

Australian Standard™

Determination of tensile properties of plastics materials

Part 3: Test conditions for films and sheets

[ISO title: Plastics—Determination of tensile properties, Part 3: Test conditions
for films and sheets]



S t a n d a r d s Australia

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CSIRO, Building, Construction and Engineering

Plastics and Chemicals Industries Association

Royal Australian Chemical Institute

Telstra Corporation

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PREFACE

This Standard was prepared by the Standards Australia Committee PL-010, Methods of Testing Plastics.

This Standard is identical to and is reproduced from ISO 527-3:1995 (E), *Plastics—Determination of tensile properties*, Part 3: *Test conditions for films and sheets*, and ISO 527-3:1995/Cor.1:1995. Amendments are indicated by a bar line set adjacent to the affected clause, figure, table, or part thereof.

The objective of this Standard is to provide testing agencies with a means for establishing conditions for testing of plastic films and sheets.

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
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<i>Reference to International Standard</i>		<i>Australian or Australian/New Zealand Standard</i>	
ISO/IEC		AS/NZS	
527	Plastics—Determination of tensile properties	1145	Determination of tensile properties of plastics materials
527-1	Part 1: General principals	1145.1	Part 1: General principals
4591	Plastics—Film and sheeting— Determination of average thickness of a sample, and average thickness and yield of a roll, by gravimetric techniques (gravimetric thickness)	—	
4593	Plastics—Film and sheeting— Determination of thickness by mechanical scanning	—	

AUSTRALIAN STANDARD

Determination of tensile properties of plastics materials—

Part 3: Test conditions for films and sheets

1 Scope

1.1 This part of ISO 527 specifies the conditions for determining the tensile properties of plastic films or sheets less than 1 mm thick, based upon the general principles given in part 1.

NOTE 1 For sheets greater than 1 mm thick, the user is referred to part 2 of this International Standard.

1.2 See ISO 527-1, subclause 1.2.

1.3 This part of ISO 527 is not normally suitable for determining the tensile properties of:

- a) cellular materials;
- b) plastics reinforced by textile fibres.

1.4 See ISO 527-1, subclause 1.5.

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

ISO 4591:1992, *Plastics — Film and sheeting — Determination of average thickness of a sample, and average thickness and yield of a roll, by gravimetric techniques (gravimetric thickness)*.

ISO 4593:1993, *Plastics — Film and sheeting — Determination of thickness by mechanical scanning*.

3 Principle

See ISO 527-1, clause 3.

4 Definitions

See ISO 527-1, clause 4.

5 Apparatus

See ISO 527-1, clause 5, subject to the following additional requirements:

In 5.1.2, the tensile-testing machine shall be capable of maintaining the speeds of testing as specified in table 1 of ISO 527-1. It is normal for films and sheets to be tested at a speed of 5 mm/min, 50 mm/min, 100 mm/min, 200 mm/min, 300 mm/min or 500 mm/min. The information contained in ISO 527-1, subclause 9.6, also applies.

In 5.1.5, when testing thin sheets or film material, the specimen shall not carry the weight of the extensometer.

In 5.2, devices complying with the requirements in ISO 4593 shall be used for measuring the thickness, except in the case of very thin film (less than 0,01 mm thick) or embossed film. In those cases, the thickness shall be determined by the method specified in ISO 4591. When ISO 4591 is used, the average thickness of the film sample shall be taken as the thickness of the test specimen.

6 Test specimens

6.1 Shape and dimensions

6.1.1 The preferred form of test specimen for the determination of tensile properties by this method is a strip 10 mm to 25 mm wide and not less than 150 mm long (specimen type 2 — see figure 1),

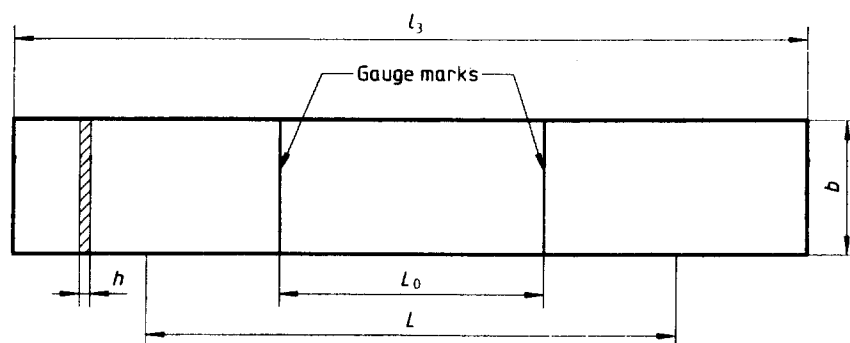
having two parallel gauge marks, 50 mm apart, on the central portion of the specimen.

