

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Environmental testing –
Part 3-3: Supporting documentation and guidance – Seismic test methods for
equipment**

**Essais d'environnement –
Partie 3-3: Documentation d'accompagnement et recommandations – Méthodes
d'essais sismiques applicables aux matériels**



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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	9
4 General and qualification considerations	14
4.1 General seismic class and specific seismic class	14
4.2 Service conditions.....	14
4.3 Malfunction criteria	15
4.4 Qualification criteria	15
5 Testing procedures.....	15
5.1 General.....	15
5.2 Mounting.....	15
5.3 Measurements	15
5.3.1 Vibration measurements at the vibration table	15
5.3.2 Vibration measurements on the equipment	16
5.3.3 Functional monitoring of the equipment	16
5.4 Frequency range.....	16
6 Conditioning	16
7 Test wave selection	16
7.1 General.....	16
7.2 Multifrequency waves.....	16
7.3 Single-frequency waves	17
8 Test waves	17
8.1 General.....	17
8.1.1 Specification of test waves	17
8.1.2 Simulation with a safety margin of the effects of an earthquake	17
8.2 Multifrequency wave testing	18
8.2.1 General requirements	18
8.2.2 Time-history test.....	18
8.2.3 Other multifrequency tests	18
8.3 Single-frequency testing	19
8.3.1 General requirements	19
8.3.2 Sine-sweep test	19
8.3.3 Sine-beat test	19
8.3.4 Continuous sine test	20
8.4 Other test wave forms	20
9 Testing conditions	20
9.1 General.....	20
9.2 Vibration response investigation	21
9.3 Test methods	21
9.3.1 Test method for equipment without critical frequencies	21
9.3.2 Test method for equipment with critical frequencies	22
9.4 Selection of damping	22
9.5 S1-earthquake and S2-earthquake testing	23

9.6	Specific application testing.....	23
9.7	Assembly testing.....	23
9.8	Component testing.....	23
10	Single and multi-axis testing	24
10.1	General.....	24
10.2	Single-axis testing	24
10.3	Biaxial testing	24
10.3.1	General requirements	24
10.3.2	Two horizontal axes.....	24
10.3.3	One horizontal axis and one vertical axis.....	24
10.4	Triaxial testing	25
10.4.1	General	25
10.4.2	Triaxial installation.....	25
10.4.3	Biaxial installation (one horizontal axis, one vertical axis).....	26
11	Conditioning for the general seismic class	26
11.1	Selection of test type	26
11.2	Test method.....	26
12	Calculated amplitude test method for the general seismic class.....	27
12.1	Application.....	27
12.2	Testing conditions.....	27
12.2.1	General	27
12.2.2	Performance level.....	27
12.2.3	Test wave selection	27
12.2.4	Damping ratio	27
12.2.5	Ground acceleration (a_g)	27
12.2.6	Superelevation factor (K).....	29
12.2.7	Direction factor (D)	29
12.2.8	Floor acceleration (a_f).....	30
13	Testing parameters for the general seismic class	30
13.1	Duration of test	30
13.2	Test acceleration (a_t)	30
13.2.1	General	30
13.2.2	Wave factor (α).....	31
13.2.3	Geometric factor (G)	31
14	Required response spectrum for the general seismic class	31
15	Testing procedures for the general seismic class.....	32
15.1	Vibration response investigation (VRI)	32
15.2	Types of test.....	33
15.2.1	Sine-beat test	33
15.2.2	Sine-sweep test.....	33
15.2.3	Time-history test.....	33
15.2.4	Other test wave forms.....	33
16	Conditioning for the specific seismic class	33
17	Test wave selection for the specific seismic class.....	34
17.1	General.....	34
17.2	Multifrequency waves.....	34
17.3	Single-frequency waves	34
18	Test waves for the specific seismic class.....	34

18.1	General.....	34
18.2	Single-frequency testing	34
18.2.1	General	34
18.2.2	Sine-sweep test.....	34
18.2.3	Sine-beat test	34
18.2.4	Continuous sine test	35
18.3	Other test wave forms	35
19	Testing conditions for the specific seismic class	35
20	Single and multi-axis testing for the specific seismic class.....	35
Annex A	(informative) Flow charts for test selection	43
A.1	Selection of test type	43
A.2	General seismic class – Calculated amplitude test	44
A.3	Specific seismic class – Single axis testing	45
A.4	Specific seismic class – Multi-axis testing	46
Bibliography		47
Figure 1	– Shape of a required response spectrum in generalized form (log-log scale) (as recommended by IEC 60068-2-57)	32
Figure 2	– Typical envelope response spectrum.....	35
Figure 3	– Types of response spectrum envelopes.....	36
Figure 4	– Multifrequency response spectrum with superimposed sine beats	37
Figure 5	– Sequence of five sine beats with five cycles	37
Figure 6	– Typical time history	38
Figure 7	– Continuous sine	39
Figure 8	– Biaxial table along an inclined plane	40
Figure 9	– Wave amplification factors	41
Figure 10	– Vibration amplitudes for ground acceleration a_g with crossover frequencies at 0,8 Hz and 1,6 Hz	42
Figure A.1	– Selection of seismic class	43
Figure A.2	– Calculated amplitude test flowchart.....	44
Figure A.3	– Single-axis testing flowchart	45
Figure A.4	– Multi-axis testing flowchart.....	46
Table 1	– Typical damping ratios (per cent of critical)	22
Table 2	– Selection of test type	26
Table 3	– Ground acceleration levels	27
Table 4	– Correspondence between peak ground acceleration and some seismic scales	28
Table 5	– Recommended superelevation factors (K)	29
Table 6	– Direction factors (D)	29
Table 7	– Wave factor	31

