



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS C 0111 : 1995

(IEC 721-2-1 : 1982)

(Reaffirmed : 2000 - 06)

**Classification of environmental
conditions Part 2 : Environmental
conditions appearing in nature
Temperature and humidity**

The code number of this Standard
changed from JIS C 0111 to the
following from 20 March 2004.

JIS C 60721-2-1:1995

ICS 19.040

Descriptors : environmental testing

Reference number : JIS C 0111 : 1995 (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 the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

Date of Establishment: 1995-03-01

Date of Public Notice in Official Gazette: 1995-03-01

Investigated by: Japanese Industrial Standards Committee
Divisional Council on Electronics

JIS C 0111:1995, First English edition published in 2001-11

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

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

© JSA 2001

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

Classification of environmental conditions

Part 2: Environmental conditions appearing in nature

Temperature and humidity

Foreword for Japanese Industrial Standard

This Japanese Industrial Standard has been prepared based on the first edition issued in 1982 of IEC 721-2-1, *Classification of environmental conditions Part 2: Environmental conditions appearing in nature Temperature and humidity* and Amendment 1 (1987) without changing the technical contents. The portions with dotted underlines are items not included in the original International Standard.

1. Scope

This Standard presents types of open-air climate in terms of temperature and humidity. It is intended to be used as part of the background material when selecting appropriate temperature and humidity severities for product applications.

The climates cover all areas of the world, excluding the Central Antarctic and high altitudes (above 5 000 m).

This presentation may be used as background material when issuing climatic environmental classes for product applications.

When selecting temperature and humidity severities for product applications, the values given in **JIS C 0110-1995**, *Classification of environmental conditions Part 1 : Classification of Environmental Parameters and Their Severities*, should be applied.

Informative reference **JIS C 0110-1995** is identical to **IEC 721-1: 1990** *Classification of environmental conditions Part 1: Environmental parameters and their severities*.

2. Object

To define a limited number of types of open-air climate, in terms of temperature and humidity, which satisfactorily represent the conditions most frequently met by products while being transported, stored, installed and used.

3. General

Electrotechnical products are used in almost all areas of the world under varying climatic conditions and have to meet the stresses imposed by severe climatic conditions with the necessary reliability. A detailed knowledge of the climatic conditions to which the product will be subjected must be available in the design stage.

Data on open-air temperature and humidity have been collected and statistically processed for many years throughout the whole world. Such data can be conveniently represented in climatograms.

In addition to the open-air temperature, the temperature stresses on a product depend on a number of other environmental parameters, for example solar radiation, air velocity, heating from adjacent equipment, etc.

The effects of humidity depend on temperature, temperature changes, impurities in the humid air, etc.

In many cases the extremes of temperature and humidity are of great importance even if they occur a short time only during the day. In other cases, where large time constants for heat or water penetration are involved, the mean values of temperature and humidity over a certain period may be more important.

It has therefore been considered useful to present here the following two values:

- The mean value over many years of the annual extreme values of temperature and humidity, which will occur only for short periods (a few hours).
- The mean value over many years of the extreme daily mean values of temperature and humidity, which will occur for longer periods.

In order to cover cases where rare events have to be taken into account, the absolute extreme temperatures and humidities, observed over a period of many years, have also been presented.

This standard does not take into account reliability aspects and therefore only the extreme values of temperatures and humidities and combinations thereof are given. For reliability purposes it is also necessary to have information on the total statistical distribution on temperatures and humidities. Such data may also be needed when considering the diffusion of moisture through materials.

4. Principles behind the presentation of statistical data of temperature and humidity

4.1 Statistical open-air climates

For the application of a product in a locally restricted geographical area, the open-air temperature and humidity can be taken from the statistical climatogram for that area. This permits the product to be designed for its application in this climate.

The different open-air temperature and humidity conditions of the world are therefore presented by defining nine climatic types, hereinafter referred to as "statistical open-air climates", covering the climatic conditions of the world.

4.2 Groups of statistical open-air climates

For the application of a product in several geographical areas with different climatic types, the appropriate statistical open-air climates are brought together in four main groups.

The restriction to four groups is made in order to limit the temperature and humidity classes applied to products intended for a more general use.

5. Presentation of statistical open-air climates

5.1 Environmental parameters

In this presentation, statistical open-air climates are defined by the values of the following

environmental parameters:

- air temperature;
- relative air humidity.

The relative humidity at a certain temperature is defined as the ratio between the actual vapour pressure and the saturation vapour pressure at the same temperature.