Some film materials have a very high elongation at break which may result in them being outside the stretching capacity of the testing machine. In such cases, it is permissible to reduce the initial distance between the grips to 50 mm.

6.1.2 When required by the specification for the material under test or for routine quality-control tests, dumb-bell specimen types 5, 1B and 4 of the shape and dimensions shown in figures 2, 3 and 4 may be used. These specimens are convenient to produce and permit rapid quality-control testing.

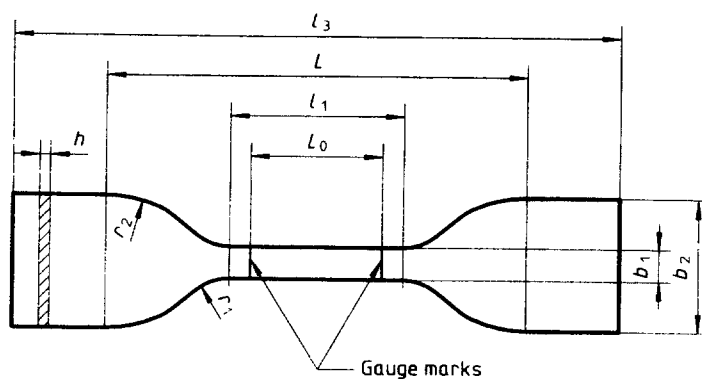
Specimen type 5 (figure 2) is recommended for film and sheet with a very high strain at break. Specimen type 4 is recommended for other types of flexible thermoplastic sheet.

Specimen type 1B (figure 3) is recommended for rigid sheets.



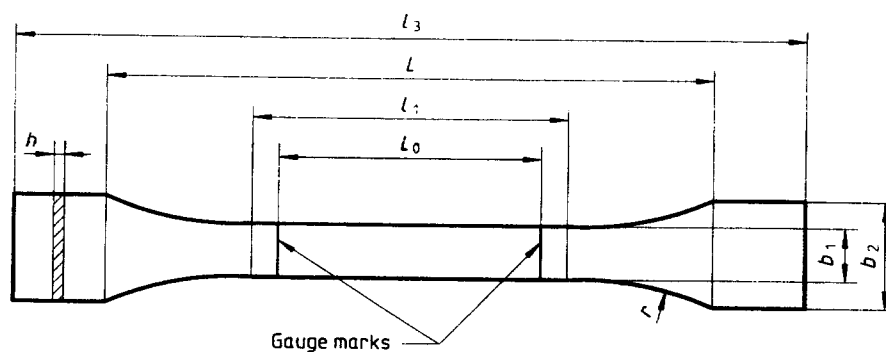
b	Width: 10 mm to 25 mm
h	Thickness: ≤ 1 mm
L_0	Gauge length: 50 mm \pm 0,5 mm
L	Initial distance between grips: 100 mm \pm 5 mm
l_3	Overall length: ≥ 150 mm

Figure 1 — Specimen type 2



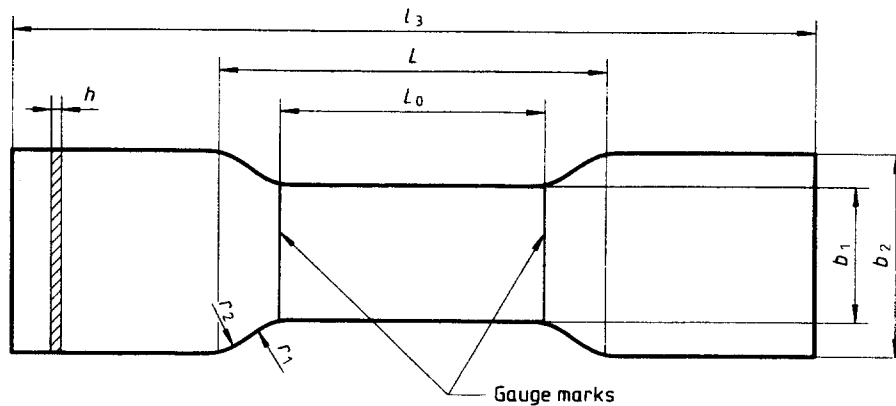
- b_1 Width of narrow parallel-sided portion: $6 \text{ mm} \pm 0,4 \text{ mm}$
- b_2 Width at ends: $25 \text{ mm} \pm 1 \text{ mm}$
- h Thickness: $\leq 1 \text{ mm}$
- L_0 Gauge length: $25 \text{ mm} \pm 0,25 \text{ mm}$
- l_1 Length of narrow parallel-sided portion: $33 \text{ mm} \pm 2 \text{ mm}$
- L Initial distance between grips: $80 \text{ mm} \pm 5 \text{ mm}$
- l_3 Overall length: $\geq 115 \text{ mm}$
- r_1 Small radius: $14 \text{ mm} \pm 1 \text{ mm}$
- r_2 Large radius: $25 \text{ mm} \pm 2 \text{ mm}$

