IEC 60068-2-39

Edition 2.0 2015-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Environmental testing –
Part 2-39: Tests – Tests and guidance: Combined temperature or temperature and humidity with low air pressure tests

Essais d'environnement –
Partie 2-39: Essais – Essais et lignes directrices: Essais combinés de température ou de température et d'humidité à basse pression atmosphérique

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ENVIRONMENTAL TESTING –

Part 2-39: Tests – Tests and guidance: Combined temperature or temperature and humidity with low air pressure tests

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International Standard IEC 60068-2-39 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

This second edition cancels and replaces the first edition published in 1976 and constitutes a technical revision.

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

a) preferred severities of the IEC 60068 series;
b) combined temperature, humidity and low air pressure

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

FDIS	Report on voting
104/657/FDIS	104/661/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.

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 publication will remain unchanged until the stability 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

Equipment and components are required to function without significant reduction in performance when subjected to different environmental parameters. The combination of temperature, humidity and low air pressure may have certain effects on components and gaskets, for example.

The type and severity of the environmental parameters depend on the operational, transport and storage environments to which the equipment and components are subjected. The environmental effects on the performance of equipment in the tropics and subtropics are totally different from those in arctic regions. Individual environmental parameters cause a variety of different and overlapping effects on the equipment and components.

The manufacturer attempts to ensure, and the user expects, that equipment and components will survive the environments to which they will be subjected throughout their useful life. This expectation can be assessed by exposure of the specimen to a range of simulated environmental parameters controlled in the laboratory. The severity of the environmental parameters is often increased to obtain meaningful results in a relatively short period of time. This allows assessment of the likely effects of applied environmental conditions.

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ENVIRONMENTAL TESTING –

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1 Scope and object

This part of IEC 60068 provides a description of test methods and guidance for testing of equipment or components under combined temperature or temperature and humidity with low air pressure tests.

The object of combined testing is to investigate to what extent the equipment or components are affected by combined temperature or temperature and humidity with low air pressure tests.

The method of combined tests detects electrical, mechanical or other physical variations.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

3 Terms and definitions

None.

4 Testing

4.1 General

All values of test parameters such as cold, dry heat, low air pressure, humidity, exposure time and conditions such as state of operation and so on, should be selected from the IEC 60068-2 series or the relevant specification.

The duration of exposure shall be measured from the time when temperature stability of the specimen has been reached under conditions of low air pressure. Temperature stability shall be according to IEC 60068-1.

It should preferably be tested with low air velocity.

4.2 Preferred combinations

Preferred combinations of temperature, low air pressure and duration shall be selected from Table 1.

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Table 1 – Test severities

Temperature °C	Low air pressure kPa	Duration h
–55	5	2
–55	15	2
–55	25	2
–55	40	2
–40	55	2 or 16
–40	70	2 or 16
–25	55	2 or 16
40	55	2
55	15	2
55	25	2
55	40	2
55	55	2 or 16
55	70	2 or 16
85	5	2
85	15	2
155	5	2
155	15	2

4.3 Initial measurement and functional performance test

The specimen shall be submitted to the visual, dimensional and functional checks specified by the relevant specification.

4.4 Test procedure

4.4.1 Preconditioning

The relevant specification may require preconditioning of specimen.

4.4.2 Test with temperature and low air pressure

Figure 1 and Figure 2 show examples of test sequence with temperature and low air pressure.

The specimen shall be introduced in the chamber as required (unpacked, switched on or off, etc.).

The temperature within the chamber shall be adjusted to the required temperature as determined in 4.1. The rate of temperature change should not exceed 1 K/min. The specimen shall be allowed to reach temperature stability.

In the case of electrically-operated specimens, a function check shall be made in accordance with the relevant specification. Intermediate measurements shall be performed as required or specified in the relevant specification.

The pressure in the chamber shall then be reduced to the required value as determined in 4.1. The rate of change of pressure should not exceed 15 kPa/min.

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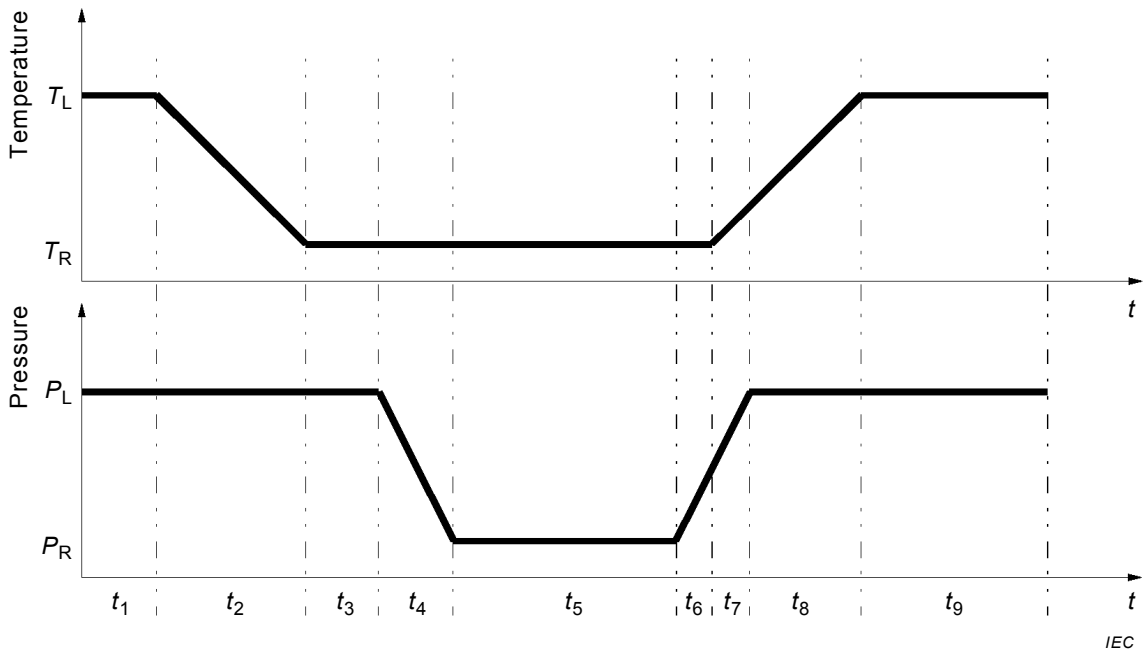
The conditions of temperature and low air pressure shall be maintained for the required duration as determined in 4.1.

