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मानक

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IS 7028-2 (2002): Performance Tests for Complete, Filled Transport Packages, Part 2: Vibration Test at Fixed Low Frequency [TED 24: Transport Packages]



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भारतीय मानक

पूरे, भरित परिवहन पैकेज का कार्यकारिता परीक्षण

भाग 2 नियत निम्न आवृत्ति पर कंपन परीक्षण

(दूसरा पुनरीक्षण)

*Indian Standard*

PERFORMANCE TESTS FOR COMPLETE,  
FILLED TRANSPORT PACKAGES

PART 2 VIBRATION TEST AT FIXED LOW FREQUENCY

(*Second Revision*)

ICS 55.180.40

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**BUREAU OF INDIAN STANDARDS**  
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NEW DELHI 110002

## FOREWORD

This Indian Standard (Part 2) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Transport Packages and Packaging Codes Sectional Committee had been approved by Transport Engineering Division Council.

This standard was first published in 1973. The second revision of this standard was undertaken to bring it in line with the revised International Standard ISO 2247 : 2000 'Packaging — Complete, filled transport packages and unit loads — Vibration tests at fixed low frequency'.

In this revision the following technical changes have been incorporated:

- a) Operational frequency range is provided for methods of test along with a graph instead of 3,4 and 6 Hz frequency;
- b) Concept of unit loads;
- c) Clauses on terminology and reference;
- d) A sub-clause on instrumentation has been included under APPARATUS; and
- e) Two types of methods of test to subject the test specimen to vibration.

The composition of the committee responsible for the preparation of this standard is given in Annex A.

*Indian Standard***PERFORMANCE TESTS FOR COMPLETE,  
FILLED TRANSPORT PACKAGES****PART 2 VIBRATION TEST AT FIXED LOW FREQUENCY***( Second Revision )***1 SCOPE**

This 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 REFERENCES**

**2.1** The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
7028(Part 1) : 2002	Performance test for complete, filled transport packages: Part 1 Stack load test ( <i>second revision</i> )
7031 : 2001	Method of conditioning for testing of complete, filled transport packages ( <i>second revision</i> )

**3 TERMINOLOGY**

For the purposes of this standard, the following term and definition shall apply.

**3.1 Test Specimen**

A complete, filled transport package or unit load.

**4 PRINCIPLE**

**4.1** 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. 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 Fig. 1. A rotary movement of the table is allowed; and
- 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°.

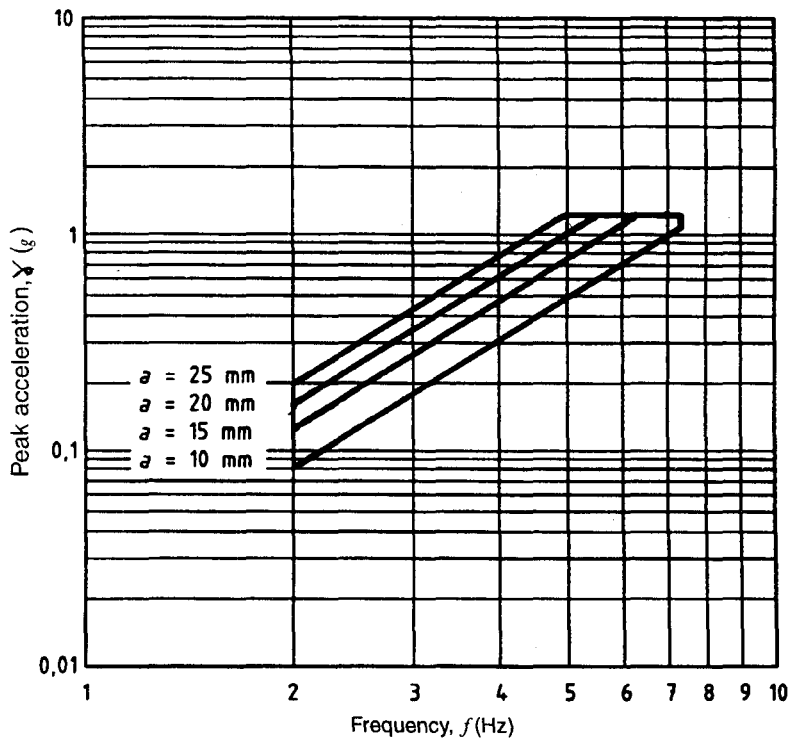
**5.2 The table may be equipped with:**

- a) low fences to restrict sideways and endways movements during testing;
- b) high fences or other means of maintaining a superimposed load in position on the test specimen during testing; and
- c) means to simulate the method of restraining the test specimen during transit.

**5.3 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; and
- b) Having an acceleration response accurate to within  $\pm 5$  percent over the frequency range specified for the test.



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

FIG. 1 PEAK ACCELERATION

## 6 TEST SPECIMEN PREPARATION

### 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.

6.2 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 shall still be used.

## 7 CONDITIONING

The test specimen shall be conditioned in accordance with one of the conditions described in IS 7031.

## 8 PROCEDURE

### 8.1 Common Procedure for Methods A and B

8.1.1 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.

8.1.2 Place the test specimen in the predetermined attitude on the vibration table (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.

8.1.3 If a superimposed load is required, the loading procedure shall comply with IS 7028 (Part 1).

8.1.4 Subject the test specimen to vibration according to either Method A (8.2) or Method B (8.3).

### 8.2 Method A

8.2.1 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.

8.2.2 Perform the test at a peak to peak displacement selected from Fig. 1, at a fixed frequency within the appropriate frequency range, to produce a test acceleration between 0.5 g and 1.0 g.

### 8.3 Method B

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

8.3.2 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.

#### NOTES

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 the 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.

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

### 9 TEST REPORT

The test report shall include:

- a) a reference to this standard;
- b) name and address of the testing laboratory and the name and address of the customer;
- c) unique identification of the report;
- d) date of receipt of the test specimens and the date(s) of performance of the test;
- e) 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) number of replicate test specimens tested;
- j) 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;
- k) a description of the contents and if simulated or substituted contents were used, full details shall be given;
- m) relative humidity, the temperature and time of conditioning, the temperature and relative humidity of the test area at the time of the test;
- n) method used (A and/or B);
- p) 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;
- q) 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;
- r) method of restraint, and whether low or high fences were used;
- s) any deviations from the test method described in this standard; and
- t) a record of the result, including any observations which assist in the correct interpretation of the results.



## ANNEX A

## (Foreword)

## COMMITTEE COMPOSITION

## Transport Packages and Packaging Codes Sectional Committee, TED 24

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Indian Institute of Packaging, Mumbai	SHRI P. V. NARAYANAN ( <i>Chairman</i> )
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Joint Director (Transport Engg), BIS

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### Amendments Issued Since Publication

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