At a fixed air pressure the absolute air humidity, defined as the actual mass of water per unit of air volume, is given by the air temperature and the relative air humidity.

Note. - Appendix B describes the constitutional diagram for humid air.

5.2 Climatograms

5.2.1 General

The climatograms presented in **Figs. 1 to 9**, define limits of statistical open-air climates. Three boundary lines are given in the diagrams, one defining the mean value of the annual extreme daily mean values, the second defining the mean value of annual extreme values and the third defining the absolute extreme value.

5.2.2 *Boundary lines representing the mean value of the annual extreme daily mean values of temperature and humidity*

The boundary lines representing the mean value of the annual extreme daily mean values are obtained by plotting for each day the mean value of air temperature and associated relative humidity occurring at one place representative of the geographical area, in a diagram with air temperature on the x-axis and relative air humidity on the y-axis. A boundary line is then drawn through the extreme plots appearing in the diagram.

The boundary line in a climatogram is the mean line between the boundary lines obtained by the procedure for each of many years (at least ten years). The boundaries have been slightly simplified so that they are kept parallel to constant air temperature, constant relative air humidity or constant absolute air humidity.

The probability is rather high (about 5%) that a product will, for short periods (a few hours per occasion), be subjected to temperatures and humidities and combinations thereof which are more extreme than those represented by the boundary lines. However, if a long-term exposure is needed for the product to attain the temperature of the surrounding air, it is unlikely that the product will be affected by these short-period exposures to more severe temperature conditions than those represented by the boundary lines.

5.2.3 *Boundary lines representing the mean value of annual extreme values of temperature and humidity*

The boundary lines representing the mean value of annual extreme values are obtained by plotting all values of air temperature and associated relative humidity during one year, occurring at one place representative of the geographical area, in the same diagram as in Sub-clause 5.2.2. A boundary line is then drawn through the extreme plots appearing in the diagram.

The boundary line in a climatogram is the mean line between the boundary lines obtained by the procedure for each of many years (at least ten years). The boundaries have been slightly simplified so that they are kept parallel to constant air temperature, constant relative air humidity or constant absolute air humidity.

Although the extreme boundary values of air temperature, relative air humidity and absolute air humidity, which can be read from the diagrams, do not exactly represent the mean value of the annual extreme values, this can be assumed for the practical use of the climatograms.

The probability of a product being exposed to combinations of air temperatures and relative air humidities outside the boundary line depends on for how long the product is exposed to open-air conditions. A product which is permanently placed outdoors for several years can be expected to be temporarily exposed to more extreme air temperatures and more extreme combinations of air temperatures and relative humidities than those indicated by the boundary line.

If a product is exposed to open-air conditions for shorter periods only, the probability is small that the product will be subjected to more extreme air temperatures and humidities than those given by the boundary lines.

The annual extreme value of low temperature normally occurs for a period of approximately 10 h, whilst the annual extreme value of high temperature normally occurs for a shorter period, approximately 5 h. The statistical occurrence could therefore be taken as approximately 0.1% for the low temperature value and approximately 0.05% for the high temperature value.

5.2.4 *Boundary lines representing the absolute extreme value of temperature and humidity*

The boundary lines representing the absolute extreme value are obtained by plotting all values of air temperature and associated relative humidity during many years (more than ten years), occurring at one place representative of the geographical area, in the same diagram as in Sub-clause 5.2.2. A boundary line is then drawn through the extreme plots appearing in the diagram. The boundary line in a climatogram representing the absolute extreme value is then identical to this line.

The boundaries have been simplified so that they are kept parallel to constant air temperature, constant relative air humidity or constant absolute air humidity.

The absolute extreme values which occur very seldom and for short periods only are included for special applications, for example, the efficient operating of devices for telecommunication under worst-case conditions.

5.3 *Identification of the statistical open-air climates*

The following tables present the types of climate defined as the statistical open-air climates.

In **Table I** the mean value of the annual extreme daily mean values of temperature and humidity is given for each type of climate.

In **Table II** the mean value of annual extreme values of temperature and humidity is given for each type of climate.

In **Table III** the absolute extreme value of temperature humidity is given for each type of climate.

All figures are based on observations over a period of not less than ten years. An increase in the observation period may result in wider extremes in **Table III**.

The climatograms for the statistical open-air climates are given in Figs. 1 to 9.

