

---

---

**Transport packaging — Reusable,  
rigid plastic distribution boxes —**

**Part 2:  
General specifications for testing**

*Emballages de transport — Boîtes de distribution en plastique rigide,  
réutilisables —*

*Partie 2: Spécifications d'essai générales*



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Performance requirements</b> .....	<b>1</b>
4.1 Surfaces.....	1
4.2 Dimensions.....	2
4.3 Shape stability.....	2
4.4 Stacking stability.....	2
4.5 Base deflection.....	2
<b>5 Requirements before testing</b> .....	<b>2</b>
5.1 General.....	2
5.2 Conditioning.....	2
5.3 Dimensions and weight.....	2
5.4 Test load.....	3
5.4.1 General.....	3
5.4.2 Test load inside the box.....	3
5.4.3 Test load on top of the box.....	3
<b>6 Test methods</b> .....	<b>3</b>
6.1 Stacking test using static load.....	3
6.1.1 Test parameters.....	3
6.1.2 Test method.....	3
6.2 Drop test.....	4
6.2.1 General.....	4
6.2.2 Drop test 1.....	4
6.2.3 Drop test 2.....	4
6.2.4 Sequence.....	4
6.3 Base deflection test.....	7
6.3.1 Test parameters.....	7
6.3.2 Test method.....	7
<b>Bibliography</b> .....	<b>8</b>

## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

The committee responsible for this document is ISO/TC 122, *Packaging*.

A list of all parts in the ISO 18616 series can be found on the ISO website.

## Introduction

Standardization is a crucial element to improve the efficiency of a returnable packaging system in a supply chain and can help to integrate a supply chain. Standardization of returnable transport items (RTI) and its operation system (returnable transport system) is the first step for an efficient and seamless supply chain. RTI standards such as container sizes, materials and weights enable a company's supply chain integration. A standardized returnable packaging operation system facilitates the supply chain automation, increases efficiency of inventory control and reduces total logistics costs. Global standardization of returnable transport systems can help a company to make it easy to invest in their packaging system while facilitating smooth and integrated supply chain interfaces from suppliers to customers.



# Transport packaging — Reusable, rigid plastic distribution boxes —

## Part 2: General specifications for testing

### 1 Scope

This document specifies the test methods for handling and managing reusable, rigid plastic distribution boxes. These boxes are based on the modular area 600 mm × 400 mm, 600 mm × 500 mm, 550 mm × 366 mm and subdivisions of them.

This document is designed for general purpose applications in a returnable transport system. For automotive industry application, ISO 19709-1, ISO/TS 19709-2 and ISO/TS 19709-3 can be referenced.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

ISO 2233, *Packaging — Complete, filled transport packages — Conditioning for testing*

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

ISO 2248, *Packaging — Complete, filled transport packages — Vertical impact test by dropping*

ISO 3394, *Packaging — Complete, filled transport packages and unit loads — Dimensions of rigid rectangular packages*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18616-1 and ISO 21067 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 4 Performance requirements

#### 4.1 Surfaces

The box shall be free from foreign bodies, blowholes, cracks and burrs and granules which have not melted, as well as from other defects. Minor unevenness or sunken areas produced in processing are permissible provided that fitness for use is not adversely affected.

## **4.2 Dimensions**

Tolerances on nominal sizes shall be not greater than  $\pm 0,5$  %.

The plan view sizes shall not exceed the modular sizes as given in ISO 3394.

Tolerances on nominal tare mass shall not exceed  $\pm 3$  %.

## **4.3 Shape stability**

When tested in accordance with [6.2](#), boxes shall exhibit no visible change or damage such as cracks or embedding. No deformation which reduces the functions of the box shall be acceptable.

## **4.4 Stacking stability**

When tested in accordance with [6.1](#), stacks of three boxes shall keep their equilibrium during and after the test.

The reduction of the height of the stack under load shall be less than 2 % of the first measurement (taken between the first and second measurement).

The residual reduction of the height of the stack shall be less than 1 % of the first measurement (taken between the first and third measurement).

## **4.5 Base deflection**

When tested in accordance with [6.3](#), the deflection under load shall be less than 3 % of the actual base diagonal length (taken between the first and second measurement).

The residual deflection shall be less than 1 % of the actual base diagonal length (taken between the first and third measurement).

# **5 Requirements before testing**

## **5.1 General**

All tests shall be conducted on new and unused boxes.

Tests shall be conducted not earlier than 72 h after the manufacture of the box. The time between manufacturing and testing shall be recorded.

The boxes to be tested shall be selected at random throughout a production batch.

The surfaces of the boxes to be tested shall be identified in accordance with ISO 2206.

## **5.2 Conditioning**

Unless otherwise specified, all samples shall be preconditioned for 24 h at  $23 \text{ °C} \pm 2 \text{ °C}$  before testing in accordance with ISO 2233.

## **5.3 Dimensions and weight**

The overall length, width, height and tare mass shall be determined before the commencement of testing but after conditioning as the mean of five samples.



## 5.4 Test load

### 5.4.1 General

The test load shall be calculated by multiplying the maximum load to be contained in or supported by the safety factor of at least 1,5.

### 5.4.2 Test load inside the box

Unless otherwise specified, the test load inside the box shall be uniformly spread and shall occupy more than 80 % of the capacity of the box. It shall be composed either of fabric or plastic film bags containing 500 g of plastic granules (type A) or steel balls (type B), or the products which have been chosen to be transported in the box.

Where both types of bags are used in a box, type B bags shall be placed in the base of the box with type A bags above.

Empty type A bags shall have flat dimensions of 150 mm × 200 mm and shall be able to contain 500 g of plastic granules.

Empty type B bags shall have flat dimensions of 100 mm × 100 mm and shall be able to contain 500 g of steel balls measuring 5 mm to 8 mm in diameter.

### 5.4.3 Test load on top of the box

Test load on top of the box shall be applied via a flat and rigid surface on the top box (see [Figure 1](#)).

## 6 Test methods

### 6.1 Stacking test using static load

#### 6.1.1 Test parameters

The following parameters shall be used:

- a) Temperature of test: 23 °C ± 2 °C
- b) Number of samples: 3 tests using 3 new boxes per test (total number: 9 boxes);
- c) Loading:
  - 1st: 10 % of the test load;
  - 2nd: 100 % of the test load.

#### 6.1.2 Test method

The test shall be carried out in accordance with ISO 2234 and the chosen test method shall be recorded.

Stack three empty boxes.

Place a test load via a flat and rigid surface on the top box (see [Figure 1](#)).

Take measurements, expressed in millimetres (mm), at every corner of the stack between the placement level and the surface of application of the test load:

- a) 1st measurement with 10 % of the test load at 23 °C ± 2 °C;
- b) 2nd measurement with 100 % of the test load after 96 h at 23 °C ± 2 °C;
- c) Relaxation: The test load is removed and the box is placed at 23 °C ± 2 °C for 24 h;

- d) 3rd measurement with 10 % of the test load at  $23\text{ °C} \pm 2\text{ °C}$ .

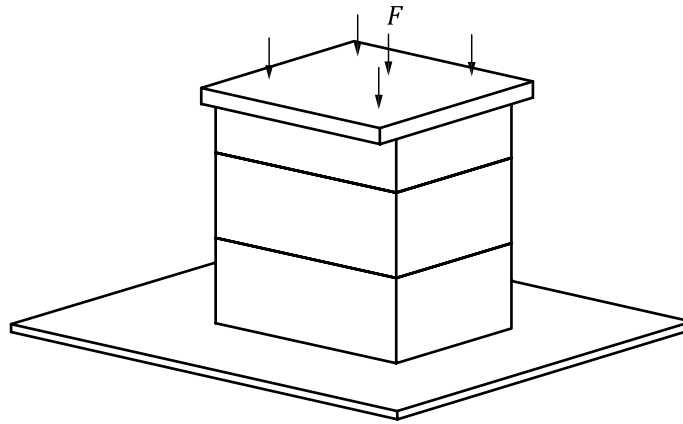


Figure 1 — Stacking test using static load

## 6.2 Drop test

### 6.2.1 General

The test shall be performed in accordance with ISO 2248, using the test parameters given in [6.2.2](#) and [6.2.3](#) (see [Figure 2](#)).

### 6.2.2 Drop test 1

- a) Conditioning:  $-18\text{ °C} \pm 2\text{ °C}$ , 4 h minimum;
- b) Test temperature:  $23\text{ °C} \pm 2\text{ °C}$ ;
- c) Test load: none;
- d) Height: 0,75 m;
- e) Number of tests: 5, using new boxes for each sequence of drops (total number 5 boxes).

When the test procedure exceeds 4 min, the boxes shall be reconditioned for a minimum period of 30 min.

### 6.2.3 Drop test 2

- a) Conditioning:  $23\text{ °C} \pm 2\text{ °C}$ , 4 h minimum;
- b) Test temperature:  $23\text{ °C} \pm 2\text{ °C}$ ;
- c) Test load: none;
- d) Height: 2,0 m;
- e) Number of tests: 5, using new boxes for each sequence of drops (total number 5 boxes).

### 6.2.4 Sequence

The sequence of drops for every test shall be:

- a) impact on to whole box base;
- b) impact on to lower longitudinal edge;

- c) impact on to lower lateral edge;
- d) impact on to one lower corner to lower diagonal line of the box base.

The box shall be positioned as if suspended from the opposite corner, edge or side to be tested (see [Figure 2](#)).

