Plastics —
Determination of
tensile properties —

Part 2: Test conditions for moulding
and extrusion plastics

The European Standard EN ISO 527-2:1996 has the status of a
British Standard

IMPORTANT NOTE. Before reading this method it is essential to read
BS 2782-0, Introduction, issued separately.
Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Plastics and Rubber Standards Policy Committee (PRM/-) to Technical Committee PRM/21, upon which the following bodies were represented:

British Plastics Federation
British Textile Confederation
Department of the Environment (Building Research Establishment)
Department of Trade and Industry (National Physical Laboratory)
Electrical and Electronic Insulation Association (BEAMA Ltd.)
GAMBICA (BEAMA Ltd.)
Institute of Materials
Ministry of Defence
Packaging and Industrial Films Association
Pira International
RAPRA Technology Ltd.

Amendments issued since publication

<table>
<thead>
<tr>
<th>Amd. No.</th>
<th>Date</th>
<th>Comments</th>
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<tr>
<td>8639</td>
<td>November 1996</td>
<td>Indicated by a sideline in the margin</td>
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</table>

The following BSI references relate to the work on this standard:
Committee reference PRM/21
Draft for comment 91/39044 DC

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Contents

Committees responsible
National foreword Inside front cover
Foreword ii
1 Scope 2
2 Normative references 3
3 Principle 3
4 Definitions 3
5 Apparatus 3
6 Test specimens 3
7 Number of test specimens 4
8 Conditioning 4
9 Procedure 4
10 Calculation and expression of results 4
11 Precision 4
12 Test report 4
Annex A (normative) Small specimens 6
Annex ZA (normative) Normative references to international publications with their relevant European publications 8
Figure 1 — Test specimen types 1A and 1B 5
Figure A.1 — Test specimen types 1BA and 1BB 6
Figure A.2 — Test specimen types 5A and 5B 7
List of references Inside back cover
National foreword


Cross-references

<table>
<thead>
<tr>
<th>International standard</th>
<th>Corresponding British Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 293:1986</td>
<td>BS 2782</td>
</tr>
<tr>
<td></td>
<td>Methods of testing plastics</td>
</tr>
<tr>
<td></td>
<td>Method 901A:1988 Compression moulding test specimens of thermoplastic material</td>
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<td></td>
<td>(Technically equivalent)</td>
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The Technical Committee has reviewed the provisions of ISO 37:1977 and ISO 1926:1979, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

WARNING NOTE. This British Standard, which is identical with ISO 527-2, does not necessarily detail all the precautions necessary to meet the requirements of the Health and Safety at Work etc. Act 1974. Attention should be paid to any appropriate safety precautions and the method should be operated only by trained personnel.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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 8, 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.
En ISO 527-2

May 1996

ICS 83.080

Descriptors: See ISO document

English version

Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics


Plastiques — Détermination des propriétés en traction — Partie 2: Conditions d’essai des plastiques pour moulage et extrusion


Kunststoffe — Bestimmung der Zugeigenschaften — Teil 2: Prüfbedingungen für Form- und Extrusionsmassen


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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.

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Foreword

The text of the International Standard from Technical Committee ISO/TC 61, Plastics, of the International Organization for Standardization (ISO) has been taken over as a European Standard by Technical Committee CEN/TC 249, Plastics, the secretariat of which is held by IBN.

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 1996, and conflicting national standards shall be withdrawn at the latest by November 1996.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of 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 and the United Kingdom.
1 Scope

1.1 This part of ISO 527 specifies the test conditions for determining the tensile properties of moulding and extrusion plastics, based upon the general principles given in ISO 527-1.

1.2 The methods are selectively suitable for use with the following range of materials:

— rigid and semirigid thermoplastics moulding, extrusion and cast materials, including compounds filled and reinforced by e.g. short fibres, small rods, plates or granules but excluding textile fibres (see ISO 527-4 and ISO 527-5) in addition to unfilled types;
— rigid and semirigid thermosetting moulding and cast materials, including filled and reinforced compounds but excluding textile fibres as reinforcement (see ISO 527-4 and ISO 527-5);
— thermotropic liquid crystal polymers.

