SLOVENSKI STANDARD

SIST EN 60068-3-4:2002

prva izdaja

september 2002

Environmental testing - Part 3-4: Supporting documentation and guidance - Damp heat tests

ICS 19.040; 29.020

Referenčna številka
SIST EN 60068-3-4:2002(en)

EUROPEAN STANDARD **EN 60068-3-4**

NORME EUROPÉENNE

EUROPÄISCHE NORM January 2002

ICS 19.040;29.020 Supersedes HD 323.2.28 S1:1988

English version

Environmental testing
Part 3-4: Supporting documentation and guidance – Damp heat tests
(IEC 60068-3-4:2001)

Essais d'environnement
Partie 3-4: Documentation d'accompagnement et guide – Essais de chaleur humide
(CEI 60068-3-4:2001)

Umweltprüfungen
Teil 3-4: Unterstützende Dokumentation und Leitfaden – Prüfungen mit feuchter Wärme
(IEC 60068-3-4:2001)

This European Standard was approved by CENELEC on 2001-12-04. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 60068-3-4:2002 E

Foreword

The text of document 104/208/FDIS, future edition 1 of IEC 60068-3-4, prepared by IEC TC 104, Environmental conditions, classification and methods of test, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60068-3-4 on 2001-12-04

This European Standard supersedes HD 323.2.28 S1:1988.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-09-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-12-01

Annexes designated "informative" are given for information only.
In this standard, annex A is informative.

Endorsement notice

The text of the International Standard IEC 60068-3-4:2001 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-1	NOTE	Harmonized as EN 60068-1:1994 (not modified).
IEC 60068-2-1	NOTE	Harmonized as EN 60068-2-1:1993 (not modified).
IEC 60068-2-10	NOTE	Harmonized as HD 323.2.10 S3:1988 (not modified).
IEC 60068-2-14	NOTE	Harmonized as EN 60068-2-14:1999 (not modified).
IEC 60068-2-17	NOTE	Harmonized as EN 60068-2-17:1994 (not modified).
IEC 60068-2-30	NOTE	Harmonized as EN 60068-2-30:1999 (not modified).
IEC 60068-2-38	NOTE	Harmonized as EN 60068-2-38:1999 (not modified).
IEC 60068-2-39	NOTE	Harmonized as EN 60068-2-39:1999 (not modified).
IEC 60068-2-61	NOTE	Harmonized as EN 60068-2-61:1993 (not modified).
IEC 60068-2-66	NOTE	Harmonized as EN 60068-2-66:1994 (not modified).
IEC 60068-2-67	NOTE	Harmonized as EN 60068-2-67:1996 (not modified).
IEC 60068-2-78	NOTE	Harmonized as EN 60068-2-78:2001 (not modified).

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
60068-3-4

Première édition
First edition
2001-08

Essais d'environnement –

Partie 3-4: Documentation d'accompagnement et guide – Essais de chaleur humide

Environmental testing –

Part 3-4: Supporting documentation and guidance – Damp heat tests

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE P

Pour prix, voir catalogue en vigueur
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
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6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60068-3-4 has been prepared by IEC Technical Committee 104: Environmental conditions, classification and methods of test.

This first edition of IEC 60068-3-4 replaces and cancels the third edition of IEC 60068-2-28, published in 1990, of which it constitutes a technical revision.

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

FDIS	Report on voting
104/208/FDIS	104/215/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 3.

Annex A is for information only.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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

INTRODUCTION

Temperature and relative humidity (RH) of the air, in varying combinations, are climatic factors which act upon a product during storage, transportation and operation.

Meteorological measurements made over many years have shown that a relative humidity >95 % combined with a temperature >30 °C does not occur in free air conditions over long periods, except in regions with extreme climates. In dwelling rooms and workshops temperatures of >30 °C may occur but in most cases are combined with a lower relative humidity than in the open air.

Special conditions exist in certain wet rooms for example, in the chemical industry, metallurgical plants, mines, electroplating plants and laundries, where the temperature can reach 45 °C combined with a relative humidity up to saturation over long periods.

Certain equipment placed under particular conditions may be subjected to relative humidities of more than 95 % at higher temperatures. This may happen when the equipment is placed in enclosures, such as vehicles, tents or aircraft cockpits, since this can result in intense heating through solar radiation while, because of inadequate ventilation, any humidity that may be developed will be retained permanently within the interior.

In rooms having several heat sources, temperatures and relative humidities may vary in different parts of the room.

Atmospheric pollution can intensify the effects of a damp climate on products. Attention is drawn to this fact because of its general importance, although pollutants are not contained in the atmospheres used for damp heat testing. If the effects of pollutants, for example corrosion and mould growth, are to be investigated, a suitable test from the IEC 60068-2 series should be used.

