Determination of tensile properties of plastics

Test conditions for moulding and extrusion plastics
(ISO 527-2:1993, including Corr 1:1994)
English version of DIN EN ISO 527-2

DIN
EN ISO 527-2

This standard incorporates the English version of ISO 527-2.

ICS 83.080.00

Descriptors: Plastics, testing, tensile strength.

Kunststoffe; Bestimmung der Zugeigenschaften. Teil 2: Prüfbedingungen für Form- und Extrusionsmassen (ISO 527-2:1993, einschließlich Corr 1:1994)

This standard, together with DIN EN ISO 527-1, April 1996 edition, and DIN EN ISO 527-3, October 1995 edition, supersedes DIN 53455, August 1981 edition, and parts of DIN 53457, October 1987 edition.

European Standard EN ISO 527-2:1996 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

This standard has been published in accordance with a decision taken by CEN/TC 249 to adopt, without alteration, International Standard ISO 527-2 as a European Standard.

The responsible German body involved in its preparation was the *Normenausschuß Kunststoffe* (Plastics Standards Committee), Technical Committee *Mechanische Eigenschaften und Probekörperherstellung*.

The DIN Standards corresponding to the International Standards referred to in clause 2 of the EN are as follows:

ISO Standard	DIN Standard
ISO 37	DIN 53504
ISO 293	DIN 16770-1
ISO 294	DIN 16770-2
ISO 295	DIN 53451
ISO 527-1	DIN EN ISO 527-1
ISO 1926	DIN 53430
ISO 3167	DIN EN ISO 3167

Amendments

DIN 53455, August 1981 edition, and parts of DIN 53457, October 1987 edition, have been superseded by the specifications of EN ISO 527-2, which is identical to ISO 527-2.

Previous editions

DIN 53371: 1955-10, 1959-09; DIN 53455: 1952-10, 1968-04, 1981-08; DIN 53457: 1968-05, 1987-06, 1987-10.

Standards referred to

(and not included in **Normative references** and **Annex ZA**)

DIN 16770-1	Preparation of specimens of thermoplastic moulding materials by compression moulding
DIN 16770-2	Preparation of specimens of thermoplastic moulding materials by injection moulding
DIN 53430	Tensile testing of rigid cellular plastics
DIN 53451	Preparation of specimens from thermosetting moulding materials
DIN 53504	Determination of tensile stress/strain properties of rubber
DIN EN ISO 527-1	Determination of tensile properties of plastics; general (ISO 527-1:1996)
DIN EN ISO 3167	Plastics; multi-purpose test specimens (ISO 3167:1993)

EN comprises 6 pages.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 527-2

May 1996

ICS 83.080.00

Descriptors: Plastics, testing, tensile strength.

English version

Plastics

Determination of tensile properties
Part 2: Test conditions for moulding and extrusion plastics
(ISO 527-2:1993, including Corr 1:1994)

Plastiques; détermination des propriétés en traction. Partie 2: Conditions d'essai des plastiques pour moulage et extrusion (ISO 527-2:1993, Corr 1:1994 inclus)

Kunststoffe; Bestimmung der Zugeigenschaften. Teil 2: Prüfbedingungen für Form- und Extrusionsmassen (ISO 527-2:1993, einschließlich Corr 1:1994)

This European Standard was approved by CEN on 1994-12-14 and is identical to the ISO Standard as referred to.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

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

Ref. No. EN ISO 527-2:1996 E

Foreword

International Standard

ISO 527-2:1993 Plastics; determination of tensile properties; test conditions for moulding and extrusion plastics,

which was prepared by ISO/TC 61 'Plastics' of the International Organization for Standardization, has been adopted by Technical Committee CEN/TC 249 'Plastics' as a European Standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by November 1996 at the latest.

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 United Kingdom.

Endorsement notice

The text of the International Standard ISO 527-2:1995 was approved by CEN as a European Standard without any modification.

NOTE: Normative references to international publications are listed in Annex ZA (normative).

