



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS C 0117 : 1997

(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**

The code number of this Standard
changed from JIS C 0117 to the
following from 20 March 2004.

JIS C 60721-3-4:1997

ICS 19.040

Descriptors : electrical equipment, electrically-operated devices, electrical components,
electronic equipment and components, environmental testing, electrical
testing, outdoor electric equipment

Reference number : JIS C 0117 : 1997 (E)

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:

Date of Establishment: 1997-11-20

Date of Public Notice in Official Gazette: 1997-11-20

Investigated by: Japanese Industrial Standards Committee
Divisional Council on Electricity

JIS C 0117 : 1997, First English edition published in 2000-06

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

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the original JIS is to be the final authority.

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Printed in Japan

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Classification of environmental conditions

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

Section 4: Stationary use at non-weatherprotected locations

Introduction

This Japanese Industrial Standard has been prepared based on the second edition issued in 1995 of *“IEC 60721-3-4, Classification of environmental conditions Part 3: Classification of groups of environmental parameters and their severities Section 4: Stationary use at non-weatherprotected locations and Amendment 1 (1996) without changing the technical contents.*

The parts with dotted-underlines are not included in the original International Standard.

The IEC standard number is based on the new numbering system implemented since January 1, 1997. The numbers of the standards issued prior to the date have also been changed to those with 60000 added. This means that only the numbers have been changed with the same contents of the standards.

1 Scope

This Standard classifies groups of environmental parameters and their severities to which products are subjected when mounted for stationary use at locations which are non-weatherprotected, including periods of erection work, downtime, maintenance and repair.

Locations which are non-weatherprotected, where products may be mounted for stationary use permanently or temporarily, include land-based and offshore locations. Use in and on vehicles is excepted.

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 products 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 at weatherprotected locations, portable and non-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 means a series of IEC 60721-3 (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. Some guidance for this is given in Annex A.

2 Normative references

The following normative references contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid.

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

Note JIS C 0110-1995 is identical to IEC 60721-1: 1990, Classification of environmental conditions Part 1: Environmental parameters and their severities.

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

Note JIS C 0111-1995 is 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*

Note JIS C 0112-1995 is 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.

3 Definitions

In addition to the definitions in clause 3 of JIS C 0110, the following definitions apply to this standard:

3.1 stationary use: The product 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, downtime, maintenance and repair at the location are included.

3.2 location which is non-weatherprotected: A location at which the product is not protected from direct weather influences.

4 General

For further general guidance, see JIS C 0112.

During periods of erection work, which are often connected with downtime, the user should be aware that conditions might differ from those during operation. Therefore, the selection of another class may be necessary for this period, unless special precautions have been taken.

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 have not yet been included in this standard, but should be considered for any environmental parameter. They should be specified additionally if applicable. Information on duration and frequency of occurrence is included in JIS C 0112 as clause 6 (Duration and frequency of occurrence).

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, for example heat dissipation sources, special process conditions, etc.

Measurements of the environmental conditions present at a location shall 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 for negotiation between supplier and user.

5 Classification of groups of environmental parameters and their severities

A number of classes are specified in Tables 1 to 6 for:

- climatic conditions (K)
- special climatic conditions (Z)
- biological conditions (B)
- chemically active substances (C)
- mechanically active substances (S)
- mechanical conditions (M)

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, mounting, process conditions, etc. (See also clause 6.)

A class indicated with higher digit conditions normally includes classes with lower digits.

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

For a given location or product, reference should be made to the total set of classes, for example

4K2/4Z1/4Z4/4Z6/4B1/4C2/4S2/4M4.

Annex A explains the basis of the classes. It contains a summary of the conditions covered by a 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 examples for practical application of this classification.

5.1 Climatic conditions

The climatic conditions specified for classes 4K1 to 4K4 refer to the groups of open-air climates in 5.4 (Grouping of statistical open-air climates) of **JIS C 0111** (This classification of climatic conditions is described in Annex A.). Reference values are the mean values of the annual extreme values of temperature and humidity.