ENVIRONMENTAL TESTING –

Part 3-4: Supporting documentation and guidance – Damp heat tests

1 Scope

This part of IEC 60068 provides the necessary information to assist in preparing relevant specifications, such as standards for components or equipment, in order to select appropriate tests and test severities for specific products and, in some cases, specific types of application.

The object of damp heat tests is to determine the ability of products to withstand the stresses occurring in a high relative humidity environment, with or without condensation, and with special regard to variations of electrical and mechanical characteristics. Damp heat tests may also be utilized to check the resistance of a specimen to some forms of corrosion attack.

2 Definitions

For the purpose of this part of IEC 60068, the following definitions apply.

2.1
condensation
precipitation of water vapour on a surface when the surface temperature is lower than the dewpoint temperature of the ambient air whereby water is transformed from vapour to the liquid state of aggregation

2.2
adsorption
adherence of water vapour molecules to a surface when the surface temperature is higher than the dewpoint temperature

2.3
absorption
accumulation of water molecules within a material

2.4
diffusion
transportation of water molecules through a material, produced by a partial pressure difference

NOTE Diffusion results in a balance of partial pressures, whilst flow (such as through leaks, when the dimensions of such leaks are great enough to provide viscous or laminar flow) always finally results in the balance of the total pressures.

2.5
breathing
exchange of air between a hollow space and its surroundings, produced by changes of temperature

3 Procedures for the production and control of humidity

3.1 General

There are a great number of humidity test chambers available, equipped with different methods of humidity generation and of humidity control.

Distilled or deionized water should be used. The water should have a pH value between 6,0 and 7,2 and a minimum resistivity of 0,05 MΩ.cm.

All internal parts of the chamber should be maintained in a clean condition.

In the following subclauses, only the principal methods of generation of humidity are mentioned.

3.2 Injection of water (spraying)

Water is atomized to very fine particles or droplets.

The spray produced in this way moistens the air stream before it enters the working space, the greater part of the droplets evaporating on the way. Small droplets of water may remain in the airflow.

Direct water injection into the working space must be avoided.

This simple system gives rapid humidification and requires little maintenance.

3.3 Injection of water vapour (steam)

Evaporated water (steam) is blown into the working space of the chamber.

This system gives rapid humidification, and is easier maintained (steam valve). However, the resultant heat input may necessitate additional cooling with possible dehumidification effects.

3.4 Saturation type

Air is blown through a vessel containing water, thus becoming saturated with vapour.

At a fixed airflow, the humidity is controlled by changing the water temperature. If an increase of humidification is produced by increasing the water temperature, this may cause a temperature rise in the working space and, due to the thermal capacity of the water, the response time may be longer. This may necessitate additional cooling with possible de-humidification effects.

If bubbles occur they may produce a small amount of spray when bursting.

3.5 Surface evaporation

The air is humidified by passing it over a large surface area of water. Different methods are used, for example repeated air flow over standing water or water-jet scrubbing over a vertical surface with the air stream in counter current.

In this system, the spray is minimized. The humidity is controlled by changing the water temperature. Due to the thermal capacity of the water, the response time may be longer.

3.6 Aqueous solutions

Relative humidity is generated over standardized aqueous solutions of salts in small sealed chambers at constant temperature. This system is not appropriate for heat-dissipating specimens or for specimens absorbing large quantities of moisture.

Salt particles may be deposited on the surface of the test specimens. In some cases, for example with ammonium salts, these particles may be hazardous to health and may cause stress corrosion in some materials.

3.7 Dehumidification

In order to control humidity, various dehumidification methods are used, including cold surfaces, injection of dry air, desiccants etc.

3.8 Control of humidity

The size of the chamber, the humidifier and the response time of temperature/humidity sensors have important influences on the possible uncertainties of the humidity control system. The chamber performance can degrade, and therefore uncertainty is affected by the quality of maintenance.

4 Physical appearance of the effects of humidity

4.1 Condensation

The dewpoint temperature depends on the content of water vapour in the air. A direct relationship exists between dewpoint, absolute humidity and vapour pressure.

When introducing a specimen into a test chamber condensation may occur if its surface temperature is lower than the dewpoint temperature of the chamber air. It may be necessary to pre-heat the specimen if condensation has to be prevented.

When condensation is required on the specimen during the conditioning period, the temperature and the water content of the air shall be raised so that the dewpoint temperature of the air becomes higher than the surface temperature of the specimen.

If the specimen has a low thermal time constant, condensation occurs only if the dewpoint temperature of the air increases very rapidly, or if the relative humidity is very close to 100 %. With the rate of temperature rise prescribed for tests Db, condensation may not occur on very small specimens.

Condensation may occur on the inner surface of casings subsequent to a fall in ambient temperature.

In general, condensation can usually be detected by visual inspection, however, this is not always possible, especially with small objects having a rough surface.