



SLOVENSKI STANDARD
SIST EN 60068-2-57:2001

01-september-2001

Environmental testing - Part 2-57: Tests - Test Ff: Vibration - Time-history method

Environmental testing -- Part 2-57: Tests - Test Ff: Vibration - Time-history method

Umweltprüfungen -- Teil 2-57: Prüfungen - Prüfung Ff: Schwingen - Zeitverlaufverfahren

Essais d'environnement -- Partie 2-57: Essais - Essai Ff: Vibrations - Méthode par accélérogrammes

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Ta slovenski standard je istoveten z: EN 60068-2-57:2000

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ICS:

19.040	Preskušanje v zvezi z okoljem	Environmental testing
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60068-2-57

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ICS 19.040

Supersedes EN 60068-2-57:1993

English version

Environmental testing
Part 2-57: Tests - Test Ff: Vibration - Time-history method
(IEC 60068-2-57:1999)

Essais d'environnement
Partie 2-57: Essais - Essai Ff: Vibrations
Méthodes par accélérogrammes
(CEI 60068-2-57:1999)

Umweltprüfungen
Teil 2-57: Prüfungen
Prüfung Ff: Schwingen
Zeitverlaufverfahren
(IEC 60068-2-57:1999)

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This European Standard was approved by CENELEC on 2000-01-01. 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, Czech Republic, 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 104/130/FDIS, future edition 2 of IEC 60068-2-57, prepared by IEC TC 104, Environmental conditions, classification and methods of test, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60068-2-57 on 2000-01-01.

This European Standard supersedes EN 60068-2-57:1993.

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) 2000-10-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2003-01-01

This standard is intended to be used in conjunction with EN 60068-1:1994.

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 and B are informative.

Annex ZA has been added by CENELEC.

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Endorsement notice

SIST EN 60068-2-57:2001

The text of the International Standard IEC 60068-2-57:1999 was approved by CENELEC as a European Standard without any modification.

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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 60068-1	1988	Environmental testing Part 1: General and guidance	EN 60068-1 ¹⁾	1994
IEC 60068-2-6 + corr. March	1995 1995	Part 2: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	1995
IEC 60068-2-27	1987	Part 2: Tests - Test Ea and guidance: Shock	EN 60068-2-27	1993
IEC 60068-2-47	1982	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	EN 60068-2-47	1993
IEC 60068-2-64 + corr. October	1993 1993	Part 2: Test methods - Test Fh: Vibration, broad-band random (digital control) and guidance	EN 60068-2-64	1994
IEC 60068-3-3	1991	Part 3: Guidance - Seismic test methods for equipments	EN 60068-3-3	1993
ISO 266	1997	Acoustics - Preferred frequencies	-	-
ISO 2041	1990	Vibration and shock - Vocabulary	-	-

1) EN 60068-1 includes the corrigendum October 1988 and A1:1992 to IEC 60068-1.

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NORME
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CEI
IEC

60068-2-57

Deuxième édition
Second edition
1999-11

Essais d'environnement –

Partie 2-57:

Essais – Essai Ff: Vibrations –
Méthode par accélérogrammes

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Environmental testing –

Part 2-57: SIST EN 60068-2-57:2001

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Tests – Test Ff: Vibration –
Time-history method

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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CONTENTS

	Page
FOREWORD	5
INTRODUCTION	7
Clause	
1 Scope and object	9
2 Normative references	9
3 Definitions	9
4 General requirements	17
5 Requirements for testing	17
5.1 Vibration response investigation	17
5.2 Time-history testing	21
5.3 Mounting	25
6 Severities	27
6.1 Test frequency range	27
6.2 Required response spectrum	29
6.3 Number and duration of time-histories	29
6.4 Number of high peaks of the response	29
7 Preconditioning	31
8 Initial measurements	31
9 Testing	31
9.1 General	31
9.2 Vibration response investigation	31
9.3 Time-history testing	33
10 Intermediate measurements	33
11 Recovery	35
12 Final measurements	35
13 Information to be given in the relevant specification	35
Annex A (informative) Synthesis of the artificial time-history: Guidance	53
Annex B (informative) Test frequency ranges	61
Figure 1 – Flow chart for vibration, time-history	37
Figure 2 – Example of a typical response of an oscillator excited by a specific time-history (specified threshold value of 70 %)	39
Figure 3 – Example of identification of the peaks of the response higher than a specified (70 %) threshold value	41
Figure 4 – Typical envelope response spectrum	43
Figure 5 – Typical time-history	45
Figure 6 – Typical plot of a required response spectrum	47
Figure 7 – Category 1: recommended shape of a required response spectrum in generalized form	49
Figure 8 – Category 2: recommended shape of a required response spectrum in generalized form	51

