

INTERNATIONAL  
STANDARD

**ISO**  
**527-2**

First edition  
1993-06-15

---

---

**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*



Reference number  
ISO 527-2:1993(E)

## 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 527-2 was prepared by Technical Committee ISO/TC 61, *Plastics*, Sub-Committee SC 2, *Mechanical properties*.

Together with the other parts of ISO 527, it cancels and replaces ISO Recommendation R 527:1966, which has been technically revised.

Annex A of this part of ISO 527 cancels and replaces ISO 6239:1986, *Plastics — Determination of tensile properties by use of small specimens*.

ISO 527 consists of the following parts, under the general title *Plastics — Determination of tensile properties*:

- *Part 1: General principles*
- *Part 2: Test conditions for moulding and extrusion plastics*
- *Part 3: Test conditions for sheet and film*
- *Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites*
- *Part 5: Test conditions for unidirectional fibre-reinforced plastic composites*

Annex A forms an integral part of this part of ISO 527.

© ISO 1993

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization  
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

# Plastics — Determination of tensile properties —

## Part 2:

### Test conditions for moulding and extrusion plastics

#### 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*).

1) To be published. (Revision of ISO 294:1975)

2) To be published. (Revision of ISO 2818:1980)

#### 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 37:1977, *Rubber, vulcanized — Determination of tensile stress-strain properties*.

ISO 293:1986, *Plastics — Compression moulding test specimens of thermoplastic materials*.

ISO 294:—<sup>1)</sup>, *Plastics — Injection moulding of test specimens of thermoplastic materials*.

ISO 295:1991, *Plastics — Compression moulding of test specimens of thermosetting materials*.

ISO 527-1:1993, *Plastics — Determination of tensile properties — Part 1: General principles*.

ISO 1926:1979, *Cellular plastics — Determination of tensile properties of rigid materials*.

ISO 2818:—<sup>2)</sup>, *Plastics — Preparation of test specimens by machining*.

**ISO 527-2:1993(E)****3 Principle**

See ISO 527-1:1993, clause 3.

**4 Definitions**

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

**5 Apparatus**

See ISO 527-1:1993, clause 5.

**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.

**6.3 Gauge marks**

See ISO 527-1:1993, subclause 6.3.

**6.4 Checking the test specimens**

See ISO 527-1:1993, subclause 6.4.

**7 Number of test specimens**

See ISO 527-1:1993, clause 7.

**8 Conditioning**

See ISO 527-1:1993, clause 8.

**9 Procedure**

See ISO 527-1:1993, clause 9.

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**

See ISO 527-1:1993, clause 10.

**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.

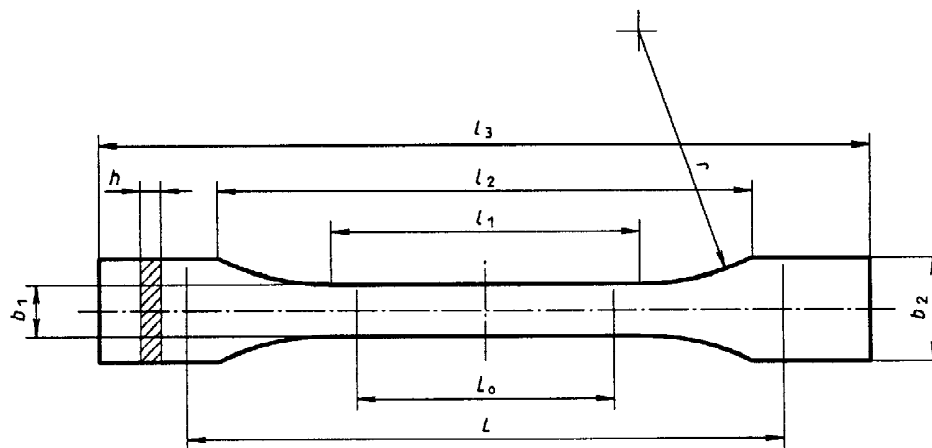
**12 Test report**

Tensile test ISO 527-2/1A/50  
 Type of specimen (see figure 1) \_\_\_\_\_  
 Testing speed, in millimetres per minute (see ISO 527-1: 1992, table 1) \_\_\_\_\_

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:

