
**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*



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Contents

	Page
Foreword.....	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 Principle.....	5
5 Apparatus.....	5
6 Test specimens.....	5
6.1 Shape and dimensions.....	5
6.2 Preparation of specimens.....	9
6.2.1 General.....	9
6.2.2 End tabs for type 3 specimens.....	9
6.2.3 Applications of end tabs for type 3 specimens.....	9
6.3 Gauge marks.....	9
6.4 Checking the specimens.....	10
6.5 Anisotropy.....	10
7 Number of specimens.....	10
8 Conditioning.....	10
9 Procedure.....	10
9.1 Test atmosphere.....	10
9.2 Measurement of specimen dimensions.....	10
9.3 Clamping.....	11
9.4 Prestresses.....	11
9.5 Setting of extensometers and strain gauges and placing of gauge marks.....	11
9.6 Speed of testing.....	11
9.6.1 For type 1B test specimens.....	11
9.6.2 For type 2, type 3 and type 4 test specimens.....	11
9.7 Recording of data.....	11
10 Calculation and expression of results.....	11
10.1 Calculation of all properties for parallel sided specimens.....	11
10.2 Failure location related calculation of tensile strength for type 4 specimens.....	12
11 Precision.....	12
12 Test report.....	12
Annex A (informative) Alignment of specimens.....	13
Annex B (informative) Testing with tapered tensile specimen geometry without tabs (type 4).....	15
Annex C (informative) Unbonded tabs or gripping condition without tabs using fine grip face.....	18
Annex D (normative) Specimen preparation for type 2 and type 3.....	21
Annex E (normative) Failure location related calculation of tensile strength for type 4 specimens.....	23
Bibliography.....	27

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).

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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 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 second edition cancels and replaces the first edition (ISO 527-4:1997), which has been technically revised.

The main changes compared to the previous edition are as follows:

- specimen type 4 (tapered tensile specimen) especially for testing of multidirectional, continuous fibre-reinforced thermoplastic composites has been implemented;
- gripping force or pressure (e.g. via torque or manometer depending on gripping system used) has been adjusted;
- the following new annexes have been added:
 - [Annex C](#) (Unbonded tabs or gripping condition without tabs using fine grip faces),
 - [Annex B](#) (Testing with tapered tensile specimen geometry without tabs), and
 - [Annex E](#) (Failure location related calculation of tensile strength for type 4 specimens).

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.

Introduction

This document introduces a new test specimen, type 4, with a tapered geometry for use without end tabs. The geometry has been developed to overcome difficulties with bonding end-tabbed test specimens, especially when testing materials based on a thermoplastic matrix.

Guidance on gripping, including grip face design, is also added.

Plastics — Determination of tensile properties —

Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites

1 Scope

This document 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 ISO 527-1.

NOTE 1 Unidirectional reinforced materials are covered by ISO 527-5.

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 defined conditions.

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 prepregged materials (prepregs);

NOTE 2 Injection moulded specimens are covered by ISO 527-2.

- combinations of the above with unidirectional reinforcements and multidirectional reinforced materials constructed from unidirectional layers, provided such laminates are symmetrical;

NOTE 3 Materials with completely or mainly unidirectional reinforcements are covered by ISO 527-5.

- finished products made from materials mentioned above.

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

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.