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Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance

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

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IEC 60068-2-64 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test. It is an International Standard.

This document has been given the status of a horizontal basic safety document in accordance with the ISO/IEC Directives, Part 1.

This third edition cancels and replaces the second edition, published in 2008, and Amendment 1:2019. This edition constitutes a technical revision.

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

a) update of Annex A with references to examples;
b) introduction of an organizational deviation treatment;
c) clarification on requirements.

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

Draft	Report on voting
104/1190/FDIS	104/1214/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all the parts in the IEC 60068 series, 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

This part of IEC 60068 deals with broadband random vibration testing intended for general application to components, equipment and other products, hereinafter referred to as "specimens", that can be subjected to vibrations of a stochastic nature. The methods and techniques in this document are based on digital control of random vibration. It permits the introduction of variations to suit individual cases if these are required by the relevant specification.

Compared with most other vibration tests, test Fh is not based on deterministic but on statistical techniques. Broad-band random vibration testing is therefore described in terms of probability and statistical averages.

It is emphasized that random testing always demands a certain degree of engineering judgement, and both equipment supplier and purchaser as well as the test house 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.

The test method is based primarily on the use of an electrodynamic or a servo-hydraulic vibration generator with an associated computer-based control system relying on measurement sensors used as a vibration testing system.

The traditional general-purpose broad-band random vibration test utilizes waveforms with a Gaussian distribution of amplitudes. However, when so specified, this test procedure can also be utilized with random vibration tests with a non-Gaussian distribution of amplitudes. Such tests are sometimes alternatively known as "high kurtosis tests".

Annex A and Annex B are informative annexes giving reference to examples of test spectra for different environmental conditions and a list of details to be considered for inclusion in specifications and guidance.

Annex C is an informative annex giving information on non-Gaussian distribution/high kurtosis tests.

Annex D is an informative annex giving guidance on technical measures of verification that the intended test purpose is achieved by the test.

1 Scope

This part of IEC 60068 demonstrates the adequacy of a specimen to resist dynamic loads without unacceptable degradation of its functional and structural integrity (or either of them) when subjected to the specified random vibration test requirements.

Broadband random vibration can be used to identify accumulated stress effects and the resulting mechanical weakness and degradation in the specified performance. This information, in conjunction with the relevant specification, can be used to assess the acceptability of specimens.

This document is applicable to specimens which can be subjected to vibration of a stochastic nature resulting from transportation or operational environments, for example, in aircraft, space vehicles and land vehicles. It is primarily intended for unpackaged specimens, and for items in their transportation container when the latter can be considered as part of the specimen itself. However, if the item is packaged, then the item itself is referred to as a product, and the item and its packaging together are referred to as a test specimen. This document can be used in conjunction with IEC 60068-2-47:2005, for testing packaged products.

If the specimens are subjected to vibration of a combination of random and deterministic nature resulting from transportation or real-life environments, for example, in aircraft, space vehicles and for items in their transportation container, it is possible that testing with pure random is not sufficient. See IEC 60068-3-8:2003 for estimating the dynamic vibration environment of the specimen and based on that, selecting the appropriate test method.

Although primarily intended for electrotechnical specimens, this document is not restricted to them and can be used in other fields where desired (see Annex A).

This document has the status of a horizontal basic safety publication in accordance with IEC Guide 108.

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 60068-2-6:2007, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)*

IEC 60068-2-47:2005, *Environmental testing - Part 2-47: Test - Mounting of specimens for vibration, impact and similar dynamic tests*

IEC 60068-5-2, *Environmental testing - Part 5-2: Guide to drafting of test methods - Terms and definitions*

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[2] LALANNE, C. *Mechanical Vibration and Shock Analysis*. Volume 5: Specification Development, Second Edition, ISTE - Wiley, 2009

[3] DIN 45667-1:2025, *Classification methods for the evaluation of irregular oscillations - Part 1: Fundamentals of the classification of irregular oscillations - Reversal point sequence*

[4] DIN 45667-2:2025, *Classification methods for the evaluation of irregular oscillations - Part 2: Rainflow process*

[5] IEC 60068-2-86, *Environmental testing - Part 2-86: Tests - Test Fx: Vibration - Multi-exciter and multi-axis method*

[6] IEC 60068-3-8:2003, *Environmental testing - Part 3-8: Supporting documentation and guidance - Selecting amongst vibration tests*

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

[8] IEC 60721-3-1, *Classification of environmental conditions - Part 3-1: Classification of groups of environmental parameters and their severities - Storage*

[9] IEC 60721-3-2, *Classification of environmental conditions - Part 3-2: Classification of groups of environmental parameters and their severities - Transportation and handling*

[10] IEC 60721-3-3, *Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weatherprotected locations*

[11] IEC 60721-3-4, *Classification of environmental conditions - Part 3-4: Classification of groups of environmental parameters and their severities - Stationary use at non-weatherprotected locations*

