SLOVENSKI STANDARD
SIST EN 17129:2019

01-januar-2019

Z neskončnim vlaknom ojačeni kompozitni polimerni materiali - Vlečene enosmerne palice - Ugotavljanje nateznih lastnosti v smeri, vzporedni smeri vlakna

Continuous-fibre-reinforced plastic composites - Pultruded unidirectional rods - Determination of tensile properties in parallel to the fibre direction

Kontinuierliche faserverstärkte Kunststoffverbunde - Gezogene unidirektionale Stäbe - Bestimmung der Zugeigenschaften parallel zur Faserrichtung

Composites plastiques renforcés de fibres continues - Joncs unidirectionnels pultrudés - Détermination des propriétés en traction parallèlement à la direction des fibres

Ta slovenski standard je istoveten z: **EN 17129:2018**

ICS:

83.120	Ojačani polimeri	Reinforced plastics

SIST EN 17129:2019 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 17129

November 2018

ICS 83.120

English Version

Continuous-fibre-reinforced plastic composites - Pultruded unidirectional rods - Determination of tensile properties in parallel to the fibre direction

Composites plastiques renforcés de fibres continues - Joncs unidirectionnels pultrudés - Détermination des propriétés en traction parallèlement à la direction des fibres

Kontinuierliche faserverstärkte Kunststoffverbunde - Gezogene unidirektionale Stäbe - Bestimmung der Zugeigenschaften parallel zur Faserrichtung

This European Standard was approved by CEN on 4 June 2018.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

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

Ref. No. EN 17129:2018 E

Contents

Page

European foreword

This document (EN 17129:2018) has been prepared by 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 May 2019, and conflicting national standards shall be withdrawn at the latest by May 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The method described in EN ISO 527-5, *Plastics — Determination of tensile properties — Part 5: Test conditions for unidirectional fibre-reinforced plastic composites*, is not applicable for unidirectional pultruded rods for the following reasons:

a) a pultruded rod is submitted to internal residual tensile stresses which affect its tensile properties. To determine the true performance of a pultruded rod, it is necessary to perform the tensile tests on the entire rod. Alternative solutions such as dumb-bell shaped specimens are not appropriate;

b) cylindrical test specimens are not described in EN ISO 527-5.

1 Scope

This document specifies a method for determining the tensile properties of pultruded, unidirectional rods made from continuous fibre-reinforced plastic composites, in parallel to fibre direction.

It is applicable to pultruded rods which diameters are preferably ranging from 3 mm to 20 mm.

This method is suitable for use with continuous-fibre-reinforced plastic composites made from carbon fibres and glass fibres.

This method is suitable for use with all polymer matrix systems reinforced with unidirectional fibres having a cylindrical shape.

This method is not intended to be used for testing specimens such as tubes or yarns already covered by other test methods.

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.

EN ISO 527-1:2012, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1:2012)*

EN ISO 291, *Plastics — Standard atmospheres for conditioning and testing (ISO 291)*

EN ISO 3611, *Geometrical product specifications (GPS) — Dimensional measuring equipment: Micrometers for external measurements — Design and metrological characteristics (ISO 3611)*

EN ISO 7500-1:2018, *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 7500-1:2018)*

EN ISO 9513:2012, *Metallic materials — Calibration of extensometer systems used in uniaxial testing (ISO 9513:2012)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 527-1:2012 and the following 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).

[SOURCE: EN ISO 527-1:2012, definition 3.1]

3.2
diameter
d
initial dimension of the cylindrical cross section in the central part of a test specimen

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

3.3
test speed
rate of separation of the gripping jaws

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

[SOURCE: EN ISO 527-1:2012, definition 3.5]

3.4
stress
σ
force per unit area of the original cross-section within the gauge length

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

[SOURCE: adapted from EN ISO 527-1:2012, definition 3.6]

3.5
tensile strength
σ_M
maximum tensile stress sustained by the specimen during a tensile test

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

Note 2 to entry: It is corresponding to the stress at break.

3.6
strain
ε
increase in length per unit original length

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

[SOURCE: EN ISO 527-1:2012, definition 3.7]

3.7
tensile strain at tensile strength
tensile failure strain
ε_M
tensile strain at the point corresponding to the tensile strength

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

Note 2 to entry: See Figure 1.

Note 3 to entry: It is corresponding to the strain at break.

