

Cellular plastics — Determination of volume percentage of open and closed cells of rigid materials

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/24, Testing of rigid and flexible cellular material, upon which the following bodies were represented:

- British Plastics Federation
- British Railways Board
- British Rigid Urethane Foam Manufacturers' Association
- British Rubber Manufacturers' Association Ltd.
- Department of the Environment (Building Research Establishment)
- Furniture Industry Research Association
- Furniture, Timber and Allied Trades Union
- Ministry of Defence
- National Bed Federation Limited
- Phenolic Foam Manufacturers' Association
- RAPRA Technology Ltd.
- Society of British Aerospace Companies Limited
- Society of Motor Manufacturers and Traders Limited

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National foreword

This British Standard has been prepared by Technical Committee PRI/24, and is the English language version of EN ISO 4590:1995 *Cellular plastics — Determination of volume percentage of open and closed cells of rigid materials* published by the European Committee for Standardization (CEN), which is identical with ISO 4590:1981, published by the International Organization for Standardization (ISO).

This British Standard supersedes method 10 of BS 4370-2:1993 which is deleted by amendment.

Cross-reference

Publication referred to	Corresponding British Standard
EN ISO 1923:1995	BS EN ISO 1923:1995 <i>Cellular plastics and rubbers — Determination of linear dimensions</i>

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN ISO title page, pages 2 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Cellular plastics — Determination of volume percentage of open and closed cells of rigid materials

(ISO 4590:1981)

Plastiques alvéolaires — Détermination du pourcentage volumique de cellules ouvertes ou fermées des matériaux rigides
(ISO 4590:1981)

Schaumstoffe — Bestimmung des Volumenanteils offener und geschlossener Zellen in harten Schaumstoffen
(ISO 4590:1981)

This European Standard was approved by CEN on 1995-05-11. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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 61, Plastics, 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).

1 Scope and field of application

This International Standard specifies a general method for the determination of the volume percentage of open and closed cells of rigid cellular plastics, by measurement first of the geometrical volume and then of the air impenetrable volume of test specimens. This method provides for correcting the apparent open cell volume by taking into account the surface cells opened by cutting during specimen preparation. Two alternative methods and corresponding apparatus are specified for the measurement of the impenetrable volume. The results obtained are to be used for comparison purposes only.

2 Reference

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

3 Definitions

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

3.1

surface area, S

the total surface area of the test specimen determined by measuring its geometrical dimensions

3.2

geometrical volume, V_g

the volume of the test specimen determined by measuring its geometrical dimensions

3.3

surface/volume ratio, r

the ratio $\frac{S}{V_g}$ for the test specimen

3.4

impenetrable volume, V_i

the volume of the test specimen into which air cannot penetrate and from which gas cannot escape, under the test conditions

3.5

apparent volume percentage of open cells, ω_r
the ratio

$$\frac{V_g - V_i}{V_g} \times 100$$

it includes the volume of the cells opened during cutting of the test specimen, and depends on the nature of the cellular plastic under test and on the surface/volume ratio r of the test specimen

3.6

corrected volume percentage of open cells, ω_o

the apparent volume percentage of open cells ω_r , corrected to take into account the surface cells opened by cutting during preparation of the test specimens

it is the limit of the apparent volume percentage of open cells ω_r as the surface/volume ratio r approaches zero

3.7

corrected volume percentage of closed cells, ψ_o

volume percentage remaining after accounting for corrected volume percentage of open cells

$$\psi_o = 100 - \omega_o$$

this percentage includes the volume of the cell walls

4 Principle

Determination of the surface area S and geometrical volume V_g of a number of test specimens, each having different geometrical surface/volume ratio r .

Determination of the impenetrable volume V_i by either of two methods, namely

- a) method 1 — by pressure variation (pycnometer);
- b) method 2 — by volume expansion.

The determination of the impenetrable volume V_i is based on the application of the Boyle-Mariotte law to a gas confined in an indeformable chamber, first in the absence and then in the presence of a test specimen.

Calculation of the apparent volume percentage of open cells ω_r of the test specimen, plotting of the curve $\omega_r = f(r)$ and extrapolation to $r = 0$, followed by calculation of the corrected volume percentage of open cells ω_o and the corrected volume percentage of closed cells ψ_o .

5 Test specimens

5.1 Number and shape

A minimum of three sets of test specimens, with each set consisting of three rectangular parallelepipeds (see Figure 1) shall be prepared from each sample. The specimens of each of the three sets are to be designated r_1 , r_2 and r_3 .

5.2 Preparation

Test specimens are to be cut with a bandsaw and machined if necessary, with minimum deformation to the original cell structure. They shall be free of dust, voids and moulding skins.

Hot-wire cutting shall not be used.