The low air pressure shall then be restored to normal pressure, at a rate not exceeding 15 kPa/min. During the increase of pressure, the temperature does not need to be controlled. The specimen remains within the chamber until the temperature reaches standard atmospheric conditions. The rate of temperature change should not exceed 1 K/min.

The specimen shall then be subjected to the recovery procedure as required.



Key

P_L	pressure at laboratory
P_R	pressure required
T_L	temperature at laboratory
T_R	temperature required
t_1	duration of preconditioning at P_L and T_L
t_2	duration of temperature change from T_L to T_R
t_3	duration to reach required temperature stability T_R
t_4	duration of pressure change from P_L to P_R
t_5	test duration as defined in Table 1
t_6 plus t_7	duration of pressure change from P_R to P_L
t_7 plus t_8	duration of temperature change from T_R to T_L
t_9	duration of recovery at P_L and T_L

Figure 1 – Example of test sequence with cold temperature and low air pressure

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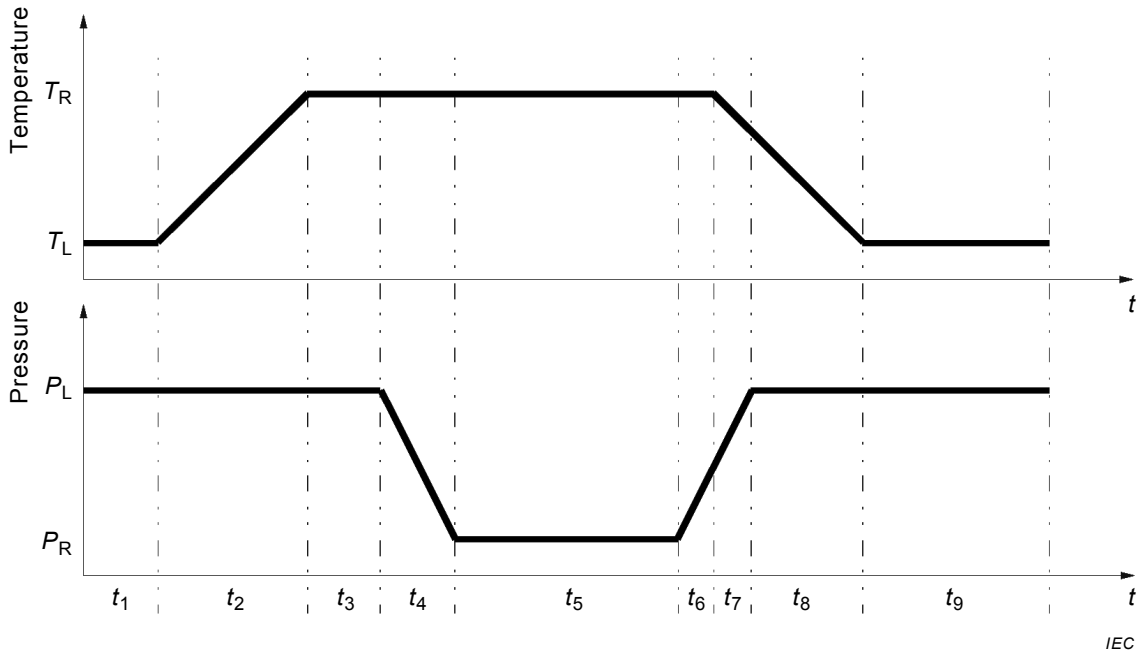

Key

P_L	pressure at laboratory
P_R	pressure required
T_L	temperature at laboratory
T_R	temperature required
t_1	duration of preconditioning at P_L and T_L
t_2	duration of temperature change from T_L to T_R
t_3	duration to reach required temperature stability T_R
t_4	duration of pressure change from P_L to P_R
t_5	test duration as defined in Table 1
t_6 plus t_7	duration of pressure change from P_R to P_L
t_7 plus t_8	duration of temperature change from T_R to T_L
t_9	duration of recovery at P_L and T_L

Figure 2 – Example of test sequence with dry heat and low air pressure

4.4.3 Test with temperature, humidity and low air pressure

Figure 3 shows an example of test sequence of temperature and humidity with low air pressure.

The specimen shall be introduced in the chamber as required (unpacked, switched on or off, etc.)

The temperature within the chamber shall be adjusted to the required temperature as determined in 4.1. The rate of temperature change should not exceed 1 K/min. The specimen shall be allowed to reach temperature stability.

A functional test shall be carried out in accordance with the relevant specification. Intermediate measurements shall be performed as required or specified in the relevant specification.

With the temperature still maintained at the required value as determined in 4.1, the air pressure in the chamber shall then be reduced to the required value as determined in 4.1. The rate of change of pressure should not exceed 15 kPa/min.

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