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REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

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



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ELECTROTECHNICAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ENVIRONMENTAL TESTING –

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

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60068-3-4:2001. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 60068-3-4 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test. It is an International Standard.

This second edition cancels and replaces the first edition published in 2001. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) the requirements for distilled and deionized water have been revised;
b) recommendations for the cleaning procedure of test chambers have been included;
c) humidification systems (ultrasonic humidifiers and atomizers) have been added;
d) the description of water penetration mechanisms has been refined.

The text of this International Standard is based on the following documents:

Draft	Report on voting
104/985/FDIS	104/1001/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60068 series, published under the general title *Environmental testing*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

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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~~ can 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~~ can be subjected to a relative humidity of more than 95 % at higher temperatures. This ~~may~~ can 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~~ can be developed will be retained permanently within the interior.

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

To take these climatic factors over the lifetime of the product into account, environmental testing includes the practice of accelerated testing (see Clause 6).

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 and the basic principles of the effect of humidity in the context of environmental testing 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~~. Furthermore, information is provided on operating climatic test chambers.

The object of this document is to present supporting documentation and guidance for a range of damp heat tests which, when specified by the relevant specification, can be applied to demonstrate the performance of equipment for which damp heat testing is required with the main aim of achieving qualification. This information and basic principles are intended to help selecting 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~~ can also be utilized to check the resistance of a specimen to some forms of corrosion attack.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

NOTE A more detailed explanation of some phenomena is available in A.2.1.

3.1
condensation
precipitation of water vapour on a surface when the surface temperature is lower than the dew point temperature of the ambient air whereby water is transformed from vapour to the liquid state of aggregation

3.2
adsorption
adherence of water vapour molecules to a surface when the surface temperature is higher than the dew point temperature

3.3
absorption
accumulation of water molecules within a material

3.4
diffusion
transportation of water molecules through a material, ~~produced~~ induced by a partial pressure difference

Note 1 to entry: 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.

3.5
breathing
exchange of air between a hollow space and its surroundings, ~~produced~~ induced by changes of temperature or pressure

4 Procedures for the production and control of humidity

4.1 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.~~

The water resistivity should be between 2 000 Ωm to 500 Ωm corresponding to a conductivity between 5 µS/cm to 20 µS/cm at +23 °C. Before the water is placed in the humidifier or storage tank of the chamber, all internal parts of the chamber should be cleaned.

NOTE 1 A conductivity lower than 5 µS/cm can harm the humidifier system. A conductivity higher than 20 µS/cm can cause limescale or other mineral deposits to form on parts of the humidifier system or specimen.

The chamber and its internal parts can be cleaned using diluted laboratory cleaning agent and a soft brush and rinsed with distilled or deionized water. It is recommended that the chamber is cleaned prior to each test. The test facility should be operated in a clean area.

NOTE 2 Chamber sensors can be affected by the cleaning procedure, as some sensors (e.g. capacitive humidity sensors) can be damaged by some cleaning agents.

NOTE 3 During cleaning, wearing gloves and a protective mask can be helpful as a precaution against the contamination of the test chamber and of the internal fixtures.

4.2 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~~ can remain in the airflow.

Direct water injection into the working space ~~must~~ should be avoided, otherwise liquid water can accumulate on the test specimen.