SLOVENSKI STANDARD
oSIST prEN IEC 60068-2-14:2022

01-september-2022

Okoljsko preskušanje - 2-14. del: Preskusi - Preskus N: Temperaturne spremembe

Environmental testing - Part 2-14: Tests - Test N: Change of temperature

Umgebungseinflüsse - Teil 2-14: Prüfverfahren - Prüfung N: Temperaturwechsel

Essais d'environnement - Partie 2-14: Essais - Essai N: Variation de température

Ta slovenski standard je istoveten z: **prEN IEC 60068-2-14:2022**

ICS:

19.040	Preskušanje v zvezi z okoljem	Environmental testing

oSIST prEN IEC 60068-2-14:2022 **en**

104/933/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
IEC 60068-2-14 ED7	
DATE OF CIRCULATION: **2022-06-24**	CLOSING DATE FOR VOTING: **2022-09-16**
SUPERSEDES DOCUMENTS: **104/925/CD, 104/929A/CC**	

IEC TC 104 : ENVIRONMENTAL CONDITIONS, CLASSIFICATION AND METHODS OF TEST	
SECRETARIAT: Sweden	SECRETARY: Mr Henrik Lagerström
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☒ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING
Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Environmental testing - Part 2-14: Tests - Test N: Change of temperature

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ENVIRONMENTAL TESTING –

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

FOREWORD

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

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

The major changes with regard to the previous edition concern:

- updating of the figures, changes to some of the wording and editorial corrections made for clarification.
- Updating specimen temperature(s) and severities as well as tolerances for change of temperature tests.
- Standardized requirements for test reports for tests Na, Nb and Nc

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

FDIS	Report on voting
XXX/XXX/FDIS	XXX/XXX/RVD

131
132 Full information on the voting for the approval of this standard can be found in the report on
133 voting indicated in the above table.

134 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

137 The committee has decided that the contents of this publication will remain unchanged until the
138 maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data
139 related to the specific publication. At this date, the publication will be

140 • reconfirmed,
141 • withdrawn,
142 • replaced by a revised edition, or
143 • amended.

144

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 standard.

ENVIRONMENTAL TESTING –

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

1 Scope

This part of IEC 60068 provides tests with specified ambient temperature changes to analyse their impacts on specimen.

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 (all parts), Environmental testing

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

IEC 60068-2-6, Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)

IEC 60068-2-17, Environmental testing – Part 2-17: Tests – Test Q: Sealing

IEC 60068-2-67, Environmental testing – Part 2-67: Tests – Test Cy: Damp heat, steady state, accelerated test primarily intended for components

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.

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use un standardization at the following addresses:

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

4 List of 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}	standard atmospheric conditions (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 may 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,

– under certain conditions of transportation and storage.

Components will undergo stresses due to changing temperature when high temperature gradients build up in an equipment after being switched on, e.g. in the proximity of high power resistors, radiation can cause rise of the surface temperature on close components while other portions remain cold.

Artificially cooled components may be subjected to rapid temperature changes when the cooling system is switched on. Rapid changes of temperature in components may also be induced during manufacturing processes or the transportation of equipment. Both the number and

amplitude of temperature changes, the time interval between them and the thermal responsiveness of the equipment (or specimen) are important.

5.2 Design of tests with temperature change

Change of temperature Tests Na, Nb and Nc comprise alternate periods at a high and a low temperature with well-defined transfers from one temperature to the other. The conditioning run from laboratory ambient to the first conditioning temperature, then to the second conditioning temperature, then back to laboratory ambient is considered one test cycle.

5.3 Test parameters

Test parameters comprise the following:

– laboratory ambient conditions (mainly temperature and humidity);
– high conditioning temperature T_B;
– increased high conditioning temperature T_{Bi}, if applicable;
– low conditioning temperature T_A;
– decreased low conditioning temperature T_{Ad}, if applicable;
– exposure time of the specimen to each conditioning temperature t_1;
– transfer time t_2 or temperature change rate dT_R;
– number of test cycles.

NOTE The high and low conditioning temperatures are understood to be ambient temperatures which will be reached by most specimens with a certain time-lag.

