

Environmental testing - Part 2-85: Tests - Test Fj:  
Vibration - Long time history replication

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 60068-2-85:2019 sisaldab Euroopa standardi EN IEC 60068-2-85:2019 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 60068-2-85:2019 consists of the English text of the European standard EN IEC 60068-2-85:2019.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 23.08.2019.	Date of Availability of the European standard is 23.08.2019.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 19.040

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English Version

**Environmental testing - Part 2-85: Tests - Test Fj: Vibration -  
Long time history replication  
(IEC 60068-2-85:2019)**

Essais d'environnement - Partie 2-85 : Essais - Essai Fj:  
Vibrations - Reproduction dans le temps par  
accélérogrammes  
(IEC 60068-2-85:2019)

Umgebungseinflüsse - Teil 2-85: Prüfverfahren - Prüfung Fj:  
Schwingen, Nachbildung von Langzeitsignalen  
(IEC 60068-2-85:2019)

This European Standard was approved by CENELEC on 2019-07-25. 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.

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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

## European foreword

The text of document 104/833/FDIS, future edition 1 of IEC 60068-2-85, prepared by IEC/TC 104 "Environmental conditions, classification and methods of test" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60068-2-85.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-04-25
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-07-25

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## Endorsement notice

The text of the International Standard IEC 60068-2-85:2019 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-3-8	NOTE	Harmonized as EN 60068-3-8
IEC 60068-2-27	NOTE	Harmonized as EN 60068-2-27
IEC 60068-2-81	NOTE	Harmonized as EN 60068-2-81
IEC 60068-1	NOTE	Harmonized as EN 60068-1
IEC 60068-5-2	NOTE	Harmonized as EN 60068-5-2
ISO/IEC 17025:2017	NOTE	Harmonized as EN ISO/IEC 17025:2017 (not modified)
IEC 60721-3 (series)	NOTE	Harmonized as EN 60721-3-9:1993/A1 (series)

## Annex ZA

(normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-6	-	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	-
IEC 60068-2-47	-	Environmental testing - Part 2-47: Test - Mounting of specimens for vibration, impact and similar dynamic tests	EN 60068-2-47	-
IEC 60068-2-64	2008	Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance	EN 60068-2-64	2008

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ENVIRONMENTAL TESTING –****Part 2-85: Tests – Test Fj: Vibration –  
Long time history replication****FOREWORD**

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International Standard IEC 60068-2-85 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

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

FDIS	Report on voting
104/833/FDIS	104/840/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.

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

This first edition of IEC 60068-2-85 was initiated in 2008 and a first proposal was prepared in 2011. It was developed out of the existing standard IEC 60068-2-64:2008 which contains a technically similar test method and modified accordingly. This facilitates usage and maintenance of both standards.

Differences are that this document relies on a specified time history. A test spectrum is not specified.

This part of IEC 60068 deals with long time history replication vibration testing intended for general application to components, equipment and other products, hereinafter referred to as "specimens", that may be subjected to vibrations of an arbitrary nature not covered by the other existing methods for vibration testing. The methods and techniques in this document are based on digital control of vibration in the time domain which allow a more flexible definition of the vibration input signal to suit individual cases that are specified in the relevant specification.

Compared with most other tests, test Fj is based on deterministic techniques, and the time history is supposed to have a long duration. There are nearly no restrictions to the vibration characteristics besides the technical limitations of the test apparatus.

As the vibration input signal in this test is specified by a digital time history stored in a file, there are no general methods for comparing two different test severities. The vibration tolerances cannot be given in a single measure, as this depends on the purpose of the test. Therefore, it is emphasized that long time history replication testing always demands a high degree of engineering judgement by the user and specifier. The writer of the relevant specification is expected to select the testing procedure, test time history and its severity, tolerances and analysis methods, 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 used as a vibration testing system.

Long time history replication vibration testing 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.

If the specimens are subjected to vibration of a deterministic transient or periodic nature resulting from transportation or real life environments that are covered by other test methods, these are generally preferred. See IEC 60068-3-8 [1]<sup>1</sup> for estimating the dynamic vibration environment of the specimen and based on that, selecting the appropriate test method.

Annex A provides guidance and a list of details that can be considered for inclusion in specifications.

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<sup>1</sup> Numbers in square brackets refer to the bibliography.

## ENVIRONMENTAL TESTING –

### Part 2-85: Tests – Test Fj: Vibration – Long time history replication

#### 1 Scope

This part of IEC 60068 demonstrates the adequacy of specimens to resist dynamic loads without unacceptable degradation of its functional and/or structural integrity when subjected to the specified vibration test requirements as defined by a time history (long time history replication). These can either be recorded in measurement exercises or generated artificially. In both cases, this method allows for generating a test tailored to very specific applications.

Typical applications are tests in which very specific deterministic transient, periodical or random excitation is necessary and the characteristics of the motion are not covered by other test standards. This includes time histories not sufficiently represented by the standard shock tests of IEC 60068-2-27 [2] or a general description by a shock response spectrum as in IEC 60068-2-81 [3], periodical vibration that is not covered by a sinusoidal waveform as in IEC 60068-2-6, and random vibration that is not covered by the description of Gaussian or non-Gaussian (high kurtosis) broad-band random vibration of IEC 60068-2-64. However, the user is made aware that long time history replication uses a deterministic time history. Simulation of random vibration of any kind is approximated by quasi-random.

In addition, additional mixed mode tests are possible with this test method by generating time histories that are representations of the required test signals. This includes tests of high complexity.

The purpose of this test is different from IEC 60068-2-57 [4]. The purpose of IEC 60068-2-57 is an evaluation for a transient vibration using mainly a synthesized time history. A long time history test is mainly used for a durability and functionality test using an actual time history measured in a real field environment. It can also be used as a method to apply a simulated non-gaussian time history.

This document is applicable to specimens which can be subjected to vibration of a very specific 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, for testing packaged products.

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 is applicable for single axis excitation.

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