5.4 *Grouping of Statistical Open-Air Climates*

The Statistical Open-Air Climates are grouped into four groups, identified as below:

- a) Restricted Open-Air Climates limited to the Warm Temperate Climates;
- b) Moderate Open-Air Climates including Cold Temperate, Warm Temperate, Warm Dry and Mild Warm Dry Climates;
- c) General Open-Air Climates Including all Statistical Climates except Extremely Cold and Extremely Warm Dry Climates;
- d) World-Wide Open-Air Climates including all Statistical Climates.

In **Table IV** the mean value of the annual extreme daily mean values of temperature and humidity is given for each group of climates.

In **Table V** the mean value of the annual extreme values of temperature and humidity is given for each group of climates.

In **Table VI** the absolute extreme value of temperature and humidity is given for each group of climates.

5.5 *Geographical survey of statistical open-air climates*

A survey of the occurrence of statistical open-air climates in geographical areas of the world is presented in two coloured maps in Appendix A.

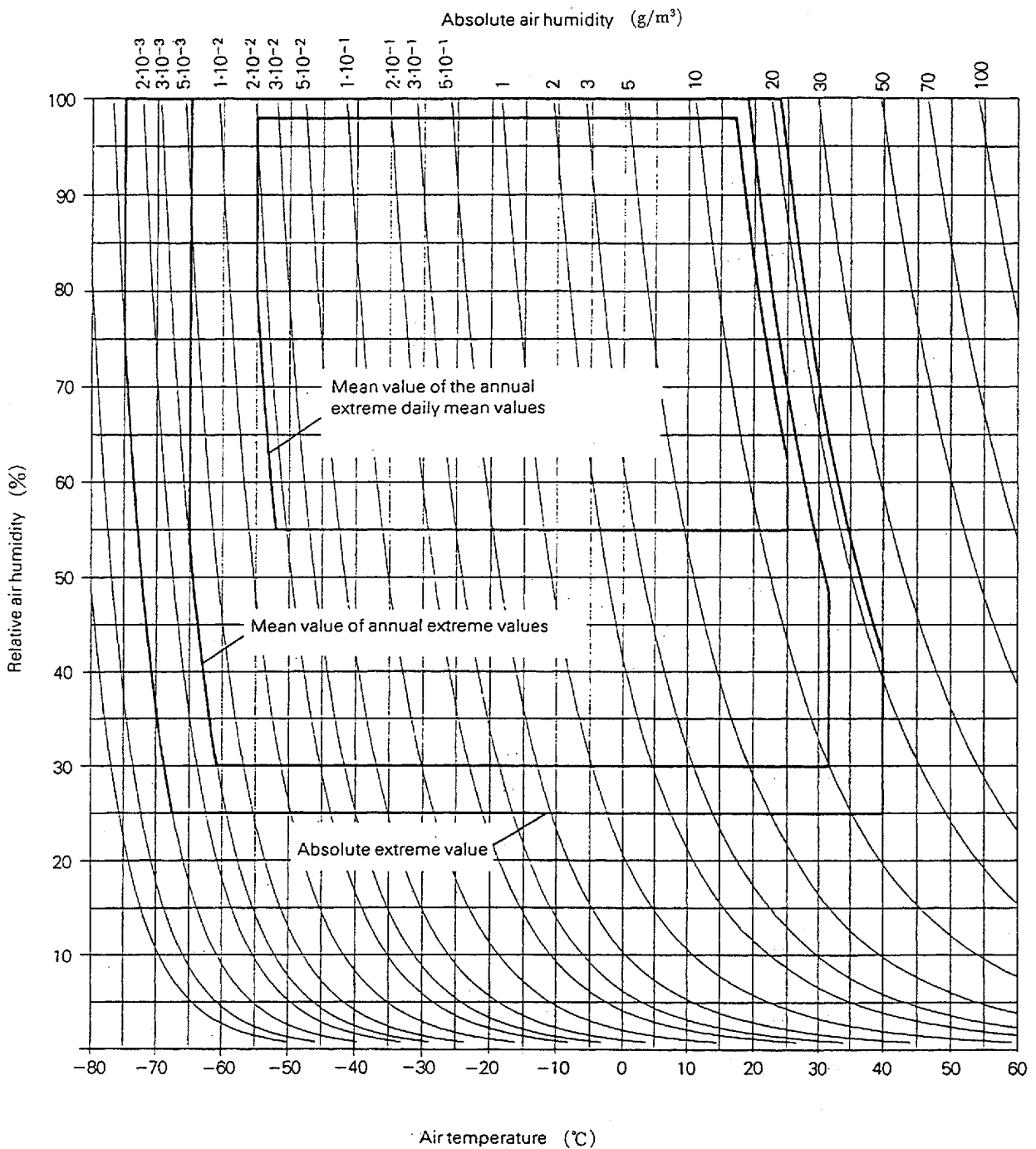


FIG. 1. — Statistical open-air climate.
Extremely Cold (except the Central Antarctic).

