



SLOVENSKI STANDARD
SIST EN 60068-2-6:2001
01-september-2001

Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)

Environmental testing -- Part 2: Tests - Test Fc: Vibration (sinusoidal)

Umweltprüfungen -- Teil 2: Prüfungen - Prüfung Fc: Schwingen, sinusförmig

Essais d'environnement -- Partie 2: Essais - Essai Fc: Vibrations (sinusoïdales)

Ta slovenski standard je istoveten z: EN 60068-2-6:1995

[SIST EN 60068-2-6:2001](https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001)

<https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001>

ICS:

19.040	Preskušanje v zvezi z okoljem	Environmental testing
--------	-------------------------------	-----------------------

SIST EN 60068-2-6:2001

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 60068-2-6:2001](#)

<https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60068-2-6

April 1995

ICS 19.040

Supersedes HD 323.2.6 S2:1988

Descriptors: Electrical engineering, sinusoidal vibration tests, measurement, requirements, definitions

English version

Environmental testing
Part 2: Tests
Tests Fc: Vibration (sinusoidal)
(IEC 68-2-6:1995 + corrigendum 1995)

Essais d'environnement

Partie 2: Essais

Essais Fc: Vibrations (sinusoïdales)

(CEI 68-2-6:1995 + corrigendum 1995)

Umweltprüfungen

Teil 2: Prüfungen

Prüfung Fc: Schwingen, sinusförmig

(IEC 68-2-6:1995 +
Corrigendum 1995)

(standards.iteh.ai)

[SIST EN 60068-2-6:2001](https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001)

<https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001>

This European Standard was approved by CENELEC on 1995-03-06. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 50A(CO)232, future edition 6 of IEC 68-2-6, prepared by SC 50A, Vibration, impact and other dynamic tests, of IEC TC 50, Environmental testing, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60068-2-6 on 1995-03-06.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 1996-03-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 1996-03-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annexes A, B and C are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 68-2-6:1995 and its corrigendum March 1995 was approved by CENELEC as a European Standard without any modification.

~~SIST EN 60068-2-6:2001~~

<https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001>

Annex ZA (normative)

Normative references to international publications
with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 50(721)	1991	International electrotechnical vocabulary (IEV) Chapter 721: Telegraphy facsimile and data communication	-	-
IEC 68-1	1988	Environmental testing Part 1: General and guidance		
+ A1	1992		EN 60068-1 ¹⁾	1994
IEC 68-2-34	1973	Part 2: Tests - Test Fd: Random vibration wide band - General requirements		
+ A1	1983		HD 323.2.34 S1	1988
IEC 68-2-35	1973	Test Fda: Random vibration wide band Reproducibility High		
+ A1	1983		HD 323.2.35 S1	1988
IEC 68-2-36	1973	Test Fdb: Random vibration wide band Reproducibility Medium		
+ A1	1983		HD 323.2.36 S1	1988
IEC 68-2-37	1973	Test Fdc: Random vibration wide band Reproducibility Low		
+ A1	1983		HD 323.2.37 S1	1988
IEC 68-2-47	1982	Mounting of components, equipment and other articles for dynamic tests including shock (Ea), bump (Eb), vibration (Fc and Fd) and steady-state acceleration (Ga) and guidance	EN 60068-2-47	1993
IEC 68-2-64	1993	Test Fh: Vibration, broad-band random (digital control) and guidance	EN 60068-2-64 ²⁾	1994

1) EN 60068-1 also includes corrigendum October 1988 to IEC 68-1.

2) EN 60068-2-64 includes corrigendum October 1993 to IEC 68-2-64.

Page 4
EN 60068-2-6:1995

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 721-1	1990	Classification of environmental conditions Part 1: Environmental parameters and their severities		
+ A1	1992		EN 60721-1	1995
ISO 2041	1990	Vibration and shock - Vocabulary	-	-

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 60068-2-6:2001](https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001)

<https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001>

**NORME
INTERNATIONALE
INTERNATIONAL
STANDARD**

**CEI
IEC
68-2-6**

Sixième édition
Sixth edition
1995-03

**PUBLICATION FONDAMENTALE DE SÉCURITÉ
BASIC SAFETY PUBLICATION**

Essais d'environnement –

Partie 2:

Essais –

Essai Fc: Vibrations (sinusoïdales)

(standards.iteh.ai)

Environmental testing –

SIST EN 60068-2-6:2001

<https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001>

Part 2:

Tests –

Test Fc: Vibration (sinusoidal)

© CEI 1995 Droits de reproduction réservés — Copyright — all rights reserved

Aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'éditeur.

