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Environmental testing – Part 2-1: Tests – Test A: Cold

Essais d'environnement – Partie 2-1: Essais – Essai A: Froid

IEC 60068-2-1:2007

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Environmental testing – Part 2-1: Tests – Test A: Cold

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ENVIRONMENTAL TESTING –

Part 2-1: Tests – Test A: Cold

FOREWORD

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International Standard IEC 60068-2-1 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

This sixth edition cancels and replaces the fifth edition issued in 1990. It includes the revised text of the fifth edition, amendment 1 issued in 1993 and amendment 2 issued in 1994.

This sixth edition deals with cold tests applicable both to non heat-dissipating and heat-dissipating specimens. For non heat-dissipating specimens, Tests Ab and Ad do not deviate essentially from earlier issues. Test Ae has been added primary for testing equipment that requires being operational throughout the test including the conditioning periods.

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

FDIS	Report on voting
104/407/FDIS	104/410/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.

It has the status of a basic safety publication in accordance with IEC Guide 104.

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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

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INTRODUCTION

Relationship of suffixes between tests a: cold and tests b: dry heat

The relationship of suffixes between Tests A: Cold, and Tests B: Dry heat, is shown in the following table:

Suffix letter	Tests A: Cold			Tests B: Dry heat		
	Specimen type	Temperature change	Air velocity	Specimen type	Temperature change	Air velocity
a	Withdrawn			Withdrawn		
b	Non heat	Gradual	High preferred	Non heat	Gradual	High preferred
c	Withdrawn			Withdrawn		
d	Heat dissipating	Gradual	Low preferred	Heat	Gradual	Low preferred
e	Heat dissipating, powered throughout	Gradual	Low preferred	Heat, powered throughout	Gradual	Low preferred

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ENVIRONMENTAL TESTING –

Part 2-1: Tests – Test A: Cold

1 Scope and object

This part of IEC 60068 deals with cold tests applicable to both non heat-dissipating and heat-dissipating specimens. For non heat-dissipating specimens, Tests Ab and Ad do not deviate essentially from earlier issues. Test Ae has been added primarily for testing equipment that requires being operational throughout the test, including the conditioning periods.

The object of the cold test is limited to the determination of the ability of components, equipment or other articles to be used, transported or stored at low temperature.

Cold tests cover by this standard do not enable the ability of specimens to withstand or operate during the temperature variations to be assessed. In this case, it would be necessary to use IEC 60068-2-14.

The cold tests are subdivided as follows:

– *Cold tests for non heat-dissipating specimens*

  - with gradual change of temperature, Ab;

– *Cold test for heat-dissipating specimens*

  - with gradual change of temperature, Ad,
  - with gradual change of temperature, specimen powered throughout, Ae.

The procedures given in this standard are normally intended for specimens that achieve temperature stability during the performance of the test procedure.

Temperature chamber(s) are constructed and verified in accordance with specifications IEC 60068-3-5 and IEC 60068-3-7.

Further guidance for dry heat and cold tests can be found in IEC 60068-3-1 and general guidance in IEC 60068-1.

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 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-14, *Basic environmental test procedures – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-3-1, *Environmental testing – Part 3: Background information – Section one: Cold and dry heat tests*

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IEC 60068-3-5, *Environmental testing – Part 3-5: Supporting documentation and guidance – Confirmation of the performance of temperature chambers*

IEC 60068-3-7, *Environmental testing – Part 3-7: Supporting documentation and guidance – Measurements in temperature chambers for tests A and B (with load)*

IEC 60068-5-2, *Environmental testing – Part 5-2: Guide to drafting of test methods – Terms and definitions*

IEC 60721 (all parts), *Classification of environmental conditions*

3 Terms and definitions

For the purposes of this document, the definitions given in IEC 60068-5-2, as well as the following definitions, apply.

3.1
low air velocity in the working space
velocity of conditioning airflow within a working space which is sufficient to maintain conditions but low enough so that the temperature at any point on the test specimen is not reduced by more than 5 K by the influence of the circulation of the air (if possible, not more than 0,5 m/s)

3.2
high air velocity in the working space
velocity of conditioning airflow within a working space, which in order to maintain conditions, also reduces the temperature at any point on the test specimen by more than 5 K by the influence of the circulation of the air

4 Application of tests for non heat-dissipating specimens versus tests for heat-dissipating specimens

4.1 General

A specimen is considered to be heat-dissipating only if the hottest point on its surface, measured in free air conditions (i.e. with low air velocity circulation), is more than 5 K above the ambient temperature of the surrounding atmosphere after temperature stability has been reached (see 4.8 of IEC 60068-1). When the relevant specification calls for a storage or transportation test, or does not specify an applied load during the test, the Cold Test Ab will apply.

4.2 Ascertaining high or low air velocity in the test chamber

Under standard atmospheric conditions for measurements and test (see IEC 60068-1) with an air velocity <0,2 m/s achieved without induced air movement, the specimen shall be switched on or electrically loaded as specified for the low temperature at which the test is to be carried out.

When temperature stability of the specimen has been reached, the temperature of a number of representative points around or on the specimen shall be measured using a suitable monitoring device. The temperature rise that occurs at each point shall then be noted.

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The chamber is switched on and, once temperature stability has been achieved, the temperature of the representative points shall again be measured. If the temperatures differ from those measured without air flow by more than 5 K (or a value stated by the relevant specification) this value shall be noted in the test report and the test chamber is considered to have high velocity circulation. The specimen is then switched off and any loading conditions removed.

4.3 Non heat-dissipating specimens

In Test Ab with gradual change of temperature, the specimen is introduced into the test chamber, the latter being at the laboratory temperature. The temperature in the chamber is then reduced gradually so as to cause no detrimental effects on the test specimen due to the temperature change. High air velocity is recommended as this will reduce the time required for temperature stabilization.

4.4 Testing of heat-dissipating specimens

Tests Ad and Ae describe procedures for testing heat-dissipating specimens with low air velocity circulation. This is to allow localized hot spots to develop within the specimen similar to those that would appear in installed applications.

4.5 Temperature monitoring

The air temperature in the chamber shall be measured by temperature sensors located at such a distance from the specimen that the effect of the dissipation is negligible. Suitable precautions shall be taken to avoid heat radiation affecting these measurements. For more information see IEC 60068-3-5.

4.6 Packaging

For storage and transportation tests, equipment may be tested with its packaging in place. However, as these tests are steady-state tests, the equipment will eventually stabilize at chamber temperature. Packaging shall be removed unless the relevant specification requires it to remain in place, or heating elements are incorporated in the package.

4.7 Diagrammatic representations

To facilitate the choice of test method, a diagrammatic representation of the various procedures is given in Figure 1.

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