INTERNATIONAL STANDARD

ISO 2247

Third edition
2000-03-01

Packaging — Complete, filled transport packages and unit loads — Vibration tests at fixed low frequency

Emballages — Emballages d'expédition complets et pleins et charges unitaires — Essais de vibration à basse fréquence fixe

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 2247 was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 3, *Performance requirements and tests for means of packaging, packages and unit loads (as required by ISO/TC 122)*.

This third edition cancels and replaces the second edition (ISO 2247:1985), which has been technically revised.

Annex A forms a normative part of this International Standard.

Introduction

It is the responsibility of the user of this International Standard to establish appropriate health and safety practice in accordance with relevant legislation.

Packaging — Complete, filled transport packages and unit loads — Vibration tests at fixed low frequency

1 Scope

This International Standard specifies methods to carry out vibration tests on complete, filled transport packages or unit loads using sinusoidal excitation at fixed frequency. These tests may be used to assess the performance of packages and unit loads in terms of the strength or the protection that they offer to their contents when subjected to low frequency vibration. These tests may be performed either as a single test to investigate the effects of low frequency vibration or as a part of a sequence of tests designed to measure the ability of a package or unit load to withstand a distribution system that includes a vibration hazard at low frequency or repetitive shocks.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2206, *Packaging — Complete, filled transport packages — Identification of parts when testing*.

ISO 2233, *Packaging — Complete, filled transport packages and unit loads — Conditioning for testing*.

ISO 2234, *Packaging — Complete, filled transport packages and unit loads — Stacking tests using static load*.

3 Term and definition

For the purposes of this International Standard, the following term and definition applies.

3.1
test specimen
a complete, filled transport package or unit load

4 Principle

The test specimen is placed on a vibration table and subjected to a vibration using an approximately sinusoidal excitation at a fixed low frequency. The atmospheric conditions, the duration of the test, the peak acceleration, the attitude of the test specimen and any method of restraint are predetermined.

NOTE When required, a load may be superimposed on the test specimen to simulate conditions at the bottom of a stack.

5 Apparatus

5.1 Vibration equipment, meeting the following requirements:

a) capable of operating at a fixed peak to peak vertical component displacement and operational frequency within the range selected from Figure A.1 (see normative annex A). A rotary movement of the table is allowed;

b) of sufficient size and performance, in terms of power, displacement, frequency range and stiffness. Its lowest resonant frequency shall be higher than the highest test frequency. It shall be horizontal within a maximum angular deviation of 0,3°.

NOTE The table may be equipped with:

1) low fences to restrict sideways and endways movements during testing;

2) high fences or other means of maintaining a superimposed load in position on the test specimen during testing;

3) means to simulate the method of restraining the test specimen during transit.

5.2 Instrumentation, if required, meeting the following requirements:

a) comprising accelerometers, signal conditioners and data display or storage devices to measure and control the accelerations at the test surface;

b) having an acceleration response accurate to within ± 5 % over the frequency range specified for the test.

6 Test specimen preparation and conditioning

6.1 Preparation

Fill the test specimen with its intended contents and ensure that the test specimen is closed normally, as if ready for distribution.

NOTE Simulated or substitute contents may be used provided that the dimensions and physical properties of such contents are as close as possible to those of the intended contents. The normal method of closure should still be used.

6.2 Conditioning

The test specimen shall be conditioned in accordance with one of the conditions described in ISO 2233.

7 Procedure

7.1 Common procedure for methods A and B

7.1.1 Wherever possible, the test shall be carried out in atmospheric conditions identical to those used for conditioning, particularly where this is critical to the materials or application of the test specimen. In other circumstances, the test shall be carried out in atmospheric conditions which approximate those used for conditioning as closely as is practicable.

7.1.2 Place the test specimen in the predetermined attitude on the vibration table (see 5.1), with the centre of its lowest face or its centre of gravity placed as near as practicable to the centre of the table; if the test specimen is not secured to the table it may be fenced.

7.1.3 If a superimposed load is required, the loading procedure shall comply with ISO 2234.

7.1.4 Subject the test specimen to vibration according to either method A (see 7.2) or method B (see 7.3).

7.2 Method A

7.2.1 Operate the vibration table to give an acceleration at a selected level between 0,5 g and 1,0 g with the test specimen not separating from the table.

7.2.2 Perform the test at a peak to peak displacement selected from Figure A.1 of annex A, at a fixed frequency within the appropriate frequency range, to produce a test acceleration between 0,5 g and 1,0 g.

7.3 Method B

7.3.1 Operate the vibration table to give an acceleration at a selected level such that the test specimen separates from the table causing repetitive shocks.