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ENVIRONMENTAL TESTING –**Part 3-3: Supporting documentation and guidance –
Seismic test methods for equipment**

FOREWORD

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International Standard IEC 60068-3-3 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 1991. This edition constitutes a technical revision.

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

- a) the main aim of this revision is to connect the testing level to the seismic activity level of the zone where the equipment could be installed;
- b) a standard shape for the required response spectrum is also given for the general seismic class for which the seismic environment is either not known or is imprecisely known;

- c) Clauses 11 to 15 were renumbered and some adjustments were made as their content is very general and the requirements can be applied both to the general seismic class and to the specific seismic class;
- d) the word “envelope” is replaced with “dominance” and “to envelop” with “to dominate” in order to provide a more precise meaning from a mathematical point of view.

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

FDIS	Report on voting
104/835/FDIS	104/841/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This International Standard is to be used in conjunction with IEC 60068-1.

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.

INTRODUCTION

Guidance is included in each of the two test methods referred to in this document but it is specific to the test method. The guidance in this document is directed towards choosing the appropriate test method and applying it to seismic testing.

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ENVIRONMENTAL TESTING –

Part 3-3: Supporting documentation and guidance – Seismic test methods for equipment

1 Scope

This part of IEC 60068 applies primarily to electro-technical equipment but its application can be extended to other equipment and to components.

In addition, if some type of analysis is always performed when making a seismic qualification, for example for the choice of the representative sample to be tested or for the extension of the seismic qualification from the tested specimen to similar specimens, the verification of the performance of an equipment by analysis or by a combination of testing and analysis can be acceptable but is outside the scope of this document, which is restricted to verification based entirely upon data from dynamic testing.

This document deals solely with the seismic testing of a full-size equipment which can be tested on a vibration table. The seismic testing of an equipment is intended to demonstrate its ability to perform its required function during and/or after the time it is subjected to the stresses and displacements resulting from an earthquake.

The object of this document is to present a range of methods of testing which, when specified by the relevant specification, can be applied to demonstrate the performance of equipment for which seismic testing is required with the main aim of achieving qualification.

NOTE Qualification by so-called “fragility-testing” is not considered to be within the scope of this document which has been prepared to give generally applicable guidance on seismic testing and specifically on the use of IEC 60068-2 test methods.

The choice of the method of testing can be made according to the criteria described in this document. The methods themselves are closely based on published IEC test methods.

This document is intended for use by manufacturers to substantiate, or by users to evaluate and verify, the performance of an equipment.

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*

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

IEC 60068-2-47, *Environmental testing – Part 2-47: Test – Mounting of specimens for vibration, impact and similar dynamic tests*

IEC 60068-2-57, *Environmental testing – Part 2-57: Tests – Test Ff: Vibration – Time-history and sine-beat method*

IEC 60068-2-64, *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance*

IEC 60068-2-81, *Environmental testing – Part 2-81: Tests – Test Ei: Shock – Shock response spectrum synthesis*

ISO 2041, *Mechanical vibration, shock and condition monitoring – Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60068-1, IEC 60068-2-6, IEC 60068-2-57 and ISO 2041 and the following apply.

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>

3.1

assembly

two or more devices sharing a common mounting or supporting structure

3.2

bandpass at –3 dB

frequency intervals defined by the points possessing an ordinate larger than or equal to $\sqrt{2}/2$ times the maximum value of the plot

SEE: Figure 2.

3.3

basic response spectrum

unmodified response spectrum defined by the characteristics of the building, its floor level, damping ratio, etc. and obtained from a specific ground motion

SEE: Figure 2.

Note 1 to entry: The basic response spectrum is generally of the narrow band type at floor level. The basic response spectrum is calculated by the architect engineer of the plant and it is generally not known by the equipment manufacturer and by the test engineer.

3.4

broadband response spectrum

response spectrum that describes the motion indicating that a number of interacting frequencies exist which should be treated as a whole

SEE: Figure 3c).

Note 1 to entry: The bandwidth is normally greater than one octave.

3.5

critical frequency

frequency 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

[SOURCE: IEC 60068-2-6:2007, 3.9]