The methods are not suitable for use with materials reinforced by textile fibres (see ISO 527-4 and ISO 527-5), with rigid cellular materials or sandwich structures containing cellular material.

1.3 The methods are applied using specimens which may be either moulded to the chosen dimensions or machined, cut or punched from injection- or compression-moulded plates. The multipurpose test specimen is preferred (see ISO 3167:1993, Plastics — Multipurpose test specimens).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 527. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 527 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 294:—, Plastics — Injection moulding of test specimens of thermoplastic materials1).
ISO 2818:—, Plastics — Preparation of test specimens by machining2).

3 Principle


4 Definitions

For the purposes of this part of ISO 527, the definitions given in ISO 527-1 apply.

5 Apparatus


6 Test specimens

6.1 Shape and dimensions

Wherever possible, the test specimens shall be dumb-bell-shaped types 1A and 1B as shown in Figure 1. Type 1A is preferred for directly-moulded multipurpose test specimens, type 1B for machined specimens.

NOTE 1 Types 1A and 1B test specimens having 4 mm thickness are identical to the multipurpose test specimens according to ISO 3167, types A and B, respectively.

For the use of small specimens, see Annex A.

6.2 Preparation of test specimens

Test specimens shall be prepared in accordance with the relevant material specification. When none exists, or unless otherwise specified, specimens shall be either directly compression- or injection moulded from the material in accordance with ISO 293, ISO 294 or ISO 295, as appropriate, or machined in accordance with ISO 2818 from plates that have been compression- or injection-moulded from the compound.

All surfaces of the test specimens shall be free from visible flaws, scratches or other imperfections. From moulded specimens all flash, if present, shall be removed, taking care not to damage the moulded surface.

Test specimens from finished goods shall be taken from flat areas or zones having minimum curvature.

For reinforced plastics, test specimens should not be machined to reduce their thickness unless absolutely necessary. Test specimens with machined surfaces will not give results comparable to specimens having non-machined surfaces.

1) To be published. (Revision of ISO 294:1975)
2) To be published. (Revision of ISO 2818:1980)
6.3 Gauge marks
See ISO 527-1:1993, subclause 6.3.

6.4 Checking the test specimens

7 Number of test specimens

8 Conditioning

9 Procedure

For the measurement of the modulus of elasticity, the speed of testing shall be 1 mm/min for specimen types 1A and 1B (see Figure 1). For small specimens see Annex A.

10 Calculation and expression of results

11 Precision
The precision of this test method is not known, because interlaboratory data are not available. When interlaboratory data are obtained, a precision statement will be added with the next revision.

12 Test report
The test report shall include the following information:

a) a reference to this part of ISO 527, including the type of specimen and the testing speed according to:

<table>
<thead>
<tr>
<th>Tensile test</th>
<th>ISO 527-2/1A/50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of specimen (see figure 1)</td>
<td></td>
</tr>
<tr>
<td>Testing speed, in millimetres per minute (see ISO 527-1:1992, table 1)</td>
<td></td>
</tr>
</tbody>
</table>

For items b) to q) in the test report, see ISO 527-1:1993, 12 b) to q).
Specimen type    1A                  1B

<table>
<thead>
<tr>
<th>Dimension</th>
<th>1A</th>
<th>1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>$l_3$ Overall length</td>
<td>$\geq 150^a$</td>
<td></td>
</tr>
<tr>
<td>$l_1$ Length of narrow parallel-sided portion</td>
<td>$80 \pm 2$</td>
<td>$60,0 \pm 0,5$</td>
</tr>
<tr>
<td>$r$ Radius</td>
<td>20 to 25</td>
<td>$\geq 60^b$</td>
</tr>
<tr>
<td>$l_2$ Distance between broad parallel-sided portions</td>
<td>104 to 113$^c$</td>
<td>106 to 120$^c$</td>
</tr>
<tr>
<td>$b_2$ Width at ends</td>
<td>20,0 ± 0,2</td>
<td></td>
</tr>
<tr>
<td>$b_1$ Width of narrow portion</td>
<td>10,0 ± 0,2</td>
<td></td>
</tr>
<tr>
<td>$h$ Preferred thickness</td>
<td>4,0 ± 0,2</td>
<td></td>
</tr>
<tr>
<td>$L_0$ Gauge length</td>
<td>50,0 ± 0,5</td>
<td></td>
</tr>
<tr>
<td>$L$ Initial distance between grips</td>
<td>115 ± 1</td>
<td>$l_2 + 5$</td>
</tr>
</tbody>
</table>

