



BSI Standards Publication

Plastics — Determination of tensile properties

Part 5: Test conditions for unidirectional fibre-reinforced plastic composites

National foreword

This British Standard is the UK implementation of EN ISO 527-5:2021. It is identical to [ISO 527-5:2021](#). It supersedes [BS EN ISO 527-5:2009](#), which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/42, Fibre reinforced thermosetting plastics and prepregs.

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

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Published by BSI Standards Limited 2021

ISBN 978 0 539 12684 6

ICS 83.120

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2021.

Amendments/corrigenda issued since publication

Date	Text affected
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English Version

Plastics - Determination of tensile properties - Part 5:
Test conditions for unidirectional fibre-reinforced plastic
composites (ISO 527-5:2021)

Plastiques - Détermination des propriétés en
traction - Partie 5 : Conditions d'essai pour
les composites plastiques renforcés de fibres
unidirectionnelles (ISO 527-5:2021)

Kunststoffe - Bestimmung der
Zugeigenschaften - Teil 5: Prüfbedingungen
für unidirektional faserverstärkte
Kunststoffverbundwerkstoffe (ISO 527-5:2021)

This European Standard was approved by CEN on 4 October 2021.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document (EN ISO 527-5:2021) 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of an identical text or by endorsement, at the latest by June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

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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.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 13, *Composites and reinforcement fibres*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 249, *Plastics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition ([ISO 527-5:2009](#)), which has been technically revised. The main changes compared to the previous edition are as follows:

- gripping force or pressure (e.g. via torque or manometer depending on gripping system used) has been adjusted;
- a new [Annex B](#) (Use of unbonded tabs and conditions for gripping tab-less specimens using fine grip faces) has been added.

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.

Plastics — Determination of tensile properties —

Part 5:

Test conditions for unidirectional fibre-reinforced plastic composites

1 Scope

This document specifies the test conditions for the determination of the tensile properties of unidirectional fibre-reinforced plastic composites, based upon the general principles given in [ISO 527-1](#).

NOTE Isotropic and orthotropic reinforced materials are covered by [ISO —-4](#).

The methods are used to investigate the tensile behaviour of the test specimens and for determining the tensile strength, tensile modulus, Poisson's ratios and other aspects of the tensile stress-strain relationship under the conditions defined.

The test method is suitable for all polymer matrix systems reinforced with unidirectional fibres and which meet the requirements, including failure mode, set out in this document.

The method is suitable for composites with either thermoplastic or thermosetting matrices, including preimpregnated materials (prepregs). The reinforcements covered include carbon fibres, glass fibres, aramid fibres and other similar fibres. The reinforcement geometries covered include unidirectional (i.e. completely aligned) fibres and rovings and unidirectional fabrics and tapes.

The method is not normally suitable for multidirectional materials composed of several unidirectional layers at different angles (see [ISO 527-4](#)).

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 527-1:2019](#), *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 1268 (all parts), *Fibre-reinforced plastics — Methods of producing test plates*

[ISO 2818](#), *Plastics — Preparation of test specimens by machining*

[ISO 16012](#), *Plastics — Determination of linear dimensions of test specimens*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 <https://www.electropedia.org/>

3.1 **gauge length**

L_0

initial distance between the gauge marks on the central part of the test specimen

Note 1 to entry: It is expressed in millimetres (mm).

Note 2 to entry: The values of the gauge length that are indicated for the specimen types in the different parts of ISO 527 represent the maximum relevant gauge length.

[SOURCE: ISO 527-1:2019, 3.1]

3.2 **thickness**

h

smaller initial dimension of the rectangular cross-section in the central part of a test specimen

Note 1 to entry: It is expressed in millimetres (mm).

[SOURCE: ISO 527-1:2019, 3.2]

3.3 **width**

b_1

larger initial dimension of the rectangular cross-section in the central part of a test specimen

Note 1 to entry: It is expressed in millimetres (mm).

[SOURCE: ISO 527-1:2019, 3.3]

3.4 **test speed**

v

rate of separation of the gripping jaws

Note 1 to entry: It is expressed in millimetres per minute (mm/min).

[SOURCE: ISO 527-1:2019, 3.5]

3.5 **stress**

σ

normal force per unit area of the original cross-section within the *gauge length* ([3.1](#))

Note 1 to entry: It is expressed in megapascals (MPa).

Note 2 to entry: In order to differentiate from the true stress related to the actual cross-section of the specimen, this stress is frequently called "engineering stress".

Note 3 to entry: σ for type A specimens is defined as σ_1 and for type B specimens as σ_2 (see [3.9](#), [Figure 2](#) and [Clause 6](#) for definitions of these directions).

[SOURCE: ISO 527-1:2019, 3.6, modified — Domain "<engineering>" and Note 3 to entry has been added.]

3.5.1 **strength**

σ_m

maximum stress observed during a tensile test

Note 1 to entry: It is expressed in megapascals (MPa).

Note 2 to entry: σ_m for type A specimens is defined as σ_{m1} and for type B specimens as σ_{m2} .