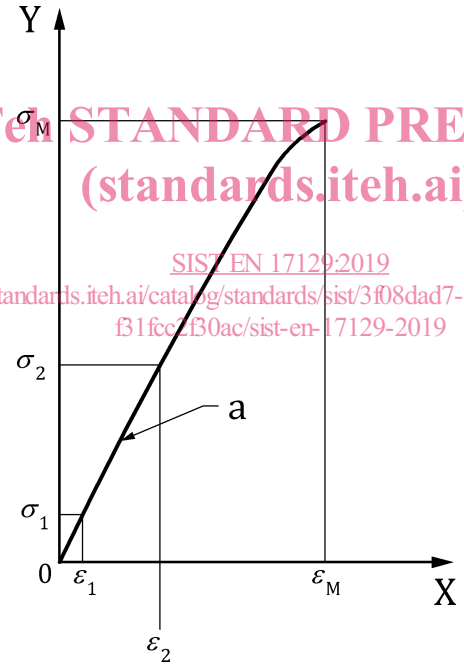
3.8
modulus
tensile modulus of elasticity
E_t
slope of the stress/strain curve $\sigma(\varepsilon)$ in the strain interval between ε_1 = 0,1 % and ε_2 = 0,5 %

Note 1 to entry: It is expressed in gigapascals (GPa).

Note 2 to entry: Other strain interval can be used unless alternative values are given in the material or technical specifications or agreed upon by the interested parties.

3.9
specimen coordinate axes
coordinate axes for the material under test, as shown in Figure 2, the direction parallel to the fibres being defined as the "1"-direction and the direction perpendicular to them (in the plane of the fibres) as the "2"-direction

Note 1 to entry: The "1"-direction is also referred to as the longitudinal direction and the "2"-direction as the transverse direction.



Key
X strain, ε
Y stress, σ
a slope, E_t

Figure 1 — Typical stress-strain curve

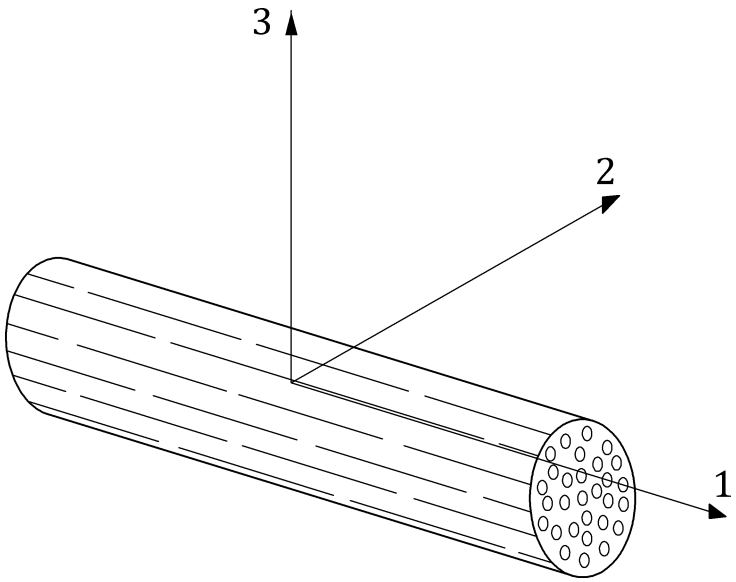


Figure 2 — Unidirectional rod showing axes of symmetry

4 Principle and methods

4.1 Principle

The test specimen is extended along its major longitudinal axis at constant speed until the specimen fractures or until the stress (load) or the strain (elongation) reaches some predetermined value. During this procedure the load sustained by the specimen and the elongation are measured.

4.2 Method

4.2.1 The use of conventional grips for testing unidirectional pultruded rods having high axial tensile strength and low transverse compressive strength can cause crushing of the rod, thereby causing premature failure, due to the high compressive forces exerted by the grips. Steel tabs, the design of which is adapted to the shape of the rod, reduce the compressive forces exerted on the rod and overcome this negative influence of conventional grips.

NOTE Conventional metallic tabs offer a high performance level and have been found satisfactory for testing rods. However, some limitations such as testing at low or high temperature have led to use alternative test fixtures.

Alternative test fixtures may be used provided that the radial compression on the rods prevents any slippage of the specimens relatively to the fixture during testing and that the failures occur outside of the gripping areas.

As testing rods of larger diameter, than the standard 6 mm diameter rod, has some limitations (e.g. testing machines of high capacity required, high load transfer into specimens) smaller specimens and alternative fixtures may be used provided that the general requirements of this document are fulfilled.

Informative Annex A describes an alternative test fixture, which may be used for testing specimens without end-tabs.

4.2.2 Tests which are carried out on specimens of different dimensions, or on specimens which are prepared under different conditions, may produce results which are not comparable. Other factors, such as the speed of testing and the conditioning of the specimens, can also influence the results. Consequently, when comparative data are required, these factors shall be carefully controlled and recorded.