

INTERNATIONAL STANDARD

NORME INTERNATIONALE

BASIC SAFETY PUBLICATION

PUBLICATION FONDAMENTALE DE SÉCURITÉ

Environmental testing –

Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens

Essais d'environnement –

Partie 2-31: Essais – Essai Ec: Choc lié à des manutentions brutales, essai destiné en premier lieu aux matériels



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENVIRONMENTAL TESTING –**Part 2-31: Tests –
Test Ec: Rough handling shocks,
primarily for equipment-type specimens**

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International Standard IEC 60068-2-31 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 1969 and constitutes a technical revision.

The major changes with regard to the previous edition concern the introduction of soft packaging tests, where appropriate. This new edition of IEC 60068-2-31 now incorporates the second edition of IEC 60068-2-32 (1975).

IEC 60068-2-32 will be withdrawn once this standard has been issued.

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

FDIS	Report on voting
104/458/FDIS	104/462/RVD

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

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

It has the status of a basic safety publication in accordance with IEC Guide 104.

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 publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

ENVIRONMENTAL TESTING –

Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens

1 Scope

This part of IEC 60068 deals with a test procedure for simulating the effects of rough handling shocks, primarily in equipment-type specimens, the effects of knocks, jolts and falls which may be received during repair work or rough handling in operational use.

This procedure does not simulate the effects of impacts received during transportation as loosely constrained cargo. Where the effects of loose cargo transportation are to be assessed, test Ee: Bounce should be used. Also this procedure does not simulate the effects of shock applied to installed equipments. Where this effect is to be assessed refer to test Ea: Shock.

Testing should only be specified for equipment likely to receive such rough handling, for example those of small to medium size and mass, and should only be applied to those faces and corners where there is a risk of such treatment being encountered.

In general, equipment which is frequently handled and serviced (for example field equipment and unit spares) can be considered at risk, whereas equipment forming an integral part of a permanent installation would not normally be considered at risk and need not be tested.

Testing may not be applicable to fragile unprotected equipment of irregular shape (for example aircraft nose radar) which, when removed from the installation would be contained in a handling frame or jig. It may however be applicable to these items of equipment when they are in their transit case or in their handling frame or jig.

For equipment which stands only on one face (for example the normal base) the test is generally only applied to that face.

Shock tests are performed on the specimen when fixed to the test machine. Drop and topple, free fall, repeated free fall and bounce tests are performed with the specimen free.

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 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-55:1987, *Environmental testing – Part 2-55: Tests – Test Ee and guidance: Bounce*

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

ISO 48:2007, *Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 4180-2:1980, *Complete, filled transport packages – General rules for the compilation of performance test schedules – Part 2: Quantitative data*

3 General description of test

Rough handling shocks can be simulated by one or more of the following tests:

a) Drop and topple

A simple test intended to assess the effects of knocks or jolts likely to be received primarily by equipment-type specimens during repair work or rough handling on a table or bench.

b) Free fall – Procedure 1

A simple test to assess the effects of falls likely to be experienced due to rough handling. It is also suitable to demonstrate a degree of robustness.

c) Free fall – Procedure 2

A test that additionally simulates repetitive shocks likely to be received by certain component-type specimens, for example connectors in service.

The topple test need not be applied to specimens which have dimensions which make them stable whilst being handled. Reference to points 1) and 2) below should be made for information on the “*c – g* ratio” and “height ratio” to establish if the test is necessary.

The falling or topple actions produced by the test procedures given in 5.1.3.1, 5.1.3.2 and 5.1.3.3 are illustrated by Figures 1, 2 and 3.

The drop and topple test includes three distinct procedures:

- i) dropping on to a face (5.1.3.1);
- ii) dropping on to an edge or a corner (5.1.3.2);
- iii) toppling (or pushover) (5.1.3.3).

The purpose of each of these procedures is basically the same, but they represent different kinds of handling.

The test is not intended to be a precise test and a tolerance of $\pm 10\%$ is allowed on the heights and angles prescribed in 5.1.2.

NOTE For a more precise shock test, test Ea: Shock (IEC 60068-2-27) should be used.

The topple test need not be applied to specimens which have dimensions which make them stable while being handled. When considering the applicability of the topple test, two dimensional ratios are important:

- 1) the ratio of the height of the centre of gravity from the base, to the smaller dimension of the base, hereinafter referred to as the *c – g* ratio;
- 2) the ratio of the height of the specimen to the smaller dimension of the base, hereinafter referred to as the height ratio.

If the *c – g* ratio is small, for example less than 0,25, the specimen is unlikely to fall over due to sudden sideways displacements. If the height ratio is small, for example less than 0,5, the specimen is unlikely to topple over due to a sudden sideways force or blow at the top. In such cases the writer of the relevant specification should consider whether the topple test is applicable.