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**Environmental testing - Part 2: Test methods - Test Fe: Vibration - Sine beat method**

Environmental testing -- Part 2: Test methods - Test Fe: Vibration - Sine beat method

Umweltprüfungen -- Teil 2: Prüfungen - Prüfung Fe: Schwingen, Sinusimpulse

Essais d'environnement -- Partie 2: Méthodes d'essai - Essai Fe: Vibrations - Méthode par sinusoïdes modulées

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Ta slovenski standard je istoveten z: **EN 60068-2-59:1993**

SIST EN 60068-2-59:2001  
<https://standards.iteh.ai/catalog/standards/sist/a0c6a506-4d0d-41b9-a016-fcfc16c8d7bb/sist-en-60068-2-59-2001>

**ICS:**

19.040	Preskušanje v zvezi z okoljem	Environmental testing
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**SIST EN 60068-2-59:2001****en**

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EUROPEAN STANDARD

NORME EUROPEENNE

EUROPÄISCHE NORM

April 1993

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Supersedes HD 323.2.59 S1:1991

Descriptors: Electricity, component, equipment, vibration, seism,  
sine-beat, procedures, components specifications writing,  
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## ENGLISH VERSION

Environmental testing  
Part 2: Test methods  
Test Fe: Vibration - Sine beat method  
(IEC 68-2-59:1990)

Essais d'environnement  
Deuxième partie: Méthodes d'essai  
Essai Fe: Vibrations - Méthode  
par sinusöides modulées  
(CEI 68-2-59:1990)

Umweltprüfungen  
Teil 2: Prüfungen  
Prüfung Fe: Schwingen  
Sinusimpulse  
(IEC 68-2-59:1990)

## iTeh STANDARD PREVIEW

This European Standard was approved by CENELEC on 1993-03-09.

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

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Ref. No. EN 60068-2-59:1993 E

## FOREWORD

At the request of CENELEC Reporting Secretariat SR 50A, HD 323.2.59 S1:1991 (IEC 68-2-59:1990) was submitted to the CENELEC voting procedure for conversion into a European Standard.

The text of the International Standard was approved by CENELEC as EN 60068-2-59 on 9 March 1993.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-03-01
- latest date of withdrawal of conflicting national standards (dow) -

Annexes designated "normative" are part of the body of the standard. Annexes designated "informative" are given only for information. In this standard, annex A is informative and annex ZA is normative.

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SIST EN 60068-2-59:2001  
The text of the International Standard IEC 68-2-59:1990 was approved by CENELEC as a European Standard without any modification.  
https://standards.iteh.ai/catalog/standards/sist/60068-2-59-1990/iec/60068-2-59-1990

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## ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD  
WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

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

IEC Publication	Date	Title	EN/HD	Date
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68-1	1988	Basic environmental testing procedures Part 1: General and guidance	HD 323.1 S2	1988
68-2-6	1982	Part 2: Tests - Test Fc and guidance: Vibration (sinusoidal)	HD 323.2.6 S2*	1988
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
68-3-3	1991	Part 3: Guidance - Seismic test test methods for equipments	EN 60068-3-3	1993

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Other publication quoted:

[SIST EN 60068-2-59:2001](https://standards.iteh.ai/catalog/standards/sist/a8eea306-4d6d-4f69-a016-fcf16c8d7bb/sist-en-60068-2-59-2001)

<https://standards.iteh.ai/catalog/standards/sist/a8eea306-4d6d-4f69-a016-fcf16c8d7bb/sist-en-60068-2-59-2001>

ISO 2041 1975 Vibration and shock - Vocabulary

\* HD 323.2.6 S2 includes A1:1983 + A2:1985 to IEC 68-2-6

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[SIST EN 60068-2-59:2001](#)

<https://standards.iteh.ai/catalog/standards/sist/a8eea306-4d6d-4f69-a016-fcf16c8d7bb/sist-en-60068-2-59-2001>

NORME  
INTERNATIONALE  
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First edition  
1990-11



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Essais d'environnement

Deuxième partie:

Méthodes d'essai

Essai Fe: Vibrations - Méthode

par sinusoïdes modulées

(standards.iteh.ai)

Environmental testing

[https://standards.iteh.ai/catalog/standards/sist/a8eea306-4d6d-4f69-a016-](https://standards.iteh.ai/catalog/standards/sist/a8eea306-4d6d-4f69-a016-f161c8c21b/sist-en-60068-2-59-2001)

Part 2:

Test methods

Test Fe: Vibration - Sine-beat method



Numéro de référence  
Reference number  
CEI/IEC 68-2-59: 1990

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ENVIRONMENTAL TESTING

## Part 2: Test methods

## Test Fe: Vibration – Sine-beat method

## FOREWORD

- 1) 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.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

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This standard has been prepared by Sub-Committee 50A: Shock and vibration tests, of IEC Technical Committee No. 50: Environmental testing.

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

Six Months' Rule	Report on Voting
50A(CO)175	50A(CO)180

Full information on the voting for the approval of this standard can be found in the Voting Report indicated in the above table.