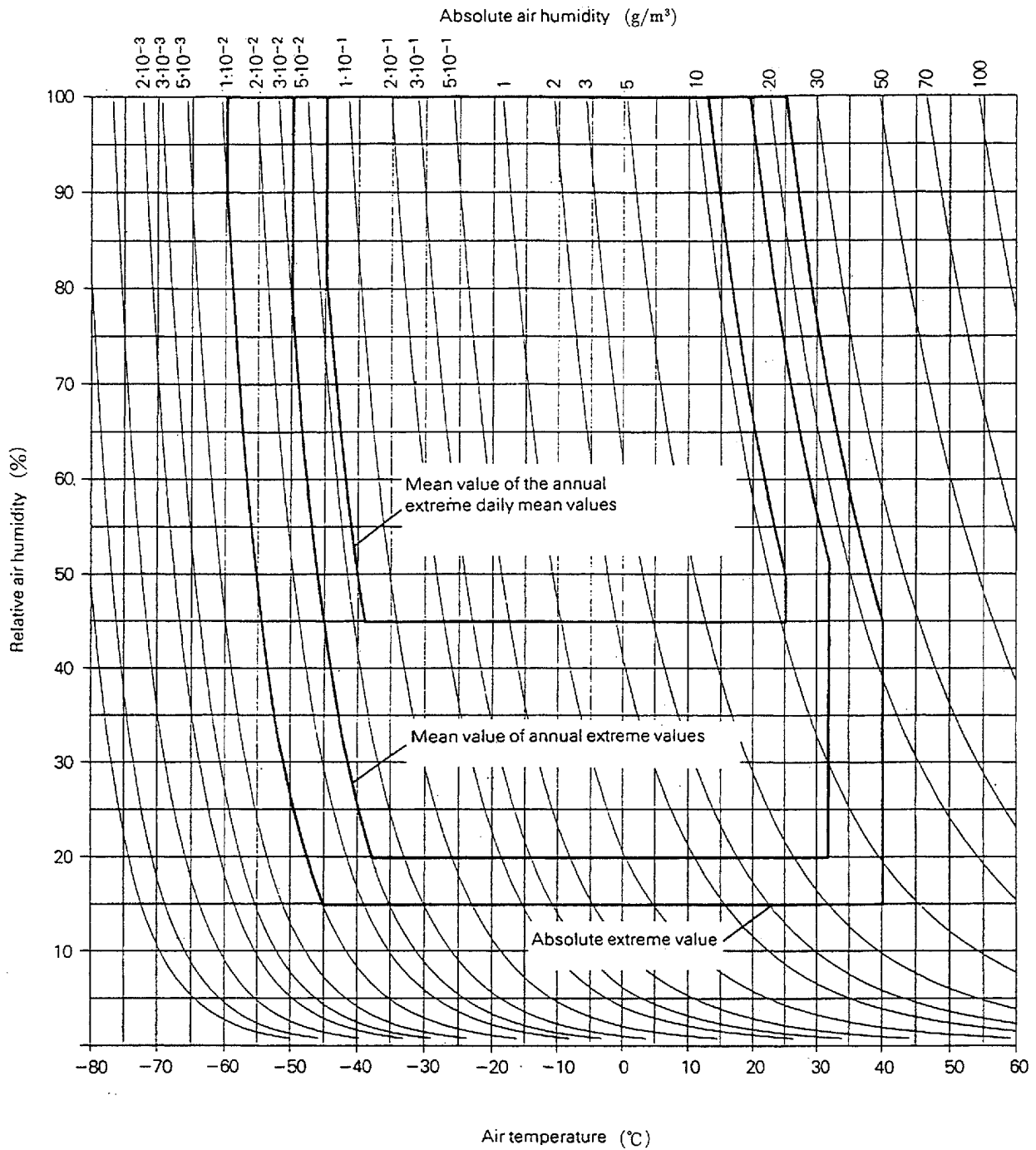


FIG. 2. — Statistical open-air climate.
Cold.