As these tests are intended to validate the effects of temperature changes on the specimen, the specimen's characteristics should always be taken into consideration (if not specified otherwise):

– thermal responsiveness of the specimen in affected areas or the core;
  - thermal conductivity;
  - specific heat capacity;
– density;
– geometry;
– mass.

The experimental determination of these characteristics is recommended, if unknown and not specified otherwise.

The test is accelerated because the number of severe changes of temperature in a given period is greater than that which will occur under field conditions.

The high and low temperatures are understood to be ambient temperatures which will be reached by most specimens with a certain time-lag.

Only in exceptional cases may these temperatures be specified outside the normal storage or operating temperature range of the object under test.

NOTE If the specimen's characteristics (mass, density, geometry) prevent the specified rate of change, the temperatures may be specified outside the normal storage or operating temperatures in order to increase the severity of the intended test, if not specified otherwise.

5.4 Purpose and choice of the tests

Change of temperature testing is recommended in the following cases:

– evaluation of electrical performance after a specified number of rapid changes of temperature, Test Na or Test Nc;

– evaluation of the suitability of mechanical components, and of materials and combinations of materials to withstand rapid changes of temperature, Test Na or Test Nc;

– evaluation of the suitability of construction of components to withstand artificial stressing, Test Na or Test Nc;

– evaluation of electrical performance during a change of temperature, Test Nb;

– evaluation of mechanical performance during a change of temperature, Test Nb.

The change of temperature tests specified in the IEC 60068 series is not intended to evaluate the difference in material constants or electrical performance when operating under the conditioning temperatures T_A and T_B.

5.5 Choice of the exposure time to each conditioning temperature

The duration of the exposure should be based on the requirements stated in 8.2.3, 9.2.3 or 10.2.2, or as stated in the relevant specification, keeping in mind the following points:

a) The exposure begins as soon as the specimen is in the new environment.

b) Stabilization occurs when the temperature difference between the specimen and the test medium (ΔT_S) is within 3 K to 5 K, or as stated in the test specification. The stabilization time of specimen temperature t_S is from the start of exposure until the moment when the temperature is within the specified difference. A representative point (or points) on the specimen may be used for this measurement.

c) The exposure time of the specimen to each conditioning temperature t_1 shall be longer than the stabilization time of the specimen temperature t_S. Figure 1 provides a graphical representation of the process. This may not be appropriate for heat generating specimens.

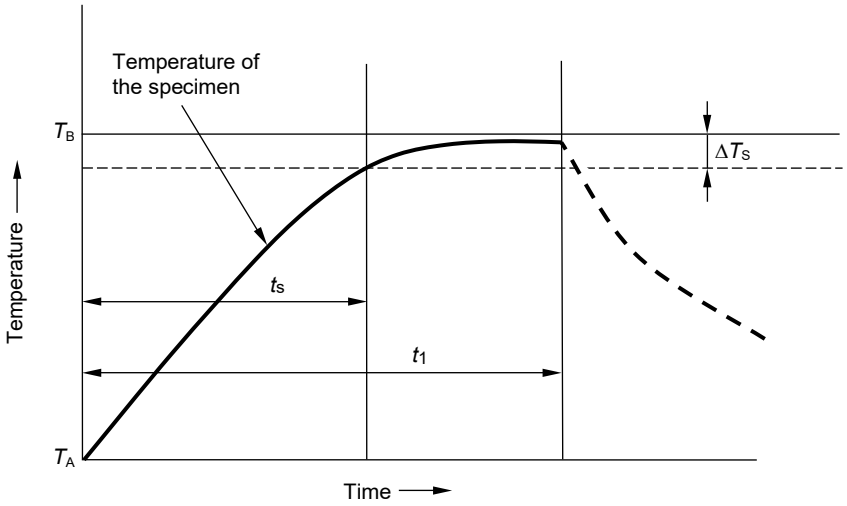

Figure 1 – Determination of the exposure time of the specimen to each conditioning temperature (t_1)

5.6 Choice of the duration of the transfer time t_2

If, e.g. due to the large size of the specimens, the transfer time t_2 cannot be kept within in 3 min, the transfer time may be increased with a negligible influence on the test results as follows: