

Cellular rubbers and plastics —

Determination of dynamic cushioning performance

ICS 83.100

National foreword

This British Standard is the UK implementation of EN ISO 4651:1995+A1:2008. It is identical with ISO 4651:1988, incorporating amendment 1:2006. It supersedes BS EN ISO 4651:1995 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO text carry the number of the ISO amendment. For example, text altered by ISO amendment 1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted to Technical Committee PRI/24, Testing of rigid and flexible cellular materials.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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This British Standard, having been prepared under the direction of the Sector Board for Materials and Chemicals, was published under the authority of the Standards Board and comes into effect on 15 July 1995

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Amendments/corrigenda issued since publication

Date	Comments
December 1995	Correction to National foreword supersession paragraph
31 December 2009	Implementation of ISO amendment 1:2006 with CEN endorsement A1:2008

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English version

Cellular rubbers and plastics — Determination of dynamic cushioning performance

(ISO 4651 : 1988)

Caoutchoucs et plastiques
alvéolaires — Détermination de la capacité
d'amortissement dynamique
(ISO 4651 : 1988)

Schaumstoffe aus Kautschuk und
Kunststoffen — Bestimmung der
stoßabsorption
(ISO 4651 : 1988)

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

The text of the international standard from ISO/TC 45, Rubber and rubber products, of the International Organization for Standardization (ISO) has been taken over as a European Standard by the Technical Committee CEN/TC 249, Plastics.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 1995, and conflicting national standards shall be withdrawn at the latest by November 1995.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

NOTE. Normative references to International publications are listed in annex ZA (normative).

Foreword to amendment A1

The text of ISO 4651:1988/Amd 1:2006 has been prepared by Technical Committee ISO/TC 61 "Plastics" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 4651:1995/A1:2008 by Technical Committee CEN/TC 249 "Plastics" the secretariat of which is held by NBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2009, and conflicting national standards shall be withdrawn at the latest by February 2009.

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Endorsement notice

The text of ISO 4651:1988/Amd 1:2006 has been approved by CEN as a EN ISO 4651:1995/A1:2008 without any modification.

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⚠ “WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.” **⚠**

1 Scope

This International Standard specifies the procedure for determining the dynamic cushioning performance of cellular rubber materials and rigid and flexible cellular plastics, by measuring the peak deceleration of a mass when it is dropped on a test piece. The test described is intended primarily for quality assurance; in addition, however, since this type of test is also used to obtain design data, notes are given in annex A to assist in the latter respect.

The method is applicable solely to materials used in packaging.

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 listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

⚠ ISO 291, *Plastics — Standard atmospheres for conditioning and testing*.

ISO 845, *Cellular plastics and rubbers — Determination of apparent density*.

ISO 1923, *Cellular plastics and rubbers — Determination of linear dimensions*.

ISO 2231, *Rubber- or plastics-coated fabrics — Standard atmospheres for conditioning and testing*.

ISO 3205, *Preferred test temperatures*.

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*. **⚠**

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 static stress, σ_{ST} : The total mass of the hammer and any additional masses multiplied by the gravitational acceleration g_n divided by the original area of the test piece.

3.2 peak deceleration, a : The maximum deceleration of the drop hammer during the impact on the test piece. In the International System of Units (SI), this is expressed in metres per second per second (m/s^2).

3.3 displacement curve: The curve describing the displacement of the impacted surface of the test piece as a function of time during the impact. (See annex A.)

3.4 dynamic stress: The decelerating force exerted by the material upon the drop hammer divided by the original area of the test piece.

3.5 deceleration force: The mass of the drop hammer multiplied by its instantaneous deceleration.

3.6 strain: Displacement expressed as a percentage of the original thickness.

3.7 dynamic compression diagram: The curve describing the relation between the dynamic stress (decelerating force per unit area) and the strain (displacement/thickness) in the cushioning material during impact. The slope of this curve at a specified strain (dynamic compressibility) may be used as a characteristic constant for the given speed of impact and the thickness of the test piece. (See annex A.)

3.8 cushioning diagram: The diagram indicating both the peak deceleration a and the maximum value ΔL_{max} of the displacement of the impact surface as a function of the static stress σ_{ST} for the test pieces of the concerned materials having given thickness L_0 . (See annex A.)

3.9 corrected value of peak deceleration, a_c : The value of the peak deceleration after correction for any small deviation of the test piece original thickness from the standard reference thickness of 50 mm. This is obtained by multiplying the measured peak deceleration by the original thickness divided by the standard reference thickness.

3.10 equivalent drop height, h : That drop height which, in conditions of free fall in vacuo under standard gravitational acceleration, would result in the same impact velocity of the hammer as was obtained during the test.