7.3.2 Select the desired vibration amplitude, start vibration of the test specimen at a frequency of 2 Hz and slowly increase it until the test specimen repeatedly separates from the vibration table.

NOTE 1 Separation of the test specimen from the vibration table may be determined by inserting a 1,5 mm to 3,0 mm thick spacer, with a minimum width of 50 mm, under at least 1/3 of the base area of the test specimen. This may be done by moving the spacer along the base of the test specimen during the test.

NOTE 2 The results of the test may be influenced by the thickness of the spacer.

8 Test report

The test report shall include:

a) a reference to this International Standard;

b) the name and address of the testing laboratory and the name and address of the customer;

c) the unique identification of the report;

d) the date of receipt of the test specimens and the date(s) of performance of the test;

e) the name, title and signature of persons accepting test responsibility for the test report;

f) a statement to the effect that the test results relate only to the specimens tested;

g) a statement that the report shall not be reproduced except in full without the written approval of the testing laboratory;

h) the number of replicate test specimens tested;

i) a full description, including dimensions, structural and material specifications of the test specimen and its fittings, cushioning, blocking, closure and reinforcing arrangements, gross mass of the test specimen and mass of the contents in kilograms;

j) a description of the contents and if simulated or substituted contents were used, full details shall be given;

k) the relative humidity, the temperature and time of conditioning, the temperature and relative humidity of the test area at the time of the test, whether these values comply with the requirements of ISO 2233;

l) the method used (A and/or B);

m) the attitudes in which the test specimen was tested, using the method of identification specified in ISO 2206;

n) the vertical motion of the table, whether linear, linear inclined, circular, elliptical or other, the vertical and horizontal peak to peak displacement, the fixed frequency and the duration of the test;

o) whether a superimposed load was used and if so, the mass, in kilograms, of the superimposed load and the period of time during which the test specimen was under load;

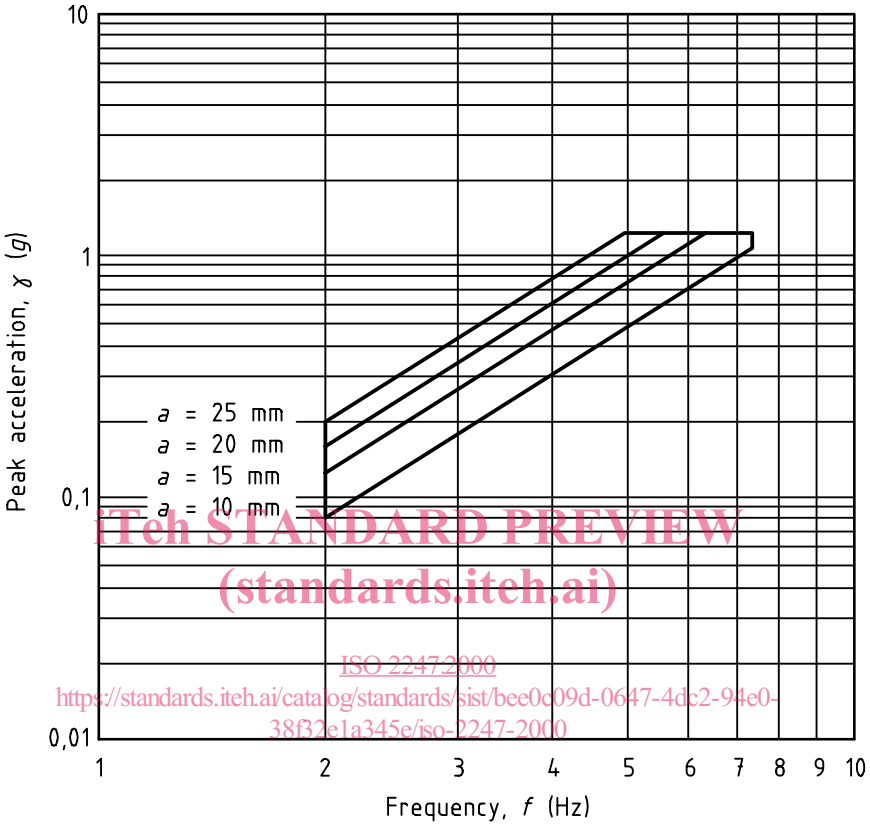
p) the method of restraint, and whether low or high fences were used;

q) any deviations from the test method described in this International Standard;

r) a record of the result, including any observations which assist in the correct interpretation of the results.

Annex A
(normative)

Peak acceleration



$\gamma(g)$ = peak acceleration in terms of acceleration due to gravity g
a = peak to peak amplitude, expressed in millimetres
f = frequency, expressed in hertz

Figure A.1 — Peak acceleration