0.42	1.0 1.4	3.0 4.2	10 14	35 49	35 49	175 247	
h) Ozone	mg/m ³ cm ³ / m ³	0.004 0.002	0.01 0.005	0.01 0.005	0.05 0.025	0.1 0.05	0.1 0.05	0.3 0.15	0.2 0.1	2.0 1.0	
i) Nitrogen oxides (expressed in the equivalent values of nitrogen dioxide)	mg/m ³ cm ³ / m ³	0.01 0.005	0.1 0.052	0.1 0.052	0.5 0.26	1.0 0.52	3.0 1.56	9.0 4.68	10 5.2	20 10.4	

Notes ⁽¹²⁾ The values given in cm³/m³ have been calculated from the values given in mg/ m³ and refer to a temperature of 20 °C and a pressure of 101.3 kPa. The table uses rounded values.

⁽¹³⁾ Mean values are expected long-term values. Maximum values are limit or peak values, occurring over a period of time of not more than 30 min per day.

⁽¹⁴⁾ It is not mandatory to consider each of classes 7C3 and 7C4 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 7C2 are valid for all parameters not especially named.

⁽¹⁵⁾ Salt mist may be present in sheltered location of coastal areas or in offshore sites.

⁽¹⁶⁾ 7C1R covers 3C1R, 7C1L covers 3C1L, 7C1 covers 3C1 and 4C1, 7C2 covers 3C2 and 4C2, 7C3 covers 3C3 and 4C3, 7C4 covers 3C4 and 4C4.

Table 5 Classification of mechanically active substances

Environmental parameter	Unit	Class		
		7S1	7S2	7S3
a) Sand	mg/m ³	30	300	10 000
b) Dust (suspension)	mg/m ³	0.2	5.0	20
c) Dust (sedimentation)	mg/(m ² ·h)	1.5	20	80