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Bureau Central de la Commission Electrotechnique Internationale 3, rue de Varembe Genève, Suisse



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE

X

● Pour prix, voir catalogue en vigueur
For price, see current catalogue

CONTENTS

	Page
FOREWORD	7
INTRODUCTION	9
Clause	
1 Scope	11
2 Normative references	11
3 Definitions	13
4 Requirements for testing	17
5 Severities	23
6 Pre-conditioning	33
7 Initial measurements	33
8 Testing	33
9 Intermediate measurements	37
10 Recovery	37
11 Final measurements	37
12 Information to be given in the relevant specification	37
Annexes	
A Guide to Test Fc	41
B Examples of severities primarily intended for components	71
C Examples of severities primarily intended for equipment	75
Tables	
1 Lower frequency	25
2 Upper frequency	25
3 Recommended frequency ranges	27
4 Recommended vibration amplitudes with lower cross-over frequency (8 Hz to 10 Hz)	29
5 Recommended vibration amplitudes with higher cross-over frequency (58 Hz to 62 Hz)	29
6 Recommended vibration displacement amplitudes applicable only for frequency ranges with an upper frequency of 10 Hz	31
A.1 Number of sweep cycles and associated endurance times per axis	59
A.2 Constant bandwidth response time	63

Tables	Page
A.3 Constant percentage bandwidth response time	63
B.1 Endurance by sweeping – Examples with higher cross-over frequency	71
C.1 Endurance by sweeping – Examples with lower cross-over frequency	75
C.2 Endurance by sweeping – Examples with higher cross-over frequency	79
 Figures	
1 Nomogram relating vibration amplitude to frequency with lower cross-over frequency (8 Hz to 10 Hz)	81
2 Nomogram relating vibration amplitude to frequency with higher cross-over frequency (58 Hz to 62 Hz)	83
3 Nomogram relating vibration displacement amplitude to frequency (only applicable for frequency ranges with an upper frequency of 10 Hz)	85
A.1 Generalized transmissibility factors for vibration isolators	87

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60068-2-6:2001

<https://standards.iteh.ai/catalog/standards/sist/74ae9e7f-518f-44c7-9c8c-f79b57762a28/sist-en-60068-2-6-2001>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENVIRONMENTAL TESTING -

Part 2: Tests -
Test Fc: Vibration (sinusoidal)

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 3) They have the form of recommendations for international use published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

International Standard IEC 68-2-6 has been prepared by sub-committee 50A: Vibration, impact and other dynamic tests, of IEC technical committee 50: Environmental testing.

This sixth edition cancels and replaces the fifth edition published in 1982, amendments 1 (1983) and 2 (1985), and constitutes a technical revision.

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

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

DIS	Report on voting
50A(CO)232	50A/294/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.

IEC 68 consists of the following parts, under the general title: Environmental testing

- Part 1: General and guidance
- Part 2: Tests
- Part 3: Background information
- Part 4: Information for specification writers - Test summaries
- Part 5: Guide to drafting of test methods

Annexes A, B and C of this standard are for information only.

INTRODUCTION

This part of IEC 68 gives a method of test applicable to components, equipment and other articles which, during transportation or in service, may be subjected to conditions involving vibration of a harmonic pattern, generated primarily by rotating, pulsating or oscillating forces, such as occur in ships, aircraft, land vehicles, rotorcraft and space applications or are caused by machinery and seismic phenomena.

This standard consists basically of subjecting a specimen to sinusoidal vibration over a given frequency range or at discrete frequencies, for a given period of time. A vibration response investigation may be specified which aims at determining critical frequencies of the specimen.

