IEC 60068-2-13

Edition 5.0 2021-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Environmental testing –
Part 2-13: Tests – Test M: Low air pressure

Essais d'environnement –
Partie 2-13: Essais – Essai M: Basse pression atmosphérique

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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CONTENTS

FOREWORD 3
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
4 Test description 5
4.1 General 5
4.2 Description of test apparatus 5
5 Test procedures 6
5.1 Severities 6
5.1.1 General 6
5.1.2 Air pressure 6
5.1.3 Duration of exposure 6
5.2 Preconditioning 7
5.3 Initial measurements 7
5.4 Conditioning 7
5.5 Recovery 7
5.6 Final measurements 7
6 Information to be given in the relevant specification 7
7 Information to be given in the test report 8
Annex A (informative) Guidance on selecting the duration of exposure 9
Bibliography 10
Table 1 – Air pressure and altitude 6

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ENVIRONMENTAL TESTING –

Part 2-13: Tests – Test M: Low air pressure

FOREWORD

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IEC 60068-2-13 has been prepared by IEC technical committee 104: Environmental conditions, classification, and methods of test. It is an International Standard.

This fifth edition cancels and replaces the fourth edition, published in 1983. This edition constitutes a technical revision.

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

a) alignment with recently revised parts of IEC 60068-2;
b) Clause 5: severities aligned with IEC 60721-2-3 and IEC 60721-3 (all parts);
c) addition of Annex A (guidance on selecting the duration of exposure).

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

FDIS	Report on voting
104/889/FDIS	104/893/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/standardsdev/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 "http://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.

ENVIRONMENTAL TESTING –

Part 2-13: Tests – Test M: Low air pressure

1 Scope

This part of IEC 60068 specifies methods of test applicable to specimens which, during transportation, storage or in service, can be subjected to low air pressure.

The object of the low air pressure test is to determine the ability of components, equipment or other articles to be used, transported or stored at low air pressure.

Components, equipment or other articles to be used, transported or stored under a simultaneous combination of high or low temperature and low air pressure, where the combination is important for the stresses imposed on the articles or for the failure mechanisms, are then tested in accordance with IEC 60068-2-39.

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

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in 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 Test description

4.1 General

The specimen is introduced into the test chamber, the chamber air pressure is then reduced to the appropriate value specified in the relevant specification.

These conditions are maintained for the specified duration.

4.2 Description of test apparatus

The test chamber shall be capable of maintaining the air pressure conditions given in Clause 5.

Care should be taken to avoid air contamination by ancillary equipment and devices and by the air introduced when pressure is restored to normal.

When heat-dissipating specimens are tested, the relevant specification may call for requirements applicable to the test chamber in accordance with test Bd or test Be of IEC 60068-2-2.

5 Test procedures

5.1 Severities

5.1.1 General

The test severities, in terms of air pressure and duration of exposure, shall be specified in the relevant specification. The values of air pressure should preferably be selected from those given in 5.1.2 and 5.1.3.

5.1.2 Air pressure

The test air pressure shall be specified in the relevant specification and should preferably be selected from Table 1. Further air pressure values according to standard atmosphere, are found in ISO 2533.

Table 1 – Air pressure and altitude

Air pressure (kPa)	Approximate altitude above sea level [a] (m)
5,5	20 000
12	15 000
26	10 000
38	7 500
54	5 000
62	4 000
70	3 000
75	2 500
84	1 500 [b]
Sea level	0 [c]

[a] The relation between air pressure and altitude are calculated from IEC 60721-2-3.

[b] Applicable when it is required to test specimen at the lower limit of the air pressure value of the standard atmospheric conditions for testing.

[c] Altitudes up to 1 000 m are covered by the standard air pressure of 86 kPa to 106 kPa, in accordance with IEC 60068-1.

5.1.3 Duration of exposure

The test duration shall be specified in the relevant specification and should preferably be selected from one of the following durations. Guidance on selecting an appropriate duration is provided in Annex A.

– 5 min;
– 30 min;
– 2 h;
– 4 h;
– 16 h.

5.2 Preconditioning

If required by the relevant specification, preconditioning shall be undertaken in accordance with the requirements of the relevant specification.

5.3 Initial measurements

The specimen shall be visually inspected and electrically and mechanically checked as required by the relevant specification.

5.4 Conditioning

It shall be possible to maintain the air pressures in Table 1, or as specified in the relevant specification, in the chamber with a tolerance of ±5 % or ±0,1 kPa whichever is the larger. The tolerance on the 84 kPa severity shall be ±2 kPa.

At the start and throughout the test, the test chamber shall be within the required temperature range specified by the standard atmospheric conditions for testing according to IEC 60068-1.

The specimen shall be introduced into the chamber in an orientation, configuration and operational state as specified in the relevant specification.

The pressure within the chamber shall then be reduced to the value appropriate to the severity. The relevant specification may limit the rate of change of pressure to not more than 15 kPa/min when considered necessary.

If required by the relevant specification, the specimen shall be operated and/or function in accordance with the procedures set out in the relevant specification. For heat-dissipating specimens, the relevant specification may require the specimen temperature to be stabilized before any functional checks and/or measurements are made.

If required by the relevant specification, intermediate measurements shall be performed.

The air pressure shall be maintained for the specified duration.

The air pressure shall be restored to normal. If required by the relevant specification, the rate of change of air pressure shall not exceed 15 kPa/min.

5.5 Recovery

The specimen, if not otherwise specified in the relevant specification, shall remain under standard atmospheric conditions before final measurements for not less than 1 h but not more than 2 h.

5.6 Final measurements

The specimen shall be visually inspected and electrically and mechanically checked as required by the relevant specification.

6 Information to be given in the relevant specification

When this test is included in the relevant specification, the following details shall be given as far as they are applicable:

a) type of test;

b) preconditioning;

c) initial measurements;

d) state of specimen during conditioning;
e) orientation of the specimen;
f) severity: pressure and duration of exposure;
g) limitation to be applied to rate of change of pressure;
h) measurements and/or loading during the conditioning;
i) recovery;
j) final measurements.

7 Information to be given in the test report

As a minimum the test report shall show the following information:

1)	customer	(name and address);
2)	test laboratory	(name and address and details of accreditation - if any);
3)	test dates	
4)	type of test	(M);
5)	purpose of test	(development, qualification etc.);
6)	test standard, edition	(IEC 60068-2-13, edition);
7)	relevant laboratory test procedure	(code and issue);
8)	test specimen description	(unique ID, drawing, photo, quantity build status, etc.);
9)	test chamber identity	(manufacturer, model number, unique ID, etc.);
10)	performance of test apparatus	(set point temperature control, air flow etc.);
11)	uncertainties of measuring system;	
12)	calibration data	(last and next due date);
13)	initial, intermediate and final measurements;	
14)	required severities	(from relevant specification);
15)	orientation of the test specimens	(from relevant specification);
16)	test severities	(measuring points, data, etc.);
17)	performance of test specimens	(results of functional tests, etc.);
18)	observations during testing and actions taken	(any pertinent observations);
19)	summary of test;	
20)	distribution	(distribution list).

A test log should be written for the testing which can be attached to the report.

Annex A
(informative)

Guidance on selecting the duration of exposure

This annex gives guidance on how to select the duration of exposure.

– 5 min Sufficient to prove functionality for most types of components.
– 30 min Sufficient to prove functionality for most types of equipment.
– 2 h Settling time and function test.
– 4 h Settling time, function test and robust verification.
– 16 h Used where changes over time can be expected, for example slow expansion of soft material, leakage of gas-tight seal.