
**Plastics — Determination of tensile
properties —**

Part 4:

Test conditions for isotropic and orthotropic
fibre-reinforced plastic composites

Plastiques — Détermination des propriétés en traction —

*Partie 4: Conditions d'essai pour les composites plastiques renforcés de
fibres isotropes et orthotropes*



Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 527-4 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical properties*.

Together with part 5, this part of ISO 527 cancels and replaces the first edition of ISO 3268 (ISO 3268:1978) which has been technically revised.

ISO 527 consists of the following parts, under the general title *Plastics — Determination of tensile properties*:

- *Part 1: General principles*
- *Part 2: Test conditions for moulding and extrusion plastics*
- *Part 3: Test conditions for sheet and film*
- *Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites*
- *Part 5: Test conditions for unidirectional fibre-reinforced plastic composites*

Annex A forms an integral part of this part of ISO 527. Annex B is for information only.

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Plastics — Determination of tensile properties —

Part 4:

Test conditions for isotropic and orthotropic fibre-reinforced plastic composites

1 Scope

1.1 This part of ISO 527 specifies the test conditions for the determination of the tensile properties of isotropic and orthotropic fibre-reinforced plastic composites, based upon the general principles given in part 1.

Unidirectionally reinforced materials are covered by part 5.

1.2 See ISO 527-1, subclause 1.2.

1.3 The test method is suitable for use with the following materials:

- fibre-reinforced thermosetting and thermoplastic composites incorporating non-unidirectional reinforcements such as mats, woven fabrics, woven rovings, chopped strands, combinations of such reinforcements, hybrids, rovings, short or milled fibres or preimpregnated materials (prepregs) (for directly injection-moulded specimens, see specimen 1A in ISO 527-2:1993);
- combinations of the above with unidirectional reinforcements and multidirectional reinforced materials constructed from unidirectional layers, provided such laminates are symmetrical (for materials with completely, or mainly, unidirectional reinforcements, see ISO 527-5);
- finished products made from these materials.

The reinforcement fibres covered include glass fibres, carbon fibres, aramid fibres and other similar fibres.

1.4 The method is performed using specimens machined from a test panel made in accordance with ISO 1268 or by equivalent methods, or from finished and semi-finished products with suitable flat areas.

1.5 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 527-2:1993, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics.*

ISO 527-5:1997, *Plastics — Determination of tensile properties — Part 5: Test conditions for unidirectional fibre-reinforced plastic composites.*

ISO 1268:1974, *Plastics — Preparation of glass fibre reinforced, resin bonded, low-pressure laminated plates or panels for test purposes.*

ISO 2818:1994, *Plastics — Preparation of test specimens by machining.*

ISO 3534-1:1993, *Statistics — Vocabulary and symbols — Part 1: Probability and general statistical terms.*

3 Principle

See ISO 527-1, clause 3.

4 Definitions

For the purposes of this part of ISO 527, the following definitions apply.

4.1 gauge length: See ISO 527-1, subclause 4.1.

4.2 speed of testing: See ISO 527-1, subclause 4.2.

4.3 tensile stress, σ (engineering): See ISO 527-1, subclause 4.3, except that σ for “1”-direction specimens is defined as σ_1 and for “2”-direction specimens as σ_2 (see 4.8 for definitions of these directions).

4.3.1 tensile strength, σ_M : See ISO 527-1, subclause 4.3.3, except that σ_M for “1”-direction specimens is defined as σ_{M1} and for “2”-direction specimens as σ_{M2} .

4.4 tensile strain, ε : See ISO 527-1, subclause 4.4, except that ε for “1”-direction specimens is defined as ε_1 and for “2”-direction specimens as ε_2 .

It is expressed as a dimensionless ratio or in percent.

4.5 tensile strain at tensile strength; tensile failure strain, ε_M : The tensile strain at the point corresponding to the tensile strength of the specimen.

For “1”-direction specimens, ε_M is defined as ε_{M1} and for “2”-direction specimens as ε_{M2} .

It is expressed as a dimensionless ratio or in percent.

4.6 modulus of elasticity in tension; Young's modulus, E : See ISO 527-1, subclause 4.6, except that E for “1”-direction specimens is defined as E_1 and for “2”-direction specimens as E_2 .

The strain values used are as given in ISO 527-1, subclause 4.6, i.e. $\varepsilon' = 0,000\ 5$ and $\varepsilon'' = 0,002\ 5$ (see figure 1), unless alternative values are given in the material or technical specifications.

4.7 Poisson's ratio, μ : See ISO 527-1, subclause 4.7, except that for “1”-direction specimens μ_b is defined as μ_{12} and μ_h as μ_{13} , using the coordinates shown in figure 2. For “2”-direction specimens, μ_b is defined as μ_{21} and μ_h as μ_{23} .