**NOTE** Specimen type 1A is preferred for directly-moulded multipurpose test specimens, type 1B for machined specimens.

- For some materials, the length of the tabs may need to be extended (e.g. $l_3 = 200$ mm) to prevent breakage or slippage in the testing jaws.
- $r = [(l_2 - l_1)^2 + (b_2 - b_1)^2]/4(b_2 - b_1)$
- Resulting from $l_1$, $r$, $b_1$ and $b_2$, but within the indicated tolerance.

Figure 1 — Test specimen types 1A and 1B
Annex A (normative)
Small specimens

If for any reason it is not possible to use a standard type 1 test specimen, specimens of the types 1BA, 1BB (see Figure A.1), 5A or 5B (see Figure A.2) may be used, provided that the speed of testing is adjusted to the value given in 5.1.2, Table 1 of ISO 527-1:1993, which gives the nominal strain rate for the small test specimen closest to that used for the standard-sized specimen. The rate of nominal strain is the quotient of the speed of testing (see 4.2 in ISO 527-1:1993) and the initial distance between grips. Where modulus measurements are required, the test speed shall be 1 mm/min. It may be technically difficult to measure modulus on small specimens because of small gauge lengths and short testing times. Results obtained from small specimens are not comparable with those obtained from type 1 specimens.

NOTE The specimen types 1BA and 1BB are proportionally scaled to type 1B with a reduction factor of 1 : 2 and 1 : 5 respectively with the exception of thickness.

Figure A.1 — Test specimen types 1BA and 1BB
### Dimensions in millimetres

<table>
<thead>
<tr>
<th>Type of specimen</th>
<th>5A</th>
<th>5B</th>
</tr>
</thead>
<tbody>
<tr>
<td>$l_2$ Overall length, minimum</td>
<td>$\geq 75$</td>
<td>$\geq 35$</td>
</tr>
<tr>
<td>$b_2$ Width at ends</td>
<td>$12.5 \pm 1$</td>
<td>$6 \pm 0.5$</td>
</tr>
<tr>
<td>$t_1$ Length of narrow parallel-sided portion</td>
<td>$25 \pm 1$</td>
<td>$12 \pm 0.5$</td>
</tr>
<tr>
<td>$b_1$ Width of narrow parallel-sided portion</td>
<td>$4 \pm 0.1$</td>
<td>$2 \pm 0.1$</td>
</tr>
<tr>
<td>$r_1$ Small radius</td>
<td>$8 \pm 0.5$</td>
<td>$3 \pm 0.1$</td>
</tr>
<tr>
<td>$r_2$ Large radius</td>
<td>$12.5 \pm 1$</td>
<td>$3 \pm 0.1$</td>
</tr>
<tr>
<td>$L$ Initial distance between grips</td>
<td>$50 \pm 2$</td>
<td>$20 \pm 2$</td>
</tr>
<tr>
<td>$L_0$ Gauge Length</td>
<td>$20 \pm 0.5$</td>
<td>$10 \pm 0.2$</td>
</tr>
<tr>
<td>$h$ Thickness</td>
<td>$\geq 2$</td>
<td>$\geq 1$</td>
</tr>
</tbody>
</table>

**NOTE** Test specimen types 5A and 5B are approximately proportional to type 5 of ISO 527-3 and represent respectively types 2 and 3 of ISO 37.

**Figure A.2 — Test specimen types 5A and 5B**
Annex ZA (normative)

Normative references to international publications with their relevant European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

<table>
<thead>
<tr>
<th>Publication</th>
<th>Year</th>
<th>Title</th>
<th>EN</th>
<th>Year</th>
</tr>
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</table>
List of references

See national foreword.
BS EN ISO
527-2:1996
BS 2782-3:
Method 322:
1994

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