



SLOVENSKI STANDARD
oSIST prEN ISO 527-1:2018
01-september-2018

**Polimerni materiali - Ugotavljanje nateznih lastnosti - 1. del: Splošna načela
(ISO/DIS 527-1:2018)**

Plastics - Determination of tensile properties - Part 1: General principles (ISO/DIS 527-1:2018)

Kunststoffe - Bestimmung der Zugeigenschaften - Teil 1: Allgemeine Grundsätze
(ISO/DIS 527-1:2018)

Plastiques - Détermination des propriétés en traction - Partie 1: Principes généraux
(ISO/DIS 527-1:2018)

Ta slovenski standard je istoveten z: prEN ISO 527-1

ICS:

83.080.01	Polimerni materiali na splošno	Plastics in general
-----------	--------------------------------	---------------------

oSIST prEN ISO 527-1:2018

en,fr,de

DRAFT INTERNATIONAL STANDARD

ISO/DIS 527-1

ISO/TC 61/SC 2

Secretariat: KATS

Voting begins on:
2018-07-10Voting terminates on:
2018-10-02

Plastics — Determination of tensile properties —

Part 1: General principles

*Plastiques — Détermination des propriétés en traction —**Partie 1: Principes généraux*

ICS: 83.080.01

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 527-1:2019

<https://standards.iteh.ai/catalog/standards/sist/5f6896fc-3ba6-4a7a-a29d-9493ff6daf2f/sist-en-iso-527-1-2019>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING



Reference number
ISO/DIS 527-1:2018(E)

© ISO 2018

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 527-1:2019

<https://standards.iteh.ai/catalog/standards/sist/5f6896fc-3ba6-4a7a-a29d-9493ff6daf2f/sist-en-iso-527-1-2019>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Principle and methods	6
4.1 Principle	6
4.2 Method	6
5 Apparatus	6
5.1 Testing machine	6
5.1.1 General	6
5.1.2 Test speeds	6
5.1.3 Grips	6
5.1.4 Force indicator	7
5.1.5 Strain indicator	7
5.1.6 Recording of data	8
5.2 Devices for measuring width and thickness of the test specimens	9
6 Test specimens	9
6.1 Shape and dimensions	9
6.2 Preparation of specimens	9
6.3 Gauge marks	9
6.4 Checking the test specimens	10
6.5 Anisotropy	11
7 Number of test specimens	11
8 Conditioning	12
9 Procedure	12
9.1 Test atmosphere	12
9.2 Dimensions of test specimen	12
9.3 Gripping	13
9.4 Prestresses	13
9.5 Setting of extensometers	13
9.6 Test speed	13
9.7 Recording of data	14
10 Calculation and expression of results	14
10.1 Stress	14
10.2 Strain	14
10.2.1 Strains determined with an extensometer	14
10.2.2 Nominal strain	15
10.3 Tensile modulus	16
10.3.1 General	16
10.3.2 Chord slope	16
10.3.3 Regression slope	16
10.4 Poisson's ratio	16
10.5 Statistical parameters	17
10.6 Significant figures	17
11 Precision	17
12 Test report	17
Annex A (informative) Determination of strain at yield	19
Annex B (informative) Extensometer accuracy for the determination of Poisson's ratio	22

ISO/DIS 527-1:2018(E)

Annex C (normative) Calibration requirements for the determination of the tensile modulus	23
Bibliography	25

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 527-1:2019
<https://standards.iteh.ai/catalog/standards/sist/5f6896fc-3ba6-4a7a-a29d-9493ff6daf2f/sist-en-iso-527-1-2019>

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 on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical properties*.

This third edition cancels and replaces the second edition (ISO 527-1:2012), which has been technically revised.

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

- An error in [Fig 1](#) concerning ϵ_{tM} has been removed;
- The inconsistency concerning the accuracy of the elongation used in the calculation of the elastic modulus between [clause 5.1.5.1](#) and [Fig 1](#) and [Annex C](#) was removed. For gage lengths $L_0 \leq 50$ mm the accuracy is set to $\pm 1 \mu\text{m}$.
- Normative references are given without dates;
- Minor editorial changes.

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

Plastics — Determination of tensile properties —

Part 1: General principles

1 Scope

1.1 This part of ISO 527 specifies the general principles for determining the tensile properties of plastics and plastic composites under defined conditions. Several different types of test specimen are defined to suit different types of material which are detailed in subsequent parts of ISO 527.

1.2 The methods are used to investigate the tensile behaviour of the test specimens and for determining the tensile strength, tensile modulus and other aspects of the tensile stress/strain relationship under the conditions defined.

