BSI Standards Publication

Plastics – Determination of tensile properties

Part 3: Test conditions for films and sheets (ISO 527-3:2018)

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National foreword

This British Standard is the UK implementation of EN ISO 527-3:2018. It supersedes BS EN ISO 527-3:1996, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/75, Plastics and rubber film and sheets.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2018

ISBN 978 0 580 92748 5

ICS 83.140.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2018.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 527-3

December 2018

ICS 83.140.10

Supersedes EN ISO 527-3:1995

English Version

Plastics - Determination of tensile properties - Part 3: Test conditions for films and sheets (ISO 527-3:2018)

Plastiques - Détermination des propriétés en traction - Partie 3: Conditions d'essai pour films et feuilles (ISO 527-3:2018)

Kunststoffe - Bestimmung der Zugeigenschaften - Teil 3: Prüfbedingungen für Folien und Tafeln (ISO 527-3:2018)

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Ref. No. EN ISO 527-3:2018: E

European foreword

This document (EN ISO 527-3:2018) has been prepared by Technical Committee ISO/TC 61 "Plastics" in collaboration with Technical Committee CEN/TC 249 “Plastics” the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by June 2019, and conflicting national standards shall be withdrawn at the latest by June 2019.

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Endorsement notice

The text of ISO 527-3:2018 has been approved by CEN as EN ISO 527-3:2018 without any modification.

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

This second edition cancels and replaces the first edition (ISO 527-3:1995), of which it constitutes a minor revision. It also incorporates the Technical Corrigenda ISO 527-3:1995/Cor.1:1998 and ISO 527-3:1995/Cor.2:2001. The changes compared to the previous edition are as follows:

— references to ISO 527-1 have been updated to the latest edition;

— Clauses 3 and 4 have been interchanged;

— the document has been editorially revised.

A list of all parts in the ISO 527 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

INTERNATIONAL STANDARD **ISO 527-3:2018**

Plastics – Determination of tensile properties —

Part 3:
Test conditions for films and sheets

1 Scope

1.1 This document 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 ISO 527-1.

NOTE For sheets greater than 1 mm thick, the user is referred to ISO 527-2.

1.2 See ISO 527-1:2012, 1.2.

1.3 This document is not normally suitable for determining the tensile properties of

a) cellular materials, and

b) plastics reinforced by textile fibres.

1.4 See ISO 527-1:2012, 1.3.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 527-1:2012, *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 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)*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 527-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

See ISO 527-1:2012, 4.1.

5 Apparatus

See ISO 527-1:2012, Clause 5, subject to the following additional requirements.

According to ISO 527-1:2012, 5.1.2, the tensile-testing machine shall be capable of maintaining the speeds of testing as specified in ISO 527-1:2012, Table 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 527-1:2012, 9.6, also applies.

According to ISO 527-1:2012, 5.1.5, when testing thin sheets or film material, the specimen shall not carry the weight of the extensometer.

According to ISO 527-1:2012, 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

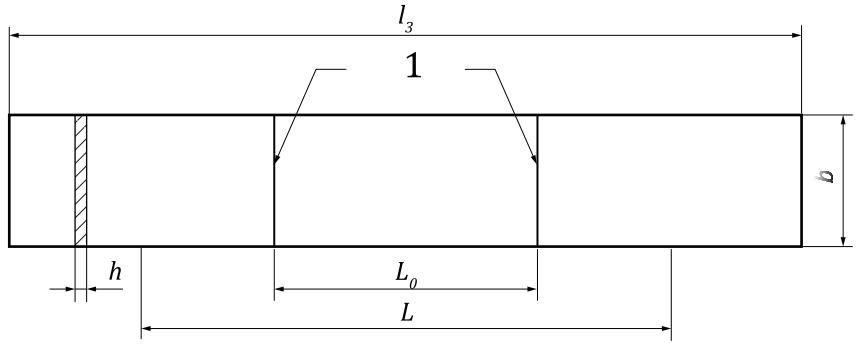
6.1.1 The preferred form of test specimen for the determination of tensile properties by this method is a strip that is 10 mm to 25 mm wide and not less than 150 mm long (specimen type 2 — see Figure 1), having two parallel gauge marks, 50 mm apart, on the central portion of the specimen.

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 (see 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.

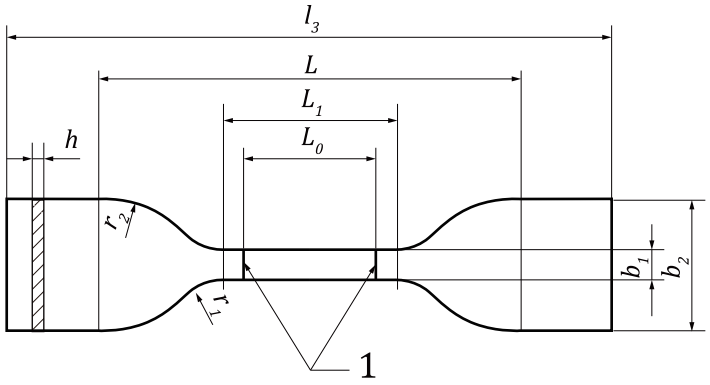
Specimen type 1B (see Figure 3) is recommended for rigid sheets.