The relevant specification shall indicate whether the specimen shall function during vibration or whether it suffices that it still works after having been submitted to vibration.

It is emphasized that vibration testing always demands a certain degree of engineering judgement, and both the supplier and purchaser should be fully aware of this fact. However, sinusoidal testing is deterministic and, therefore, relatively simple to perform. Thus it is readily applicable to both diagnostic and service life testing.

(standards.iteh.ai)

The main part of this standard deals primarily with the methods of controlling the test at specified points using either analogue or digital techniques, and gives, in detail, the testing procedure. The requirements for the vibration motion, choice of severities including frequency ranges, amplitudes and endurance times are also specified; these severities representing a rationalized series of parameters. The relevant specification writer is expected to choose the testing procedure and values appropriate to the specimen and its use.

Certain terms have been defined to facilitate a proper understanding of the text. These definitions are given in clause 3.

Annex A gives general guidance for the test and annexes B and C provide guidance on the selection of severities for components and equipment.

ENVIRONMENTAL TESTING –

Part 2: Tests – Test Fc: Vibration (sinusoidal)

1 Scope

This part of IEC 68 gives a method of test which provides a standard procedure to determine the ability of components, equipment and other articles, hereinafter referred to as specimens, to withstand specified severities of sinusoidal vibration.

The purpose of this test is to determine any mechanical weakness and/or degradation in the specified performance of specimens and to use this information, in conjunction with the relevant specification, to decide the acceptability of the specimens. In some cases, the test method may also be used to demonstrate the mechanical robustness of specimens and/or to study their dynamic behaviour. Categorization of components can also be made on the basis of a selection from within the severities quoted in the test.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 68. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 68 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50(721): 1991, *International Electrotechnical Vocabulary (IEV) – Chapter 721: Telegraphy facsimile and data communication*

IEC 68-1: 1988, *Environmental testing – Part 1: General and guidance*
Amendment 1 (1992)

IEC 68-2-34: 1973, *Environmental testing – Part 2: Tests – Test Fd: Random vibration wide band – General requirements**
Amendment 1 (1983)

IEC 68-2-35: 1973, *Environmental testing – Part 2: Tests – Test Fda: Random vibration wide band – Reproducibility High**
Amendment 1 (1983)

IEC 68-2-36: 1973, *Environmental testing – Part 2: Tests – Test Fdb: Random vibration wide band – Reproducibility Medium**
Amendment 1 (1983)

* Tests Fd, Fda, Fdb and Fdc are to be withdrawn in 1998.

IEC 68-2-37: 1973, *Environmental testing – Part 2: Tests – Test Fdc: Random vibration wide band – Reproducibility Low**
Amendment 1 (1983)

IEC 68-2-47: 1982, *Environmental testing – Part 2: Tests – Mounting of components, equipment and other articles for dynamic tests including shock (Ea), bump (Eb), vibration (Fc and Fd) and steady-state acceleration (Ga) and guidance*

IEC 68-2-64: 1993, *Environmental testing – Part 2: Tests – Test Fh: Vibration broad-band random (digital control) and guidance*

IEC 721-1: 1990, *Classification of environmental conditions – Part 1: Environmental parameters and their severities*
Amendment 1 (1992)

ISO 2041: 1990, *Vibration and shock – Vocabulary*

3 Definitions

Definitions in alphabetical order:

Actual motion	3.7
Basic motion	3.6
Centred resonance frequency	3.10
Check point	3.2.1
Critical frequencies	3.9
Damping	3.8
Fictitious reference point	3.2.2.1
Fixing point	3.1
g_n	3.12
Measuring points	3.2
Multipoint control	3.3.2
Reference point	3.2.2
Restricted frequency sweeping	3.11
Signal tolerance	3.5
Single point control	3.3.1
Sweep cycle	3.4

The terms used are generally as defined in ISO 2041 and in IEC 68-1. However, sweep cycle (3.4) and signal tolerance (3.5) have specific meanings in this standard.

The other terms described below are not identical to, or not defined in, ISO 2041 or in IEC 68-1.

