

Environmental testing —

Part 3-8: Supporting documentation and guidance — Selecting amongst vibration tests

The European Standard EN 60068-3-8:2003 has the status of a
British Standard

ICS 19.040; 29.020

National foreword

This British Standard is the official English language version of EN 60068-3-8:2003. It is identical with IEC 60068-3-8:2003.

The UK participation in its preparation was entrusted to Technical Committee GEL/104, Environmental testing, which has the responsibility to:

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- monitor related international and European developments and promulgate them in the UK.

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Part 3-8: Supporting documentation and guidance –
Selecting amongst vibration tests
(IEC 60068-3-8:2003)

Essais d'environnement
Partie 3-8: Documentation
d'accompagnement et lignes directrices -
Sélection d'essais de vibrations
(CEI 60068-3-8:2003)

Umweltprüfungen
Teil 3-8: Unterstützende Dokumentation
und Leitfaden –
Auswahl zwischen verschiedenen
Schwingprüfverfahren
(IEC 60068-3-8:2003)

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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.

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CENELEC

European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 104/308/FDIS, future edition 1 of IEC 60068-3-8, 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 60068-3-8 on 2003-11-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
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national standard or by endorsement (dop) 2004-08-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2006-11-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annex ZA is normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60068-3-8:2003 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60721-3-0 NOTE Harmonized as HD 478.3.0 S1:1987 (not modified).

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INTRODUCTION

Components, equipment and other electrotechnical products, hereinafter called specimens, can be subjected to different kinds of vibration during manufacture, transportation or in service. In the IEC 60721-3 standards, those different vibration environments are tabulated into classes characterizing stationary and transient vibration conditions. The standards in the IEC 60068-2 series describe methods for testing with stationary or transient vibration. There will be three standards in the IEC 60068-2 series for environmental testing that specify test methods employing stationary vibration:

Part 2-6 Test Fc: Vibration (sinusoidal),

Part 2-64 Test Fh: Vibration, broad-band random (digital control) and guidance, and

Part 2-80 Test F-: Mixed mode testing¹

¹ Under consideration.

ENVIRONMENTAL TESTING –

Part 3-8: Supporting documentation and guidance – Selecting amongst vibration tests

1 Scope

This part of IEC 60068 provides guidance for selecting amongst the IEC 60068-2 stationary vibration test methods F_c sinusoidal, F_h random and $F(x)$ Mixed mode vibration. The different steady-state test methods and their aims are briefly described in Clause 4. Transient test methods are not included.

For vibration testing, the environmental conditions, especially the dynamic conditions for the specimen, should be known. This standard helps to collect information about the environmental conditions (Clause 5), to estimate or measure the dynamic conditions (Clause 6) and gives examples to enable decisions to be made on the most applicable environmental vibration test method. Starting from the condition, the method of selecting the appropriate test is given. Since real life vibration conditions are dominated by vibration of a random nature, random testing should be the commonly used method, see Table 1, Clause 7.

The methods included hereafter may be used to examine the vibration response of a specimen under test before, during and after vibration testing. The selection for the appropriate excitation method is described in Clause 8 and tabulated in Table 2.

In this standard specification, writers will find information concerning vibration test methods and guidance for their selection. For guidance on test parameters, or severities of one of the test methods, reference should be made to the normative references.

2 Normative references

The following referenced documents are indispensable for the application 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 F_c : Vibration (sinusoidal)*

IEC 60068-2-64, *Environmental testing – Part 2-64: Test methods – Test F_h : Vibration, broad-band random (digital control) and guidance*

IEC 60068-2-80, *Environmental testing – Part 2-80: Tests – Test F –: Mixed mode testing*²

IEC 60721-3 (all parts), *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities*

IEC 60721-4 (all parts), *Classification of environmental conditions – Part 4: Guidance for the correlation and transformation of environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068-2*

² Under consideration.

IEC Guide 104:1997, The preparation of safety publications and the use of basic safety publications and group safety publications

ISO 2041, *Vibration and shock – Vocabulary*

ISO 5348, *Mechanical vibration and shock – Mechanical mounting of accelerometers*

3 Terms and definitions

For the purposes of this document, terms and definitions used are generally defined in ISO 2041, in IEC 60068-1, IEC 60068-2-6 or IEC 60068-2-64. Where, for the convenience of the reader, a definition from one of those sources is included here, the derivation is indicated and departures from the definitions in those sources are also indicated.

3.1

dynamic conditions

all parameters that describe the vibration environment for a specimen

3.2

stationary vibration

type of vibration with all the vibration-related parameters (statistical and spectral) constant over time

3.3

frequency sweep

change of exciting frequency during sine testing

NOTE For further definitions for sine testing, see IEC 60068-2-6.

3.4

linear spectrum

type of spectrum used for periodic signals, usually calculated with fast Fourier transformation (FFT) algorithms, units being, for example, $\text{m/s}^2 \times \text{s}$ or g/Hz or $\text{g} \times \text{s}$.

[IES-RP-DET 012.1]

3.5

acceleration spectral density

ASD

type of spectrum used for stationary random signals, usually calculated using squared discrete Fourier transformations (DFT): mean-square value of that part of an acceleration signal passed by a narrow-band filter of a centre frequency, per unit bandwidth, in the limit as the bandwidth approaches zero and the averaging time approaches infinity, sometimes called autospectrum, the unit being $(\text{m/s}^2)^2/\text{Hz}$ or g_n^2/Hz

[ISO 2041, modified]

3.6

autocorrelation

statistical measure of the degree of which one part of a signal is related to another part (offset by a given time) of the same signal

NOTE The Fourier transform of the autocorrelation function gives the autospectrum or ASD, the unit being a ratio from -1 to $+1$.