Figure 2 — Specimen type 5



- b_1 Width of narrow parallel-sided portion: $10 \text{ mm} \pm 0,2 \text{ mm}$
- b_2 Width at ends: $20 \text{ mm} \pm 0,5 \text{ mm}$
- h Thickness: $\leq 1 \text{ mm}$
- L_0 Gauge length: $50 \text{ mm} \pm 0,5 \text{ mm}$
- l_1 Length of narrow parallel-sided portion: $60 \text{ mm} \pm 0,5 \text{ mm}$
- L Initial distance between grips: $115 \text{ mm} \pm 5 \text{ mm}$
- l_3 Overall length: $\geq 150 \text{ mm}$
- r Radius: $\geq 60 \text{ mm}$

Figure 3 — Specimen type 1B



- b_1 Width of narrow parallel-sided portion: $25,4 \text{ mm} \pm 0,1 \text{ mm}$
- b_2 Width at ends: 38 mm
- h Thickness: $\leq 1 \text{ mm}$
- L_0 Gauge length: $50 \text{ mm} \pm 0,5 \text{ mm}$
- L Initial distance between grips: 73,4 mm
- l_3 Overall length: 152 mm
- r_1 Small radius: 22 mm
- r_2 Large radius: 25,4 mm

Figure 4 — Specimen type 4

6.2 Preparation of specimens

6.2.1 The test specimens described in 6.1.1 shall be cut or punched so that the edges are smooth and free from notches; examination with a low-power magnifier is recommended to check the absence of notches. Razor blades, suitable paper cutters, scalpels or other devices capable of cutting the specimens to the proper width and producing straight, clean, parallel edges with no visible imperfections shall be used. Punch dies shall be kept sharp by regular honing, and a suitable backing material shall be used with punch dies to ensure a clean-cut edge.

6.2.2 The test specimens described in 6.1.2 shall be obtained by the use of punch dies, using suitable backing material to ensure a clean-cut edge. Dies shall be kept sharp by regular honing, and the edges of the specimen shall be examined with a low-power magnifier to ensure the absence of notches. Discard any specimen with obvious imperfections on the cut edges.

6.3 Gauge marks

See ISO 527-1, subclause 6.3.

The marking device used to produce the gauge marks shall have two parallel edges which are ground smooth and true, 0,05 mm to 0,10 mm wide at the edge and bevelled at an angle of not more than 15°. An ink stamp may also be used to apply ink to the area of the gauge marks, before or after producing them with the marking device, using an ink of a suitable contrasting colour that has no deleterious effect on the film being tested.

6.4 Checking the specimens

Discard any test specimen with obvious imperfections on the cut edges.

6.5 Anisotropy

The properties of certain types of film material may vary with direction in the plane of the film (anisotropy). In such cases, it is essential to prepare two groups

of test specimens with their major axes respectively parallel and perpendicular to the direction of orientation of the film.

7 Number of specimens

See ISO 527-1, clause 7.

8 Conditioning

See ISO 527-1, clause 8.

9 Procedure

See ISO 527-1, clause 9.

10 Calculation and expression of results

See ISO 527-1, clause 10, except for "10.3 Modulus calculation", and "10.4 Poisson's ratio, μ ".

11 Precision

The precision of the test method is not known because inter-laboratory data are not available. When inter-laboratory data are obtained, a precision statement will be added at the following 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 test speed, written in the following format:

Tensile test	ISO 527-3/1B/50
Type of specimen	_____
Test speed in millimetres per minute	_____

- b) to q) see ISO 527-1, clause 12, b) to q).

TECHNICAL CORRIGENDUM 1

Figure 4

Correct the value of L (initial distance between grips) from 73,4 mm to 98 mm.

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