

INTERNATIONAL STANDARD

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Packaging — Complete, filled transport packages — Compression and stacking tests using a compression tester

*Emballages — Emballages d'expédition complets et pleins — Essais de
compression et de gerbage à l'aide d'une machine d'essai de compression*



Reference number
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Foreword

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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.

International Standard ISO 10248 was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 3, *Performance requirements and tests*.

This first edition cancels and replaces ISO 2872:1985 and ISO 2874:1974, which have been technically revised.

Annexes A and B of this International Standard are for information only.

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Packaging — Complete, filled transport packages — Compression and stacking tests using a compression tester

1 Scope

This International Standard specifies a method for testing the resistance to compression of complete, filled transport packages and a method for carrying out a stacking test on complete, filled transport packages using the same apparatus.

The test may be used to assess the performance of a package in terms of its strength or the protection it offers to its contents when it is subjected to compressive forces. A test may be performed either as a single test to investigate the effects (deformation, collapse or failure) of compression or stacking, or as part of a sequence of tests designed to measure the ability of a package to withstand a distribution system that includes a compression or stacking hazard.

This test may also be used as a stacking test to investigate performance under particular conditions of loading, as, for example, when the bottom package in a stack rests on an open-decked pallet.

2 Normative references

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

ISO 2206:1987, *Packaging — Complete, filled transport packages — Identification of parts when testing*.

ISO 2233:—¹⁾, *Packaging — Complete, filled transport packages — Conditioning for testing*.

3 Principle

The test package is placed between the platens of a compression tester and either:

- in the case of a compression test, a load is applied until failure occurs or predetermined values for load or displacement are reached; or
- in the case of a stacking test, a predetermined load is applied for a predetermined time or until failure occurs.

4 Apparatus

4.1 Compression tester, motor-driven, platen-type, capable of applying load through uniform movement of one or both platens at a relative speed of 10 mm/min $\pm$ 3 mm/min.

NOTES

1 The comparison between results obtained from apparatus operated at other speeds (for example 12,5 mm/min $\pm$ 2,5 mm/min) and results obtained at 10 mm/min $\pm$ 3 mm/min is not recommended.

2 For certain packagings, such as metal drums or wooden crates, lower speeds may be required to prevent load peaks in excess of the predetermined value.

4.1.1 Platens

Each platen shall be

— flat:

- with a tolerance of 1 part in 1 000 for surface areas $<1 \text{ m}^2$;
- for surface areas $>1 \text{ m}^2$, such that when placed horizontally the difference in height between the lowest and highest points of the platen does not exceed 1 mm;

— dimensioned so as to extend over the whole area of that side of the test package or interposed devices with which it is in contact;

1) To be published. (Revision of ISO 2233:1986)

- rigid, so as not to deform by more than 1 mm at any point when the tester applies a load of 75 % of its maximum rating, either to a centrally placed 100 mm × 100 mm × 100 mm block having sufficient strength to accept the load without failure, or to four similar blocks placed at the four corners, in the case of swivel-mounted platens.

One platen shall remain horizontal, within a tolerance of two parts per 1 000, at all times during the test. The other platen shall be either rigidly mounted so as to remain horizontal within two parts per 1 000 at all times during the test, or be held by a universal joint at its centre and so be free to tilt in any direction.

The working surfaces of the platens may be locally recessed for fixing bolts etc.

4.1.2 Means of applying a predetermined load for a predetermined time, with a fluctuation not exceeding ± 4 % of the predetermined load and with no more relative movement of the platens than is necessary to maintain this load during any vertical displacement of the upper platen.

4.2 Recording device or other means of indicating applied load and platen displacement, with a percentage of error not exceeding 2 % of the load and an accuracy for recording platen displacement of ± 1 mm.

4.3 Means of measuring package dimensions with an accuracy of ± 1 mm.

5 Package preparation

The test package shall normally be filled with its intended contents. However, simulated or dummy contents may be used, on condition that the dimensions and physical properties of such contents shall be as close as possible to those of the intended contents.

Ensure that the test package is closed normally, as if ready for distribution. If simulated or dummy contents are used, ensure that the normal method of closure is still employed.

6 Conditioning

The package shall be conditioned in accordance with one of the sets of conditions given in ISO 2233.

7 Procedure

Wherever possible the test shall be carried out in the same atmospheric conditions as used for conditioning, where this is critical to the materials or application of the package. In other circumstances, the test shall be carried out in atmospheric conditions

which are as near as practicable to those used for conditioning.