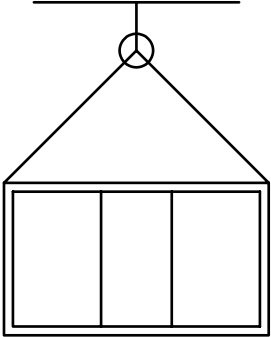
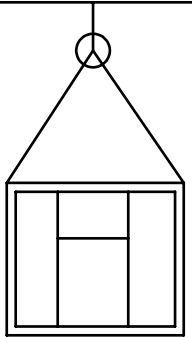
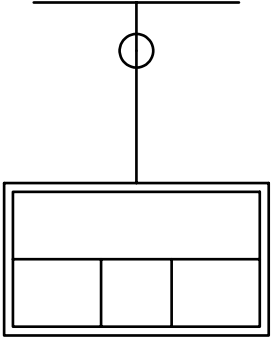
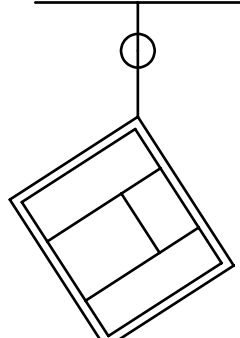
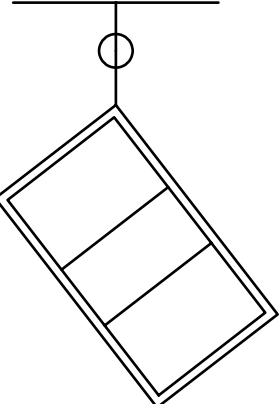
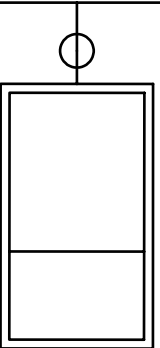
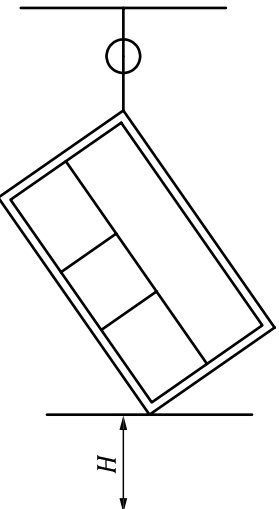
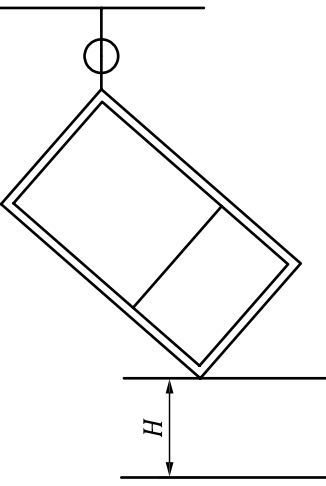
	Longitudinal view	Lateral view
1. Impact on to whole box base		
2. Example: impact on to lower longitudinal edge		
3. Example: impact on to lower lateral edge		
4. Example: impact on to one lower corner to lower diagonal line of the box base		

Figure 2 — Drop test sequence

### 6.3 Base deflection test

#### 6.3.1 Test parameters

The following parameters shall be used:

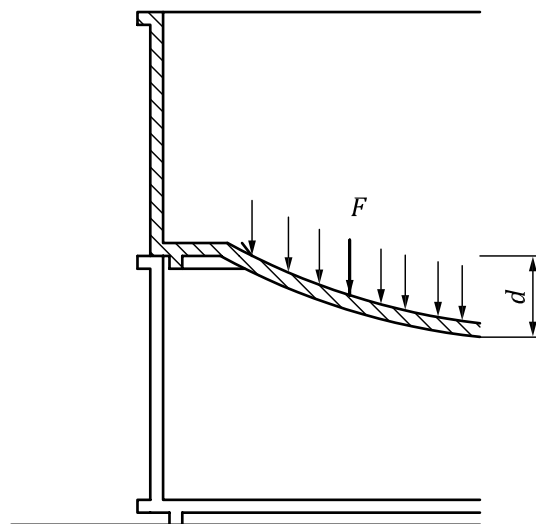
- a) Temperature of test:  $23\text{ °C} \pm 2\text{ °C}$ ;
- b) Number of samples: 2 boxes;
- c) Loading:
  - 1st: 10 % of the test load;
  - 2nd: 100 % of the test load;
  - 3rd: 10 % of the test load.

#### 6.3.2 Test method

Using the following method, measure the deflection ( $d$ ) of the base of the box containing the load ( $F$ ) when supported on an assembly with the same points of support (see [Figure 3](#)):

- a) 1st measurement with a ballast of 10 % of the test load at  $23\text{ °C} \pm 2\text{ °C}$ ;
- b) 2nd measurement with a ballast of 100 % of the test load after 96 h at  $23\text{ °C} \pm 2\text{ °C}$ ;
- c) Relaxation: The ballast is removed and the box, still remaining on its support is placed at  $23\text{ °C} \pm 2\text{ °C}$ ; for 24 h;
- d) 3rd measurement at  $23\text{ °C} \pm 2\text{ °C}$ ; with a ballast of 10 % of the test load.

All measurements shall be taken at the point of maximum base deflection.



#### Key

- $d$  deflection
- $F$  load

**Figure 3 — Static deflection of base**

## Bibliography

- [1] ISO 3676, *Packaging — Complete, filled transport packages and unit loads — Unit load dimensions*
- [2] ISO 18616-1, *Transport packaging — Reusable, rigid plastic distribution boxes — Part 1: General purpose application*
- [3] ISO 21067, *Packaging — Vocabulary*