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENVIRONMENTAL TESTING –

Part 2-57: Tests – Test Ff: Vibration –
Time-history method

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 co-operation 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 express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, 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.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60068-2-57 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 1989, and constitutes a technical revision.

This part 2-57 is intended to be used in conjunction with IEC 60068-1. It was established on the basis of the sixth edition of that standard (1988) together with its amendment 1 (1992).

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

FDIS	Report on voting
104/130/FDIS	104/136/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 3.

Annexes A and B are for information only.

The committee has decided that this publication remains valid until 2006. At this date, in accordance with the committee's decision, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

This part of IEC 60068 details a method for testing components, equipment and other electrotechnical products, hereinafter referred to as "specimens", which in service can be subjected to short-duration random-type dynamic forces of which typical examples are the stresses induced in equipment as a result of earthquakes, explosions and during transport and operation of different kinds of vehicles.

The characteristics of these forces and the damping of the specimen may be such that the vibration response of the specimen will not reach a steady-state condition.

The test consists, after any preliminary vibration response investigation with sinusoidal or random vibration has been performed, of subjecting the specimen to a vibration time-history specified by a response spectrum with characteristics simulating the effects of the dynamic forces.

A time-history may be developed or obtained from:

- a natural event (natural time-history);
 - a random sample, or
 - a synthesized signal.
- } artificial time-history

In general, some modification is necessary in order to adapt to the required testing severity.

The use of a time-history allows a single test wave to envelop a broadband response spectrum.

It is possible for all the modes of the specimen in the excitation axis (or axes) to be excited at the same time and consequently the stresses derived from the combined effects of the coupled modes are generally taken into account.

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, that is frequency range, required response spectrum, number of high-peaks of the response and number and duration of time-histories, are also detailed.

Specification writers will find in clause 13 a list of details to be considered for inclusion in specifications, in annex A, on the guidance, and in annex B, on recommended test frequency ranges.

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.

ENVIRONMENTAL TESTING –

Part 2-57: Tests – Test Ff: Vibration – Time-history method

1 Scope and object

This part of IEC 60068 aims to provide a standard procedure for determining, by the time-history method, the ability of a specimen to withstand specified severities of transient vibration.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60068. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60068 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*

IEC 60068-2-47:1982, *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 60068-2-64:1993, *Environmental testing – Part 2: Tests – Test Fh: Vibration, broad-band random (digital control) and guidance*

IEC 60068-3-3:1991, *Environmental testing – Part 3: Guidance – Seismic test methods for equipment*

ISO 266:1997, *Acoustics – Preferred frequencies*

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

3 Definitions

For the purpose of this part of IEC 60068, the terms and definitions given in ISO 2041, IEC 60068-1, IEC 60068-2-6, IEC 60068-2-64 and the following apply.

3.1**critical frequency**

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**damping**

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**critical damping**

minimum viscous damping that will allow a displaced system to return to its initial position without oscillation in the shortest time possible

3.4**damping ratio**

ratio of actual damping to critical damping in a system with viscous damping

3.5**signal tolerance**

signal tolerance:

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$$T = \left(\frac{NF}{F} - 1 \right) \times 100 \quad (\text{in percentage})$$

where

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

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

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3.6**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

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.

3.7 **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.

3.8**high peaks of the response**

calculated peaks of the response of a single-degree-of-freedom system (oscillator), excited by a time-history, exceeding a specified threshold value (see figure 2)

NOTE 1 In practice, reference is made to high peaks of the response since it is difficult to identify complete response cycles due to a transient excitation (time-history).

NOTE 2 The peak is a positive or a negative maximum deviation from the zero-line between two consecutive zero-crossing points (see figure 3).