



BSI Standards Publication

Environmental testing

Part 2-14: Tests — Test N: Change of temperature

National foreword

This British Standard is the UK implementation of EN IEC 60068-2-14:2023. It is identical to IEC 60068-2-14:2023. It supersedes BS EN 60068-2-14:2009, which will be withdrawn on 31 August 2026.

The UK participation in its preparation was entrusted to Technical Committee GEL/104, Environmental conditions, classification and testing.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Published by BSI Standards Limited 2023

ISBN 978 0 539 19721 1

ICS 19.040

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2023.

Amendments/corrigenda issued since publication

Date	Text affected
<hr/>	

English Version

Environmental testing - Part 2-14: Tests - Test N: Change of
temperature
(IEC 60068-2-14:2023)

Essais d'environnement - Partie 2-14: Essais - Essai N:
Variation de température
(IEC 60068-2-14:2023)

Umgebungseinflüsse - Teil 2-14: Prüfverfahren - Prüfung N:
Temperaturwechsel
(IEC 60068-2-14:2023)

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 104/991/FDIS, future edition 7 of IEC 60068-2-14, prepared by IEC/TC 104 "Environmental conditions, classification and methods of test" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60068-2-14:2023.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2024-05-31 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2026-08-31 document have to be withdrawn

This document supersedes EN 60068-2-14:2009 and all of its amendments and corrigenda (if any).

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

IEC 60068 series	NOTE	Approved as EN 60068 series
IEC 60068-2-6	NOTE	Approved as EN 60068-2-6
IEC 60068-2-17	NOTE	Approved as EN 60068-2-17
IEC 60068-2-30	NOTE	Approved as EN 60068-2-30
IEC 60068-2-67	NOTE	Approved as EN 60068-2-67
IEC 60068-3-1	NOTE	Approved as EN 60068-3-1

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-1	-	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	-
IEC 60068-2-2	-	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENVIRONMENTAL TESTING –

Part 2-14: Tests – Test N: Change of temperature

FOREWORD

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IEC 60068-2-14 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test. It is an International Standard.

This seventh edition cancels and replaces the sixth edition published in 2009. This edition constitutes a technical revision.

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

- a) updating of the figures for clarification purposes;
- b) updating of specimen temperature(s) and severities as well as tolerances for change of temperature tests;
- c) revision of standardized requirements for test reports for Tests Na and Nb.

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

Draft	Report on voting
104/991/FDIS	104/1016/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.

INTRODUCTION

A change of temperature test is intended to determine the effect on the specimen of a change of temperature or a succession of changes of temperature.

It is not intended to show effects that are caused by low or high temperature exposure. For these effects, the cold test or the dry heat test, as specified in IEC 60068-2-1 and IEC 60068-2-2, should be used.

The effect of change of temperature tests is determined by

- values of high and low conditioning temperature between which the change is to be affected,
- the conditioning times for which the test specimen is kept at these temperatures,
- the rate of change between these temperatures,
- the number of cycles of conditioning,
- the amount of heat transfer into or from the specimen,
- the thermal conductivity and the materials of the specimen,
- the rate of change of the specimen's temperature on its surface (respectively in relevant positions) or in its core.

Guidance on the choice of suitable test parameters for inclusion in the detail specification is given throughout this document.

ENVIRONMENTAL TESTING –

Part 2-14: Tests – Test N: Change of temperature

1 Scope

This document provides tests with specified ambient temperature changes to analyse their impacts on specimens.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60068-2-1 and IEC 60068-2-2 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>

4 Symbols

D	temperature difference between high conditioning temperature T_B and low conditioning temperature T_A
T_A	low conditioning temperature
T_{Ad}	decreased low conditioning temperature
T_B	high conditioning temperature
T_{Bi}	increased high conditioning temperature
T_{STD}	temperature of standard atmospheric conditions for measurement and tests (15 °C to 35 °C)
ΔT_s	temperature difference between the specimen and the test medium (e.g. air)
dT_R	temperature change rate (Test Nb)
t_s	stabilization time of specimen temperature
t_{s^*}	stabilization time of specimen temperature during the first cycle, starting from laboratory air temperature
t_1	exposure time of the specimen to each conditioning temperature
t_2	transfer time of the specimen from one test chamber to another (two-chamber test method)
$\pm\sigma_T$	applicable temperature tolerance of the medium temperature during temperature transition (Test Nb)
$\pm\sigma_{Tconst}$	applicable temperature tolerance of the medium temperature during the constant conditioning

5 General

5.1 Field conditions of changing temperature

It is common in electronic equipment and components that changes of temperature occur. Parts inside equipment undergo slower changes of temperature than those on an external surface when the equipment is not switched on.

Rapid changes of temperature can be expected

- when equipment is transported from warm indoor into cold outdoor environments or vice versa,
- when equipment is suddenly cooled by rainfall or immersion in cold water,
- when equipment is attached or in close proximity to components leading to high thermal stress (e.g. combustion engines, central processing units),
- when equipment is artificially cooled or heated,
- in externally mounted airborne equipment or when equipment is located in unheated aircraft or cargo holds,
- under certain conditions of transportation and storage.