When possible, carry out the test on five replicate packages.

7.1 Compression test

7.1.1 Weigh the package and its contents separately, fill the package and measure the external dimensions of the filled package.

7.1.2 Place the test package centrally on the lower platen of the test machine (4.1), in the predetermined attitude.

When the compression load is not to be applied over the whole surface of the package which is being tested, appropriate devices should be suitably interposed between the package and platen of the compression tester in order to simulate the conditions met in distribution systems when applying these compression loads.

7.1.3 Apply the load by relative movement of the platens at the appropriate speed, in such a way that peaks in excess of the predetermined load do not occur, until the predetermined value is reached or until collapse occurs, whichever is first. If collapse occurs first, record the value of the load reached.

In measuring deformation, the initial reading (the datum point), unless otherwise specified, shall be taken at an initial load which is a function of the expected average compression load according to table 1.

Table 1 — Datum points

Average compression load N	Datum point N
101 – 200	10
201 – 1 000	25
1 001 – 2 000	100
2 001 – 10 000	250
10 001 – 20 000	1 000
20 001 – 100 000	2 500
etc.	etc.

7.1.4 If required, maintain the predetermined load for a predetermined time or until collapse occurs, whichever is first. If collapse occurs first, record the value of the time elapsed.

7.1.5 Remove the load by movement of the platens, examine the package and, if collapse has occurred, measure its dimensions and examine the contents for damage.

7.1.6 Where it is desired to measure the ability of a complete, filled transport package to resist external

compressive loads applied to opposite edges or corners of the package, follow the procedure in 7.1.1 to 7.1.5, using a tester in which the platens are not free to tilt.

7.2 Stacking test

NOTE 3 A stacking test on a complete, filled transport package, using one of three methods of applying a static load, is given in ISO 2234.

7.2.1 Proceed as in 7.1.1 to 7.1.3 and maintain the predetermined load for a predetermined time or until collapse occurs, whichever is first. If collapse occurs first, record the value of the time elapsed.

NOTE 4 Where it is desired to measure the ability of a complete, filled transport package to resist external compressive loads applied during stacking, a tester with one fixed platen is preferred.

7.2.2 Remove the load by movement of the platens, examine the package and, if collapse has occurred, measure its dimensions and examine the contents for damage.

NOTES

5 At any time during the test it may be necessary to measure dimensions (see annex A).

6 Appropriate profiles representative of particular loading conditions may be inserted between platens and package as required.

8 Test report

The test report shall include the following information:

- a) reference to this International Standard;
- b) whether a compression or stacking test was carried out;
- c) number of replicate packages tested;
- d) full description of the package, including dimensions, structural and material specifications of the package and its fittings, cushioning, blocking, closure or reinforcing arrangements;
- e) description of the contents — if simulated or dummy contents were used, full details shall be given;
- f) gross mass of the package and mass of contents, in kilograms;
- g) relative humidity, temperature and time of conditioning; temperature and relative humidity of test area at time of test; whether these values comply with the requirements of ISO 2233;
- h) the attitude in which the package was tested, using the method of identification given in ISO 2206;
- i) type of test apparatus used, including whether the compression tester was mechanically or hydraulically operated and whether or not both platens were rigidly mounted;
- j) location of measurement points on packages and stage of test at which measurements were made;
- k) design and dimensions of any profiles used;
- l) test conditions, i.e.: the rate of application of the load (see 4.1), the load applied, in newtons, and duration of application of load to the package;
- m) a record of the average results, including load applied until collapse if less than the predetermined load, the time elapsed until collapse if less than the predetermined time, any observed changes in package dimensions and, if required, load/platen displacement recording, with any observations which may assist in correct interpretation;
- n) any deviation from the test methods described in this International Standard;
- o) date of test;
- p) signature of tester.

Annex A (informative)

Example of a method of measuring package deformation load

A.1 Place the weighed, filled transport package centrally between the platens and apply, at the standard rate of $10 \text{ mm/min} \pm 3 \text{ mm/min}$, an initial load of approximately 10 % of the value of the predetermined load to be applied.

A.2 Take a preliminary series of dimensional measurements of the package from the surfaces which apply the load to the package to several points along the vertical edges of the package and, optionally, along the sides.

A.3 Apply the predetermined load for a predetermined time.

A.4 Repeat the dimensional measurements, in the same positions as in A.2, at predetermined stages during application of the load.

NOTE 7 The average deformations may be measured more simply by using a chart recorder.