

Plastics — Determination of tensile properties —

Part 3: Test conditions for films and sheets

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and Corrigendum
No. 1*

The European Standard EN ISO 527-3:1995 has the status of a
British Standard

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/75, Plastics and rubber films and sheets, upon which the following bodies were represented:

- British Plastics Federation
- Her Majesty's Stationery Office
- Institute of Trading Standards Administration
- Ministry of Defence
- Packaging and Industrial Films Association
- PIRA International

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 January 1996

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The following BSI references relate to the work on this British standard:
Committee reference PRI/75
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Amendments issued since publication

Amd. No.	Date	Comments
13253 Technical Corrigendum No. 1	August 2001	Correction to key in Figure 3
15005 Corrigendum No. 1	16 March 2004	Correction to implementation of amendment 13253 and correction to key in Figure 4

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National foreword

This British Standard has been prepared by Technical Committee PRI/75 and is the English language version of EN 527-3:1995 *Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets*, published by the European Committee for Standardization (CEN). It was derived by CEN from ISO 527-3:1995, including Technical corrigendum June 1998 and April 2001 published by the International Organization for Standardization (ISO).

It is incorporated into BS 2782 *Methods of testing plastics: Part 3: Mechanical properties*, as Method 326E:1996.

EN 527-3:1995 was produced as a result of international discussions in which the United Kingdom took an active part.

This test method has been prepared for reference by other standards under preparation by CEN. It has been implemented to enable experience of the method to be gained and for use for other fresh applications.

It is also for use for the revision or amendment of other national standards as practicable, but it should not be presumed to apply to any existing standard or specification which contains or makes reference to a different test method, until that standard/specification has been amended or revised, to make reference to this method and adjust any requirements as appropriate.

This method supersedes BS 2782-3:Method 326A:1977, Method 326B:1977 and Method 326C:1977 which are withdrawn.

WARNING NOTE. This British Standard, which is identical with EN ISO 527-3:1995, 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.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online. This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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 7 and a back cover.

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English version

Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets

(ISO 527-3:1995)

Plastiques — Détermination des propriétés en
traction —
Partie 3: Conditions d'essai pour films et feuilles
(ISO 527-3:1995)

Kunststoffe — Bestimmung der
Zugeigenschaften —
Teil 3: Prüfbedingungen für Folien und Tafeln
(ISO 527-3:1995)

This European Standard was approved by CEN on 1995-07-29. 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.

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CEN

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

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

The text of the International Standard ISO 527-3:1995 has been prepared by Technical Committee ISO/TC 61, Plastics, in collaboration with 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 February 1996, and conflicting national standards shall be withdrawn at the latest by February 1996.

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 and the United Kingdom.

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 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

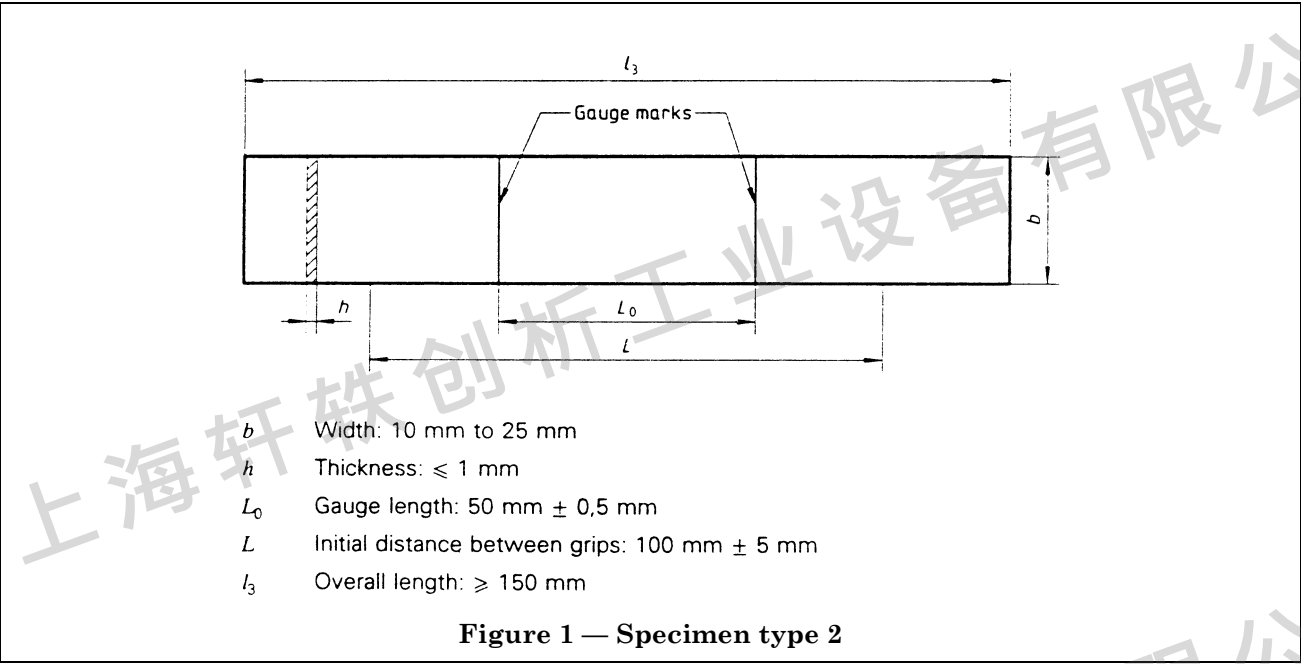
6.1.1 The preferred form of test specimen for the determination of tensile properties by this method is a strip 10 mm to 25 mm wide and not less than 150 mm long (specimen type 2 — see Figure 1), having two parallel gauge marks, 50 mm apart, on the central portion of the specimen.