3.1 fixing point: Part of the specimen in contact with the fixture or vibration table at a point where the specimen is normally fastened in service. If a part of the real mounting structure is used as the fixture, the fixing points shall be taken as those of the mounting structure and not of the specimen.

3.2 measuring points: The test is carried out using data gathered at certain specific points. These are of two main types, the definitions of which are given below.

NOTE – Measurements may be made at points within the specimen in order to assess its behaviour, but these are not considered as measuring points in the sense of this standard. For further details, see A.2.1.

3.2.1 check point: Point located on the fixture, on the vibration table or on the specimen as close as possible to one of its fixing points, and in any case rigidly connected to it.

NOTES

- 1 A number of check points are used as a means of ensuring that the test requirements are satisfied.
- 2 If four or fewer fixing points exist, each is used as a check point. If more than four fixing points exist, four representative fixing points will be defined in the relevant specification to be used as check points.
- 3 In special cases, for example for large or complex specimens, the check points will be prescribed in the relevant specification if not close to the fixing points.
- 4 Where a large number of small specimens are mounted on one fixture, or in the case of a small specimen where there are several fixing points, a single check point (i.e. the reference point) may be selected for the derivation of the control signal. This signal is then related to the fixture rather than to the fixing points of the specimen(s). This is only valid when the lowest resonance frequency of the loaded fixture is well above the upper frequency of the test.

3.2.2 reference point: Point chosen from the check points whose signal is used to control the test, so that the requirements of this standard are satisfied.

3.2.2.1 fictitious reference point: A fictitious point derived from multiple check points either manually or automatically, the result of which is used to control the test, so that the requirements of this standard are satisfied.

3.3 Control points

3.3.1 single point control: This is achieved by using the signal from the transducer at the reference point in order to maintain this point at the specified level (see 4.1.4.1).

3.3.2 multipoint control: This is achieved by using the signals from each of the transducers at the check points. The signals are either continuously averaged arithmetically or processed by using comparison techniques, depending upon the relevant specification (see 4.1.4.1).

3.4 sweep cycle: A traverse of the specified frequency range once in each direction, for example 10 Hz to 150 Hz to 10 Hz.

NOTE – Manufacturer's handbooks for digital sine control systems often refer to a sweep cycle as f_1 to f_2 , not f_1 to f_2 to f_1 .

3.5 signal tolerance: Signal tolerance $T = \left(\frac{NF}{F} - 1 \right) \times 100$ (per cent).

where

NF is the r.m.s value of the unfiltered signal;

F is the r.m.s value of the filtered signal.

NOTE – This parameter applies to whichever signal, i.e. acceleration, velocity or displacement, is being used to control the test. (see A.2.2)

3.6 basic motion: Motion at the driving frequency of vibration at the reference point (see also 4.1.1).

3.7 actual motion: Motion represented by the wideband signal returned from the reference point transducer.

3.8 damping: The generic term ascribed to the numerous energy dissipation mechanisms in a system. In practice, damping depends on many parameters, such as the structural system, mode of vibration, strain, applied forces, velocity, materials, joint slippage, etc.

3.9 critical frequencies: Frequencies at which:

- malfunctioning and/or deterioration of performance of the specimen are exhibited which are dependent on vibration, and/or
- mechanical resonances and/or other response effects occur, for example, chatter.

3.10 centred resonance frequency: Frequency automatically centred on the actual resonance frequency derived from the vibration response investigation.

3.11 restricted frequency sweeping: Sweeping over a restricted frequency range between 0,8 and 1,2 times the critical frequency.

3.12 g_n : Standard acceleration due to the earth's gravity, which itself varies with altitude and geographical latitude.

NOTE - For the purpose of this standard, the value of g_n is rounded up to the nearest whole number, that is 10 m/s².

4 Requirements for testing

4.1 Required characteristics

The required characteristics apply to the complete vibration system, which includes the power amplifier, vibrator, test fixture, specimen and control system when loaded for testing.

4.1.1 Basic motion

The basic motion shall be a sinusoidal function of time and such that the fixing points of the specimen move substantially in phase and in straight parallel lines, subject to the limitations of 4.1.2 and 4.1.3.