Environmental testing

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

This English-language version is derived from the original bilingual publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.
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FOREWORD

1) The IEC (International Electrotechnical Commission) is a world-wide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation 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, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

3) They have the form of recommendations for international use published in the form of standards, 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.

This International Standard has been prepared by sub-committee 50A: Shock and vibration tests, of IEC technical committee 50: Environmental testing.

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

<table>
<thead>
<tr>
<th>DIS</th>
<th>Report on Voting</th>
<th>Amendment to DIS</th>
<th>Report on Voting</th>
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<tr>
<td>50A(CO)206</td>
<td>50A(CO)223</td>
<td>50A(CO)224</td>
<td>50A(CO)227</td>
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</tbody>
</table>

Full information on the voting for the approval of this standard can be found in the reports on voting indicated in the above table.

It has the status of a basic safety publication in accordance with IEC Guide 104.
IEC 68 consists of the following parts, under the general title: Environmental testing.

- Part 1: General and guidance
- Part 2: Tests
- Part 3: Background information
- Part 4: Information for specification writers – Test summaries
- Part 5: Guide to drafting of test methods

Annex A forms an integral part of this standard.

Annexes B and C are for information only.
INTRODUCTION

This standard for broad-band random vibration testing is intended for general application to specimens of electrotechnical products that may be subjected to vibrations of a stochastic nature. The methods and techniques in this standard are based on digital control of random vibration. It permits the introduction of variations to suit individual cases, if these are prescribed by the relevant specification. The standard provides an alternative to the established analogue versions of the random vibration wide-band tests (test Fd, IEC 68-2-34 to 68-2-37).

It should be noted that random vibration testing is a complex subject requiring both a good basic understanding of the philosophy of the test and the exercise of considerable engineering judgement.

Compared with most other 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.

Annex A is a normative annex giving the requirements for the vibration response investigation.

Specification writers will find in clause 11 a list of details to be considered for inclusion in specifications, and in annex B (informative), the guidance.

Annex C is an informative annex, cross-referenced to the relevant clauses, giving the conversion between the quoted values (in dB or percentages) and the values with the alternative magnitudes.
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1 Object

The object of this International Standard is to provide two standard test methods (method 1 and method 2) for determining the ability of a specimen to withstand specified severities of broad-band random vibration. Neither test method can be considered more severe than the other, the difference being primarily that method 2 provides more information to quantify the applied test, and is therefore more reproducible.

It is also to reveal the accumulated effects of stress induced by random vibration, and the resulting mechanical weakness and degradation in specified performance and to use this information, in conjunction with the relevant specification, to assess the acceptability of specimens. In some cases, this standard may also be used to demonstrate the mechanical robustness of specimens and/or to study their dynamic behaviour.

This standard is applicable to specimens which may 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 may be considered as part of the specimen itself.

Although primarily intended for electrotechnical products, this standard is not restricted to them and may be used in other fields where desired.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 68. At the time of publication, the editions indicated were valid. All normative documents are subject to revision and parties to agreements based on this part of IEC 68 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. Members of IEC and ISO maintain registers of current valid International Standards.

Chapter 301: General terms on measurements in electricity.
Chapter 302: Electrical measuring instruments.
Chapter 303: Electronic measuring instruments. (Advance edition)

IEC 68, Environmental testing.

IEC 68-2, Environmental testing – Part 2: Tests.


IEC 68-2-47: 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 721, Classification of environmental conditions.