

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Classification of environmental conditions –
Part 2-3: Environmental conditions appearing in nature – Air pressure**

**Classification des conditions d'environnement –
Partie 2-3: Conditions d'environnement présentes dans la nature – Pression
atmosphérique**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 IEC, Geneva, Switzerland

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 either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.



IEC 60721-2-3

Edition 2.0 2013-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Classification of environmental conditions –
Part 2-3: Environmental conditions appearing in nature – Air pressure**

**Classification des conditions d'environnement –
Partie 2-3: Conditions d'environnement présentes dans la nature – Pression
atmosphérique**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

H

ICS 19.040

ISBN 978-2-83220-875-5

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references	5
3 Terms and definitions	5
4 Air pressure effects	5
4.1 General	5
4.2 Air pressure lower than normal	5
4.3 Air pressure higher than normal	6
5 Values of air pressure	6
Bibliography.....	8
Table 1 – Normal air pressure related to altitudes above and below sea-level.....	6

iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 60721-2-3:2013](https://standards.iteh.ai/catalog/standards/sist/a7ea1c4c-6fd0-4367-8cc7-749212d97685/iec-60721-2-3-2013)

<https://standards.iteh.ai/catalog/standards/sist/a7ea1c4c-6fd0-4367-8cc7-749212d97685/iec-60721-2-3-2013>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CLASSIFICATION OF ENVIRONMENTAL CONDITIONS –

**Part 2-3: Environmental conditions appearing in nature –
Air pressure**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60721-2-3 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

This second edition cancels and replaces the first edition, published in 1987, and constitutes a technical revision.

The main changes with regard to the previous edition are as follows:

- removal of figures for decreasing cooling efficiency for altitude;
- simplification of Table 1;
- additional formula for calculating air pressure from altitude.

The text of this standard is based on the following documents:

FDIS	Report on voting
104/611/FDIS	104/615/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60068 series, under the general title *Classification of environmental conditions*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 60721-2-3:2013](https://standards.iteh.ai/catalog/standards/sist/a7ea1c4c-6fd0-4367-8cc7-749212d97685/iec-60721-2-3-2013)

<https://standards.iteh.ai/catalog/standards/sist/a7ea1c4c-6fd0-4367-8cc7-749212d97685/iec-60721-2-3-2013>

CLASSIFICATION OF ENVIRONMENTAL CONDITIONS –

Part 2-3: Environmental conditions appearing in nature – Air pressure

1 Scope

This part of IEC 60721 presents a selection of different values of air pressure appearing in nature. It is intended to be used as part of the background material when selecting appropriate severities of air pressure for product applications, which products are liable to be exposed during storage, transportation and use.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60721-1, *Classification of environmental conditions – Part 1: Environmental parameters and their severities*

3 Terms and definitions

Terms and definitions are defined, in context, throughout the present standard.

4 Air pressure effects

4.1 General

When selecting severities of the parameter air pressure for product application, the values given in IEC 60721-1 should be applied.

Air pressure can affect products in various ways, the most important of which are as follows:

4.2 Air pressure lower than normal

Low air pressure occurring at altitudes above sea-level can affect products as follows:

- leakage of gases or fluids from gasket-sealed containers;
- rupture of pressurized containers;
- change of physical and chemical properties of low density materials;
- erratic operation or malfunction of equipment from arcing or corona as the breakdown voltage between two electrodes in air decreases with pressure (the breakdown voltage of air in a uniform electric field depends on the product of the gas pressure and the electrode spacing for a given electrode shape and material (Paschen's law));
- decreased efficiency of heat dissipation by convection and conduction in air;
- acceleration of effects due essentially to temperature, for example volatilization of plasticizers, evaporation of lubricants, etc.

4.3 Air pressure higher than normal

High air pressure occurring in natural depressions and mines can have a mechanical effect on sealed containers.

5 Values of air pressure

The normal value of air pressure at mean sea level is 101,325 kPa. Depending on meteorological conditions, air pressure at sea level may vary. Similar variation occurs at altitudes above and below sea-level.

In areas above sea-level, air pressure is lower than at sea level; in areas below sea level (natural depressions and mines) it is higher than at sea-level.

Table 1 gives standard values of air pressure, in round figures, for different altitudes.

Table 1 – Normal air pressure related to altitudes above and below sea-level

Altitude m		Air pressure kPa
15 000		12,0
10 000		26,6
8 000		35,6
6 000		47,2
5 000		54,0
4 000		61,6
3 000		70,1
2 000		79,5
1 000		89,9
0	Sea level	101,3
–400		106,2

NOTE 1 Values corresponding to the highest altitudes are given to take into account meteorological observation units and transportation by air.

NOTE 2 The altitude –400 m corresponds to the deepest natural depression in the world.

NOTE 3 For further information, see [1].

According to [1], the formula for calculating the relation between altitude and air pressure is:

$$p = p_0 \times ((1 - (L \times h) / T_0)^{g / (R \times L)}) \quad (\text{for altitude below 11 000 m});$$

and

$$p = p_1 \times e^{(-g \times (h-h_1) / (R \times T_1))} \quad (\text{for altitude between 11 000 m and 20 000 m});$$

where

- p is the air pressure (kPa);
- p_0 = 101,325 kPa (standard pressure at sea level);
- p_1 = 22,632 kPa (standard pressure at 11 000 m);
- h is the altitude above sea level (m) (<20 000 m);
- h_1 = 11 000 m (altitude at 11 000 m);
- L = 0,006 5 K/m (temperature lapse rate);
- T_0 = 288,15 K (standard temperature at sea level);
- T_1 = 216,65 K (standard temperature at 11 000 m);
- g = 9,806 65 m/s² (earth-surface gravitational acceleration);
- R = 287,053 J/(kg.K) (universal gas constant).

ITEH STANDARD PREVIEW
(standards.iteh.ai)

[IEC 60721-2-3:2013](https://standards.iteh.ai/catalog/standards/sist/a7ea1c4c-6fd0-4367-8cc7-749212d97685/iec-60721-2-3-2013)

<https://standards.iteh.ai/catalog/standards/sist/a7ea1c4c-6fd0-4367-8cc7-749212d97685/iec-60721-2-3-2013>

Bibliography

- [1] ISO 2533, *Standard Atmosphere*
-

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 60721-2-3:2013](https://standards.iteh.ai/catalog/standards/sist/a7ea1c4c-6fd0-4367-8cc7-749212d97685/iec-60721-2-3-2013)

<https://standards.iteh.ai/catalog/standards/sist/a7ea1c4c-6fd0-4367-8cc7-749212d97685/iec-60721-2-3-2013>

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

IEC 60721-2-3:2013

<https://standards.iteh.ai/catalog/standards/sist/a7ea1c4c-6fd0-4367-8cc7-749212d97685/iec-60721-2-3-2013>