



JAPANESE
INDUSTRIAL
STANDARD

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Japanese Standards Association

JIS C 0118 : 1999

(IEC 60721-2-4 : 1987/Amd. 1 : 1988)

**Classification of environmental
conditions—
Part 2 : Environmental conditions
appearing in nature.
Solar radiation and temperature**

The code number of this Standard
changed from JIS C 0118 to the
following from 20 March 2004.

JIS C 60721-2-4:1999

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temperature distribution, geographic distribution, electric power systems,
electrical equipment, electrical components, electronic equipment and
components

Reference number : JIS C 0118 : 1999 (E)

C 0118 : 1999 (IEC 60721-2-4 : 1987/Amd. 1 : 1988)

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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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Contents

	Page
Introduction	1
1 Scope	1
2 Object	2
3 General	2
4 Solar radiation physics	3
5 Levels of global radiation	3
5.1 Maximum levels	3
5.2 Mean monthly and annual global solar radiation	4
5.3 Simultaneous values of maximum air temperatures and solar radiation	4
5.4 World distribution of daily global irradiation	4
6 Minimum levels of atmospheric radiation at night	4
Annex A (informative) World distribution of daily global irradiation	7

Classification of environmental conditions

Part 2 : Environmental conditions appearing in nature.

Solar radiation and temperature

Introduction This Japanese Industrial Standard has been prepared based on IEC 60721-2-4, *Classification of environmental conditions—Part 2 : Environmental conditions appearing in nature—Solar radiation and temperature* published in 1987 and Amendment 1:1988 without modifying their technical contents.

The portions with dotted underlines show the matters not included in the original International Standard.

The IEC Standard number is based on the new numbering system of IEC Standards put in force on January 1st 1997, and the Standard published before the said date is numbered by adding 60000 to the former number.

This is only the change in the numbering system and the contents remain unchanged.

1 Scope This Japanese Industrial Standard presents a broad division into types of solar radiation areas. It is intended to be used as part of the background material when selecting appropriate severities of solar radiation for product applications.

All types of geographical areas are covered, except areas with altitudes above 5 000 m.

When selecting severities of solar radiation for product applications, the values which are given in JIS C 0110 : 1995 should be applied

Remarks : The International Standard corresponding to this Standard is given below.

IEC 60721-2-4: 1987 *Classification of environmental conditions—Part 2: Environmental conditions appearing in nature. Solar radiation and temperature*

1.a) Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards indicated below shall be applied.

All these Standards are subjected to revision, and parties relating with these Standards are encouraged to investigate the possibility of applying the most recent editions of the Standards indicated below.

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

Remarks : The above is identical with 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 : The above is identical with IEC 60721-2-1:1995 *Classification of environmental conditions—Part 2 : Environmental conditions appearing in nature. Temperature and humidity.*

2 Object To define limiting severities of solar radiation to which products are liable to be exposed during transportation, storage and use.

3 General Solar radiation can affect products primarily by heating of material and their environment or by photochemical degradation of material.

The ultraviolet content of solar radiation causes photochemical degradation of most organic materials. Elasticity and plasticity of certain rubber compounds and plastic materials are affected. Optical glass may become opaque.

Solar radiation bleaches out colours in paints, textiles, paper, etc. This can be of importance, for example for the colour coding of components.

The heating of material is the most important effect of exposure to solar radiation. The presentation of severities of solar radiation is therefore related to the power density radiated towards a surface, or irradiance, expressed in watts per square metre.

An object subjected to solar radiation will attain a temperature depending primarily on the surrounding air temperature, the energy radiated from the sun, and the incidence angle of the radiation on the object. Other factors, for example wind and heat conduction to mountings, can be of importance. In addition, the absorptance a_s of the surface for the solar spectrum is of importance.

An artificial air temperature t_s may be defined, which, under steady-state conditions, results in the same surface temperature of an object as the combination of the actual air temperature t_a and the solar radiation of the irradiance E .

An approximate value can be obtained from the following equation:

$$t_s = t_a + \frac{a_s \cdot E}{h_y}$$

The coefficient h_y is the heat transfer coefficient for the surface, in watts per square metre and degree Celsius, and includes thermal radiation to the surroundings, heat conduction and convection due to wind.

The absorptance a_s depends on the thermal colour, the reflectance and the transmittance of the surface.

Typical clear sky values are : $a_s = 0.7$

$$h_y = 20 \text{ W}/(\text{m}^2 \cdot ^\circ\text{C})$$

$$E = 900 \text{ W}/\text{m}^2$$

resulting in an “overtemperature” due to solar radiation of about 30°C . It can then be seen that an error of 10 % in the estimation of the intensity of the solar radiation will influence the temperature involved by less than 5°C . Therefore, there is no need in this classification for extremely accurate severities of solar radiation and minor factors affecting the heat radiated have therefore been disregarded here.

The heating effect is caused mainly by short-term radiation of high intensity, i.e. the solar radiation around noon on cloudless days. Such values are presented in Table 1.