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INTERNATIONAL STANDARD

colour inside

Environmental testing –
Part 3-1: Supporting documentation and guidance – Cold and dry heat tests



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ENVIRONMENTAL TESTING –

Part 3-1: Supporting documentation and guidance – Cold and dry 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 60068-3-1:2011. 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 60068-3-1 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test. It is an International Standard.

This third edition cancels and replaces the second edition published in 2011. This edition constitutes a technical revision.

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

a) information relating to specimen temperatures has been revised;
b) information relating to tests of multiple specimens has been revised;
c) the effect of air density has been added;
d) a recommendation for corrective actions regarding IR radiation has been added;
e) the requirements for the mounting and supports of the specimen have been revised.

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

Draft	Report on voting
104/986/FDIS	104/1002/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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ENVIRONMENTAL TESTING –

Part 3-1: Supporting documentation and guidance – Cold and dry heat tests

1 Scope

This part of IEC 60068 provides guidance regarding the performance of cold and dry heat tests.

2 Normative references

~~The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.~~

~~IEC 60068-1, *Environmental testing – Part 1: General and guidance*~~

~~IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*~~

~~IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*~~

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

3.1
heat-dissipating specimen
specimen on which the hottest point on its surface, measured in free-air conditions and under the air pressure as specified in IEC 60068-1, is more than 5 K above the ambient temperature of the surrounding atmosphere after thermal stability has been reached

[SOURCE: IEC 60068-1:2013, 3.6, modified – The definition has been slightly adapted and Note 1 to entry has been deleted.]

3.2
non heat-dissipating specimen
~~specimen that does not produce heat to a level that can affect the air temperature surrounding the specimen or those specimens located nearby~~

specimen on which the hottest point on its surface, measured in free-air conditions and under the air pressure as specified in IEC 60068-1, is equal or less than 5 K above the ambient temperature of the surrounding atmosphere after thermal stability has been reached

3.3
free-air conditions
conditions within an infinite space where the movement of the air is affected only by the heat-dissipating specimen

Note 1 to entry: Free-air conditions can apply to the laboratory environment. The conditions during the measurement should be stated in the test report (if not specified otherwise).

[SOURCE: IEC 60068-1:2013, 3.7, modified – In the preferred term "free" has been added, in the definition "itself" has been deleted and the Note 1 to entry has been added.]

4 Selection of test procedures

4.1 General background

4.1.1 General

Specimen performance ~~may~~ can be influenced or limited by the temperatures in which the specimen is operated. The level of influence ~~may~~ can be affected by test gradients that exist within the test system (climatic or environmental chamber) and internal temperatures within the specimen itself. In order to determine the level of influence that exists and to ensure that the specimen is designed appropriately, cold ~~and/~~or dry heat tests or both are performed.

4.1.2 Ambient temperature

The maximum and minimum ambient temperature values, ~~where~~ in which the specimen ~~will be subjected~~ is intended to operate, should be known. Preferred values for testing purposes are provided in IEC 60068-2-1 or IEC 60068-2-2 or both.

Difficulties can arise due to the fact that heat transfer causes temperature variations in the area surrounding the specimen. Consequently, the effect from the transfer of heat to the ambient temperature of the surrounding atmosphere should be considered. Airflow related to spacing between specimens should also be considered when performing a test.

4.1.3 Specimen temperatures

The performance of the specimen can be affected by its own temperature in the case of heat-dissipating specimens. Because of this, when controlling the test environment, it ~~may~~ can be necessary to measure the temperature of the specimen under test at different locations, both internally and externally.

The change of temperature at a point on the surface of a specimen follows approximately an exponential law. Inside large specimens, temperature equalization can be reached with significant delay.

In case of doubt, how the temperature change is reflected by the specimen, the monitoring of the temperature of the specimens at a representative point (or points) is recommended.

NOTE For further information on the influence of test temperatures on specimens, IEC 60068-2-14 or IEC 60068-3-11 can be helpful.

4.1.4 ~~Specimens without heat dissipation~~ Non heat-dissipating specimens

If the ambient temperature is uniform and constant and there is no generation of heat within the specimen, heat will flow from the ambient atmosphere into the specimen if the ambient atmosphere is at a higher temperature. Conversely, heat will flow from the specimen into the ambient atmosphere if the specimen is at a higher temperature. This heat transfer will continue until the specimen has completely reached thermal equilibrium with the surrounding atmosphere. From that moment on, the heat transfer ceases and will not start again unless the ambient temperature changes.