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:—[1], *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:—[2], *Plastics — Preparation of test specimens by machining.*

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

The test report shall include the following information:

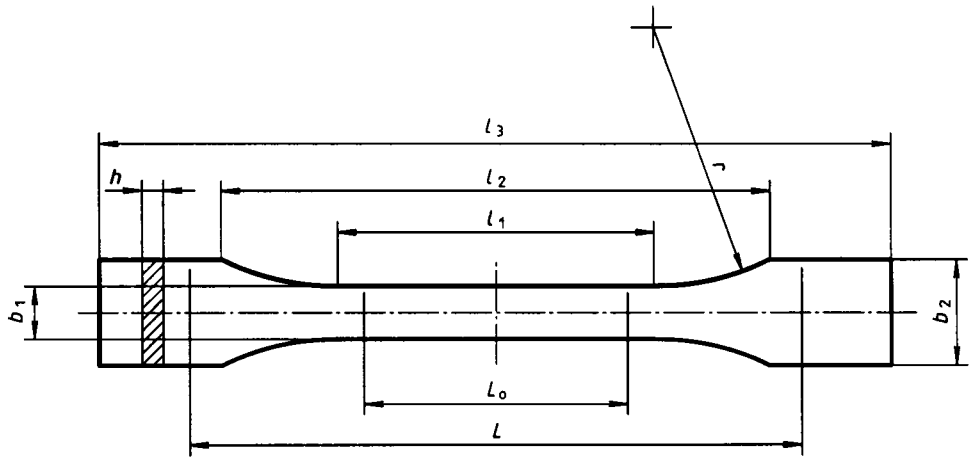
a) a reference to this part of ISO 527, including the type of specimen and the testing speed according to:

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)

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	⩾ 150 [1]	
l_1	Length of narrow parallel-sided portion	80 ± 2	60,0 ± 0,5
r	Radius	20 to 25	⩾ 60 [2]
l_2	Distance between broad parallel-sided portions	104 to 113 [3]	106 to 120 [3]
b_2	Width at ends	20,0 ± 0,2	
b_1	Width of narrow portion	10,0 ± 0,2	
h	Preferred thickness	4,0 ± 0,2	
L_0	Gauge length	50,0 ± 0,5	
L	Initial distance between grips	115 ± 1	$l_2\ {}^{+5}_{0}$

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

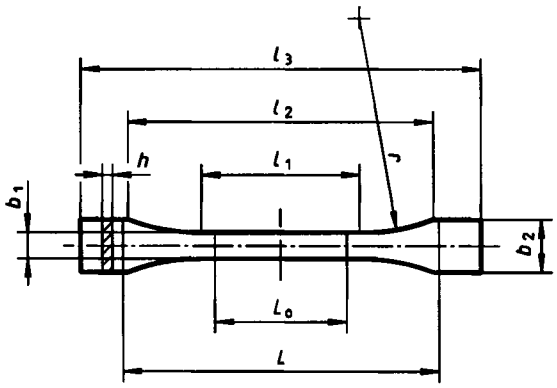
3) Resulting from l_1, r, b_1 and b_2, but within the indicated tolerance.

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.

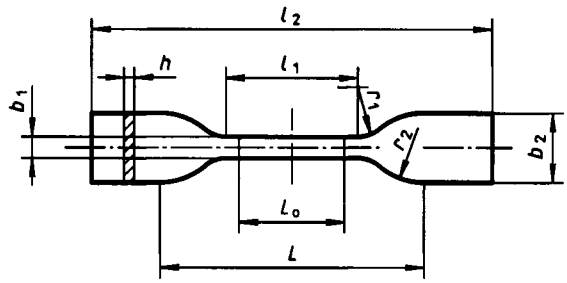


Dimensions in millimetres

	Type of specimen	1BA	1BB
l_3	Overall length	⩾ 75	⩾ 30
l_1	Length of narrow parallel-sided portion	30 ± 0,5	12 ± 0,5
r	Radius	⩾ 30	⩾ 12
l_2	Distance between broad parallel-sided portions	58 ± 2	23 ± 2
b_2	Width at ends	10 ± 0,5	4 ± 0,2
b_1	Width of narrow portion	5 ± 0,5	2 ± 0,2
h	Thickness	⩾ 2	⩾ 2
L_0	Gauge length	25 ± 0,5	10 ± 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	⩾ 75	⩾ 35
b_2	Width at ends	12,5 ± 1	6 ± 0,5
l_1	Length of narrow parallel-sided portion	25 ± 1	12 ± 0,5
b_1	Width of narrow parallel-sided portion	4 ± 0,1	2 ± 0,1
r_1	Small radius	8 ± 0,5	3 ± 0,1
r_2	Large radius	12,5 ± 1	3 ± 0,1
L	Initial distance between grips	50 ± 2	20 ± 2
L_0	Gauge length	20 ± 0,5	10 ± 0,2
h	Thickness	⩾ 2	⩾ 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

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.

Publication	Year	Title	EN	Year
ISO 527-1	1993	Plastics - Determination of tensile properties - Part 1: General principles	EN ISO 527-1	1996