1.3 The methods are selectively suitable for use with the following materials:

- rigid and semi-rigid (see 3.12 and 3.13, respectively) moulding, extrusion and cast thermoplastic materials, including filled and reinforced compounds in addition to unfilled types; rigid and semi-rigid thermoplastics sheets and films;
- rigid and semi-rigid thermosetting moulding materials, including filled and reinforced compounds; rigid and semi-rigid thermosetting sheets, including laminates;
- fibre-reinforced thermosets and thermoplastic composites incorporating unidirectional or non-unidirectional reinforcements, such as mat, woven fabrics, woven rovings, chopped strands, combination and hybrid reinforcement, rovings and milled fibres; sheet made from pre-impregnated materials (prepregs),
- thermotropic liquid crystal polymers.

The methods are not normally suitable for use with rigid cellular materials, for which ISO 1926 is used, or for sandwich structures containing cellular materials.

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 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 2602, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 9513, *Metallic materials — Calibration of extensometer systems used in uniaxial testing*

ISO 16012, *Plastics — Determination of linear dimensions of test specimens*

ISO 20753, *Plastics — Test specimens*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

ISO/DIS 527-1:2018(E)

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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

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 relevant maximum gauge length.

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).

3.3

width b

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).

3.4

cross-section A

product of initial width and thickness, $A = bh$, of a test specimen.

Note 1 to entry: It is expressed in square millimetres, (mm²)

3.5

test speed v

rate of separation of the gripping jaws

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

3.6

stress σ

normal force per unit area of the original cross-section within the gauge length

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"

3.6.1 stress at yield

σ_y
stress at the yield strain

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

Note 2 to entry: It may be less than the maximum attainable stress (see [Figure 1](#), curves b and c)

3.6.2 strength

σ_m
stress at the first local maximum observed during a tensile test

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

Note 2 to entry: This may also be the stress at which the specimen yields or breaks (see [Figure 1](#)).

3.6.3 stress at x % strain

σ_x
stress at which the strain reaches the specified value x expressed as a percentage

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

Note 2 to entry: Stress at x % strain may, for example, be useful if the stress/strain curve does not exhibit a yield point (see [Figure 1](#), curve d).

3.6.4 stress at break

σ_b
stress at which the specimen breaks

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

Note 2 to entry: It is the highest value of stress on the stress-strain curve directly prior to the separation of the specimen, i.e directly prior to the load drop caused by crack initiation.

3.7 strain

ε
increase in length per unit original length of the gauge.

Note 1 to entry: It is expressed as a dimensionless ratio, or as a percentage (%).

3.7.1 strain at yield yield strain

ε_y
the first occurrence in a tensile test of strain increase without a stress increase

Note 1 to entry: It is expressed as a dimensionless ratio, or as a percentage (%).

Note 2 to entry: See [Figure 1](#), curves b and c.

Note 3 to entry: See [Annex A](#) (informative) for computer-controlled determination of the yield strain.

ISO/DIS 527-1:2018(E)

3.7.2**strain at break**

ε_b
strain at the last recorded data point before the stress is reduced to less than or equal to 10 % of the strength if the break occurs prior to yielding

Note 1 to entry: It is expressed as a dimensionless ratio, or as a percentage (%).

Note 2 to entry: See [Figure 1](#), curves a and d.

3.7.3**strain at strength**

ε_m
strain at which the strength is reached

Note 1 to entry: It is expressed as a dimensionless ratio, or as a percentage (%).

3.8**nominal strain**

ε_t
crosshead displacement divided by the gripping distance

Note 1 to entry: It is expressed as a dimensionless ratio, or as a percentage (%).

Note 2 to entry: It is used for strains beyond the yield strain (see [3.7.1](#)) or where no extensometers are used.

Note 3 to entry: It may be calculated based on the crosshead displacement from the beginning of the test, or based on the increment of crosshead displacement beyond the strain at yield, if the latter is determined with an extensometer (preferred for multipurpose test specimens).

3.8.1**nominal strain at break**

ε_{tb}
nominal strain at the last recorded data point before the stress is reduced to less than or equal to 10 % of the strength if the break occurs after yielding

Note 1 to entry: It is expressed as a dimensionless ratio, or as a percentage (%).

Note 2 to entry: See [Figure 1](#), curves b and c.

3.9**modulus**

E_t
slope of the stress/strain curve $\sigma(\varepsilon)$ in the strain interval between $\varepsilon_1 = 0,05 \%$ and $\varepsilon_2 = 0,25 \%$

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

Note 2 to entry: It may be calculated either as the chord modulus or as the slope of a linear least-squares regression line in this interval (see [Figure 1](#), curve d).

Note 3 to entry: This definition does not apply to films.

3.10**Poisson's ratio**

μ
negative ratio of the strain decrease $\Delta\varepsilon_n$, in one of the two axes normal to the direction of extension, to the corresponding strain increase $\Delta\varepsilon_l$ in the direction of extension, within the linear portion of the longitudinal versus normal strain curve

Note 1 to entry: It is expressed as a dimensionless ratio.