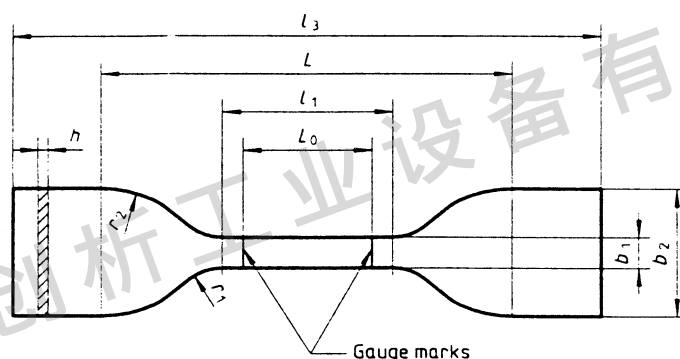
Some film materials have a very high elongation at break which may result in them being outside the stretching capacity of the testing machine. In such cases, it is permissible to reduce the initial distance between the grips to 50 mm.

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 Figure 2, Figure 3 and Figure 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.

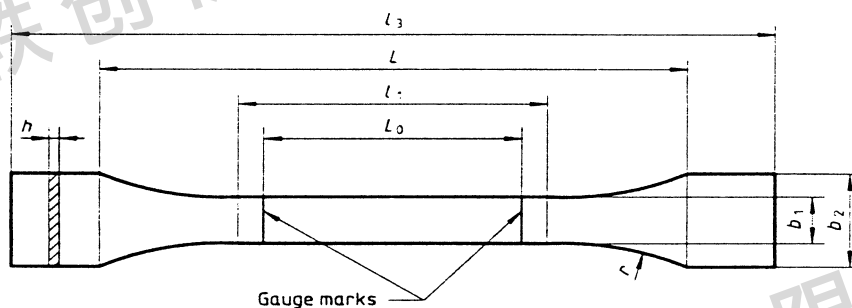
Specimen type 1B (Figure 3) is recommended for rigid sheets.





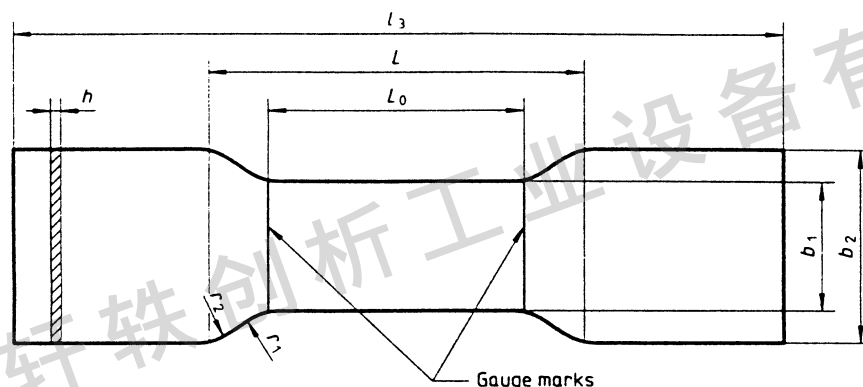
- b_1 Width of narrow parallel-sided portion: $6 \text{ mm} \pm 0,4 \text{ mm}$
- b_2 Width at ends: $25 \text{ mm} \pm 1 \text{ mm}$
- h Thickness: $\leq 1 \text{ mm}$
- L_0 Gauge length: $25 \text{ mm} \pm 0,25 \text{ mm}$
- l_1 Length of narrow parallel-sided portion: $33 \text{ mm} \pm 2 \text{ mm}$
- 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: $\geq 60 \text{ mm}$ (recommended radius: $60,0 \text{ mm} \pm 0,5 \text{ mm}$)

Figure 3 — Specimen type 1B



b_1	Width of narrow parallel-sided portion: 25,4 mm \pm 0,1 mm
b_2	Width at ends: 38 mm
h	Thickness: \leq 1 mm
L_0	Gauge length: 50 mm \pm 0,5 mm
L	Initial distance between grips: 98 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).

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