**ENVIRONMENTAL TESTING**  
**Part 2: Test methods**  
**Test Fe: Vibration - Sine-beat method**

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## INTRODUCTION

This standard details methods for testing components, equipments and other electrotechnical products (hereinafter referred to as "specimens") which in service can be subjected to pulsating or oscillating forces of short duration caused, for example, by seismic or explosive phenomena or by vibration in machinery.

In this test the specimen is excited at fixed frequencies with a preset number of sine beats (see figure 1). These fixed test frequencies are predetermined frequencies, critical frequencies identified by means of a sinusoidal vibration test (IEC 68-2-6) or both. Pauses are provided between the individual sine beats in order to allow decay of the free response of the specimen.

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Specification writers will find in clause 12 a list of details to be considered for inclusion in specifications and, in annex A, the guidance.

[SIST EN 60068-2-59:2001](https://standards.iteh.ai/catalog/standards/sist/a8eea306-4d6d-4f69-a016-fcf16c8d7bb/sist-en-60068-2-59-2001)

<https://standards.iteh.ai/catalog/standards/sist/a8eea306-4d6d-4f69-a016-fcf16c8d7bb/sist-en-60068-2-59-2001>

## RELATED DOCUMENTS

The following international standards are directly referred to in this standard:

IEC 68, *Environmental testing*

IEC 68-1: 1988, *Part 1: General and guidance*

IEC 68-2-6: 1982, *Part 2: Tests - Test Fc and guidance: Vibration (sinusoidal)*

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*

IEC 68-3-3: 19..., *Part 3: Guidance. Section 3: Seismic test methods for equipments*

ISO 2041: 1975, *Vibration and shock - Vocabulary*

### 1 Object

To provide a standard procedure for determining, by the sine-beat method, the ability of a specimen to withstand specified severities of transient vibration.

## 2 General description

The purpose of this test is to determine mechanical weakness and/or degradation in specified performance and to use this information, in conjunction with the relevant specification, to decide whether a specimen is acceptable or not. It may also be used, in some cases, to demonstrate the mechanical robustness of specimens and/or to study their dynamic behaviour.

The extent to which a specimen has to function during vibration or merely to survive conditions of vibration shall be stated in the relevant specification.

Procedures are described for conducting the test and for the measurement of the vibration at given points. The requirements for the vibration motion and for the choice of severities (including frequency range, test levels, sine-beat cycles and number of sine beats) are also detailed.

It is emphasized that vibration testing always demands a certain degree of engineering judgement and both supplier and purchaser should be fully aware of this fact. The writer of the relevant specification is expected to select the testing procedure and the values of severity appropriate to the specimen and its use.

For the purpose of this test the specimen is always fastened to the vibration table.

In order to facilitate the use of this standard, references are given in the main part where the reader is invited to refer to annex A; additionally the clause numbers in the main part are referred to in annex A which also gives specific information on the correlation between sine beats of displacement, velocity and acceleration.

This standard is to be used in conjunction with IEC 68-1.

## 3 Definitions

The terms used are generally defined in ISO 2041 and in IEC 68-1 or 68-2-6. Where, for the convenience of the reader, a definition from one of those sources is included here, the derivation is indicated. Departures from the definitions in those sources are also indicated.

The additional terms and definitions that follow are also applicable for the purpose of this standard.

**3.1 critical frequency** (definition technically equivalent to that of 8.1 of IEC 68-2-6):  
Frequencies at which:

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

**3.2 crossover frequency** (definition technically equivalent to that of ISO 2041). That frequency at which the characteristic of a vibration changes from one relationship to another.

NOTE - For example, a crossover frequency may be that frequency at which the test vibration amplitude changes from a constant displacement value versus frequency to a constant acceleration value versus frequency.

**3.3 damping** (not identical with ISO 2041 definitions): Damping is 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.

**3.3.1 critical damping:** Minimum viscous damping that will allow a displaced system to return to its initial position without oscillation.

**3.3.2 damping ratio:** Ratio of actual damping to critical damping in a system with viscous damping.

**3.4 distortion** (definition identical with that in clause 3 of IEC 68-2-6; not identical with ISO 2041 definition):

$$\text{distortion } d = \frac{\sqrt{a_{\text{tot}}^2 - a_1^2}}{a_1} \cdot 100 \text{ (in per cent)}$$

where

$a_1$  is the r.m.s. value of the acceleration at the driving frequency

$a_{\text{tot}}$  is the total r.m.s. value of the applied acceleration (including  $a_1$ ).

**3.5 fixing point** (definition technically equivalent to that of 3.1 of IEC 68-2-6): Part of the specimen in contact with the fixture or vibration table at a point where the specimen is normally fastened in service.

NOTE - If a part of the real mounting structure is used as the fixture, the fixing points are taken as those of the mounting structure and not of the specimen.

**3.6 " $g_n$ " 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/s<sup>2</sup>.

**3.7 measuring points** (definition technically identical with that of 3.2 of IEC 68-2-6): Specific points at which data are gathered for conducting the test. These points are of two main types as defined below.

NOTE - Measurements may be made at points within the specimen in order to assess its behaviour; these are not considered as measuring points in the sense of this standard.