Key

1 gauge marks
b width: 10 mm to 25 mm
h thickness: ≤1 mm
L_0 gauge length: 50 mm ± 0,5 mm
L initial distance between grips: 100 mm ± 5 mm
l_3 overall length: ≥150 mm

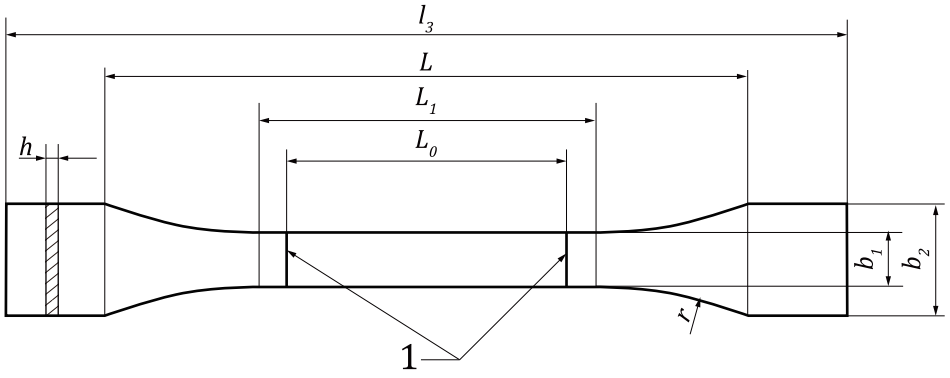
Figure 1 — Specimen type 2



Key

1 gauge marks
b_1 width of narrow parallel-sided portion: 6 mm ± 0,4 mm
b_2 width at ends: 25 mm ± 1 mm
h thickness: ≤1 mm
L_0 gauge length: 25 mm ± 0,25 mm
L_1 length of narrow parallel-sided portion: 33 mm ± 2 mm
L initial distance between grips: 80 mm ± 5 mm
l_3 overall length: ≥115 mm
r_1 small radius: 14 mm ± 1 mm
r_2 large radius: 25 mm ± 2 mm

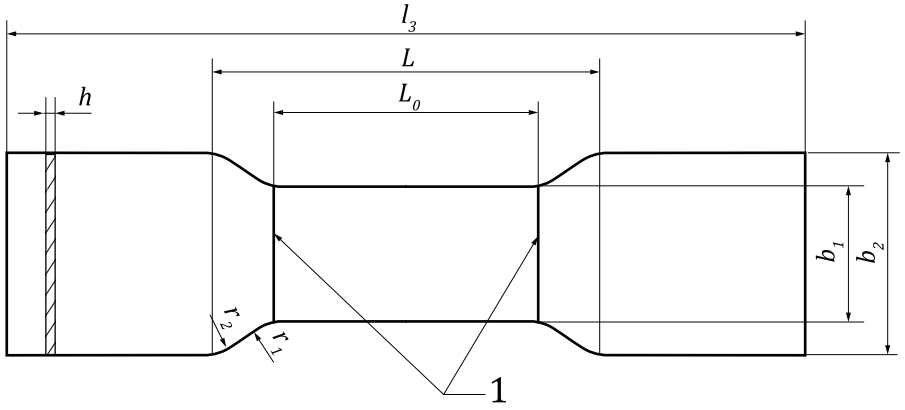
Figure 2 — Specimen type 5



Key

1 gauge marks
b_1 width of narrow parallel-sided portion: 10 mm ± 0,2 mm
b_2 width at ends: 20 mm ± 0,5 mm
h thickness: ≤1 mm
L_0 gauge length: 50 mm ± 0,5 mm
L_1 length of narrow parallel-sided portion: 60 mm ± 0,5 mm
L initial distance between grips: 115 mm ± 5 mm
l_3 overall length: ≥150 mm
r radius: ≥60 mm (recommended radius: 60,0 mm ± 0,5 mm)

Figure 3 — Specimen type 1B



Key

1 gauge marks
b_1 width of narrow papallel-sidedportion: 25,4 mm ± 0,1 mm
b_2 width at ends: 38 mm
h thickness: ≤1 mm
L_0 gauge length: 50 mm ± 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 527-1:2012, 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 527-1:2012, Clause 7.

8 Conditioning

See ISO 527-1:2012, Clause 8.

9 Procedure

See ISO 527-1:2012, Clause 9.

10 Calculation and expression of results

See ISO 527-1:2012, Clause 10 except for ISO 527-1:2012, 10.3 and ISO 527-1:2012,10.4.

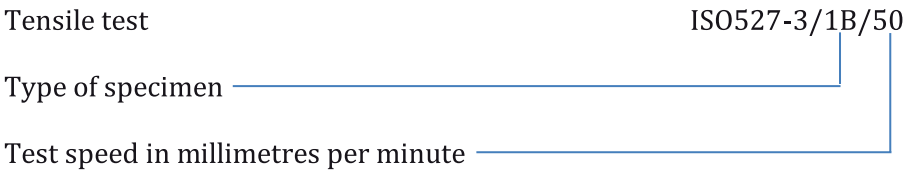
11 Precision

The precision of the test method is not known because interlaboratory data are not available. When interlaboratory 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 document, i.e. ISO 527-3:2018, including the type of specimen and the test speed, written in the following format:



b) see ISO 527-1:2012, Clause 12 b) to q).

Bibliography

[1] ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*

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