[12] IEC 60721-3-5, *Classification of environmental conditions - Part 3-5: Classification of groups of environmental parameters and their severities - Ground vehicle installations*

[13] IEC 60721-3-6, *Classification of environmental conditions - Part 3-6: Classification of groups of environmental parameters and their severities - Ship environments*

[14] IEC 60721-3-7, *Classification of environmental conditions - Part 3-7: Classification of groups of environmental parameters and their severities, - Portable and non-stationary use*

[15] IEC 60721-4 (all parts), *Classification of environmental conditions*

[16] IEC TR 60721-4-1, *Classification of environmental conditions - Part 4-1: Guidance for the correlation and transformation of environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068 - Storage*[5]

[17] IEC TR 60721-4-2, *Classification of environmental conditions - Part 4-2: Guidance for the correlation and transformation of environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068 - Transportation*[6]

[18] IEC TS 60721-4-3, *Classification of environmental conditions - Part 4-3: Guidance for the correlation and transformation of environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068 - Stationary use at weatherprotected locations*

[19] IEC TS 60721-4-4, *Classification of environmental conditions - Part 4-4: Guidance for the correlation and transformation of environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068, stationary use at non-weatherprotected locations*[7]

[20] IEC TR 60721-4-5, *Classification of environmental conditions - Part 4-5: Guidance for the correlation and transformation of environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068 - Ground vehicle installations*

[21] IEC TR 60721-4-6, *Classification of environmental conditions - Part 4-6: Guidance for the correlation and transformation of environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068 - Ship environments*

[22] IEC TR 60721-4-7, *Classification of environmental conditions - Part 4-7: Guidance for the correlation and transformation of environmental condition classes of IEC 60721-3 to the environmental tests of IEC 60068 - Portable and non-stationary use*

[23] IEC 61373, *Railway applications - Rolling stock equipment - Shock and vibration tests*

[24] IEC 62131 (all parts), *Environmental conditions - Vibration and shock of electrotechnical equipment*

[25] IEC TR 62131-2, *Environmental conditions - Vibration and shock of electrotechnical equipment - Part 2: Equipment transported in fixed wing jet aircraft*

[26] IEC TR 62131-3, *Environmental conditions - Vibration and shock of electrotechnical equipment - Part 3: Equipment transported in rail vehicles*

[27] IEC TR 62131-4, *Environmental conditions - Vibration and shock of electrotechnical equipment - Part 4: Equipment transported road vehicles*

[28] IEC TR 62131-5, *Environmental conditions - Vibration and shock of electrotechnical equipment - Part 5: Equipment during storage and handling*

[29] IEC TR 62131-6, *Environmental conditions - Vibration and shock of electrotechnical equipment - Part 6: Transportation by propeller aircraft*

[30] IEC TR 62131-7, *Environmental conditions - Vibration and shock of electrotechnical equipment - Part 7: Transportation by rotary wing aircraft*

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5 This publication has been withdrawn.

6 This publication has been withdrawn.

7 Under preparation. Stage at the time of publication: IEC TS/A2CD 60721-4-4:2025

[31] IEC TR 62131-8, *Environmental conditions - Vibration and shock of electrotechnical equipment - Part 8: Transportation in ships*

[32] IEC 60945, *Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results*

[33] ISO 2041, Mechanical *vibration, shock and condition monitoring - Vocabulary*

[34] ISO 16750-3, *Road vehicles - Environmental conditions and testing for electrical and electronic equipment, Part 3 Mechanical loads*

[35] ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

[36] ISO 19453 (all parts), *Road vehicles - Environmental conditions and testing for electrical and electronic equipment for drive system of electric propulsion vehicles*

[37] ISO/IEC Guide 98-3, *Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

[38] ETSI 300 019-2-2, *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-2: Specification of environmental tests; Transportation*

[39] ETSI EN 300 019-2-3, *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment - Part 2-3: Specification of environmental tests; Stationary use at weather- protected locations*

[40] ETSI 300 019-2-4, *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment - Part 2-4: Specification of environmental tests; Stationary use at non-weatherprotected locations*

[41] ETSI 300 019-2-5, *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment - Part 2: Specification of environmental tests; Sub-part 5: Ground vehicle installations*

[42] ETSI 300 019-2-6, *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment - Part 2-6: Specification of environmental tests; Ship environments*

[43] ETSI EN 300 019-2-7, *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment - Part 2-7: Specification of environmental tests; Portable and non-stationary use*

[44] ETSI 300 019-2-8, *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment - Part 2-8: Specification of environmental tests; Stationary use at underground locations*

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[46] RTCA DO-160G:2010, *Environmental conditions and test procedures for airborne equipment*

[47] IEC Guide 108, *Guidelines for ensuring the coherence of IEC publications - Horizontal functions, horizontal publications and their application*

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