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



Dimensions in millimetres

Specimen type	1A	1B
$l_3$ Overall length		$\geq 150$ <sup>1)</sup>
$l_1$ Length of narrow parallel-sided portion	$80 \pm 2$	$60,0 \pm 0,5$
$r$ Radius	20 to 25	$\geq 60$ <sup>2)</sup>
$l_2$ Distance between broad parallel-sided portions	104 to 113 <sup>3)</sup>	106 to 120 <sup>3)</sup>
$b_2$ Width at ends	$20,0 \pm 0,2$	
$b_1$ Width of narrow portion	$10,0 \pm 0,2$	
$h$ Preferred thickness	$4,0 \pm 0,2$	
$L_0$ Gauge length	$50,0 \pm 0,5$	
$L$ Initial distance between grips	$115 \pm 1$	$l_2$ <sup>+5</sup> <sub>0</sub>

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

1) 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.

2)  $r = [(l_2 - l_1)^2 + (b_2 - b_1)^2] / 4 (b_2 - b_1)$

3) Resulting from  $l_1$ ,  $r$ ,  $b_1$  and  $b_2$ , but within the indicated tolerance.

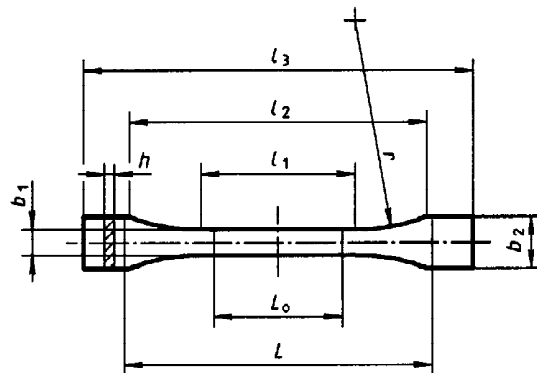
**Figure 1 — Test specimen types 1A and 1B**

## 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.

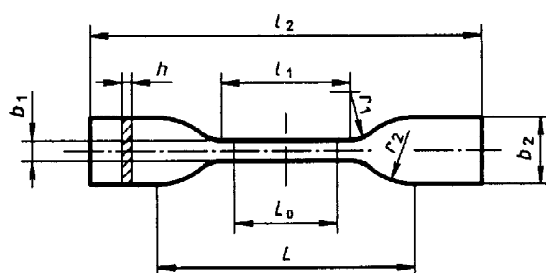


Dimensions in millimetres

Type of specimen	1BA	1BB
$l_3$ Overall length	$\geq 75$	$\geq 30$
$l_1$ Length of narrow parallel-sided portion	$30 \pm 0,5$	$12 \pm 0,5$
$r$ Radius	$\geq 30$	$\geq 12$
$l_2$ Distance between broad parallel-sided portions	$58 \pm 2$	$23 \pm 2$
$b_2$ Width at ends	$10 \pm 0,5$	$4 \pm 0,2$
$b_1$ Width of narrow portion	$5 \pm 0,5$	$2 \pm 0,2$
$h$ Thickness	$\geq 2$	$\geq 2$
$L_0$ Gauge length	$25 \pm 0,5$	$10 \pm 0,2$
$L$ Initial distance between grips	$l_2^{+2}_0$	$l_2^{+1}_0$

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

Type of specimen	5A	5B
$l_2$ Overall length, minimum	$\geq 75$	$\geq 35$
$b_2$ Width at ends	$12,5 \pm 1$	$6 \pm 0,5$
$l_1$ Length of narrow parallel-sided portion	$25 \pm 1$	$12 \pm 0,5$
$b_1$ Width of narrow parallel-sided portion	$4 \pm 0,1$	$2 \pm 0,1$
$r_1$ Small radius	$8 \pm 0,5$	$3 \pm 0,1$
$r_2$ Large radius	$12,5 \pm 1$	$3 \pm 0,1$
$L$ Initial distance between grips	$50 \pm 2$	$20 \pm 2$
$L_0$ Gauge length	$20 \pm 0,5$	$10 \pm 0,2$
$h$ Thickness	$\geq 2$	$\geq 1$

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

ISO 527-2:1993(E)

---

---

**UDC [678.5/.8].017:620.172**

**Descriptors:** plastics, moulding materials, extrusion materials, tests, tension tests, determination, tensile properties, testing conditions, test specimens.

Price based on 5 pages

---

---