Climatic conditions in tropical areas as specified in classes 4K5 and 4K6 are explained in Annex E.

At locations which are non-weatherprotected, the influence of 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 of temperature change, solar radiation, precipitation, air velocity and wind-chill should be considered in this respect.

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

5.2 Special climatic conditions

In practice, the parameters heat radiation, movement of surrounding air, water from sources other than rain and low air pressure may occur with any of their severities in combination with any of the other climatic conditions. These parameters are therefore specified as special conditions 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 in 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 salts. The contamination may affect the function and the materials of products.

The values given in this classification have been encountered 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. Average 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 actually present increase simultaneously and homogeneously. Depending on the local situation, there are often higher values of one contaminant only. The values specified for class 4C1 will normally be experienced in rural areas. The values specified for class 4C2 are experienced in urban areas. Therefore, the severity of each of these two classes shall be considered as the requirements for the combined effect of all parameters stated. The severities of classes 4C3 and 4C4, however, cannot be considered as the requirements for the combined effect of all parameters stated, in order to avoid any uneconomic overdesign. For these classes, it is possible to select only the severities of those single parameters which might be relevant in the particular application. If single parameters of the classes 4C3 or 4C4 are selected for the description of the chemically active substances present at a location, the severities of class 4C2 are valid for all other parameters which are not specially named.

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 low and high frequency ranges.

Random vibration is not considered in this standard. It may be included when sufficient information is available.

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 Table 1)

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 IE42. 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 IE42 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							
		4K1	4K2	4K3	4K4	4K4H	4K4L	4K5 ⁵⁾	4K6 ⁶⁾
a) Low air temperature	°C	-20	-33	-50	-65	-20	-65	+5	-20
b) High air temperature	°C	+35	+40	+40	+55	+55	+35	+40	+55
c) Low relative humidity ¹⁾	%	20	15	15	4	4	20	30	4
d) High relative humidity ¹⁾	%	100	100	100	100	100	100	100	100
e) Low absolute humidity ¹⁾	g/m ³	0.9	0.26	0.03	0.003	0.9	0.003	6	0.9
f) High absolute humidity ¹⁾	g/m ³	22	25	36	36	36	22	36	27
g) Rain intensity	mm/min	6	6	15	15	15	15	15	15
h) Rate of change of temperature ²⁾	°C/min	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
i) Low air pressure ³⁾	kPa	70	70	70	70	70	70	70	70
j) High air pressure	kPa	106	106	106	106	106	106	106	106
k) Solar radiation	W/m ²	1120	1120	1120	1120	1120	1120	1120	1120
l) Heat radiation	None	5)	5)	5)	5)	5)	5)	5)	5)
m) Movement of surrounding air	m/s	5)	5)	5)	5)	5)	5)	50	50
n) Condensation	None	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
o) Precipitation (rain, snow, hail, etc.)	None	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
p) Low rain temperature ⁴⁾	°C	+5	+5	+5	+5	+5	+5	+5	+5
q) Water from sources other than rain	None	5)	5)	5)	5)	5)	5)	5)	5)
r) Ice and frost formation	None	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

¹⁾ The low and high relative humidities are limited by the low and high absolute humidities, so that, for instance, 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⁾ Averaged over a period of 5 min.

³⁾ The value 70 kPa represents a limit value for open-air use, normally at about 3 000 m altitude. In some geographical areas, open-air use may take place at higher altitudes. For some restricted applications at lower altitudes, a value may be selected from Table 2.

⁴⁾ This rain temperature should be considered together with high air temperature b) and solar radiation k). The cooling effect of the rain should be considered in connection with the surface temperature of the product.

⁵⁾ Conditions occurring at the location concerned should be selected from Table 2.

⁶⁾ Further information on classes 4K5 (tropical damp) and 4K6 (tropical dry) is given in annex E.