SLOVENSKI STANDARD
oSIST prEN ISO 22459:2022

01-januar-2022

Fina keramika (sodobna keramika, sodobna tehnična keramika) - Ojačitev keramičnih kompozitov - Ugotavljanje porazdelitve natezne trdnosti in deformacij/obremenitev vlaken v svežnjih pri visoki temperaturi (ISO 22459:2020)

Fine ceramics (advanced ceramics, advanced technical ceramics) - Reinforcement of ceramic composites - Determination of distribution of tensile strength and tensile strain to failure of filaments within a multifilament tow at ambient temperature (ISO 22459:2020)

Hochleistungskeramik - Faserverstärkungen von keramischen Verbundwerkstoffen - Bestimmung der Verteilung von Zugfestigkeit und Zugdehnung bis zum Versagen von Filamenten innerhalb eines Multifilamentkabels bei Raumtemperatur (ISO 22459:2020)

Céramiques techniques - Renfort de céramiques composites - Détermination de la distribution de la résistance en traction et de la déformation à la rupture en traction de filaments dans un fil multifilamentaire à température ambiante (ISO 22459:2020)

iTeh Standards
(https://standards.iteh.ai)
Document Preview
SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/922d63ff-ce73-4dfe-82c0-cb9cbd78bebd/sist-en-iso-22459-2022

Ta slovenski standard je istoveten z: prEN ISO 22459

ICS:

81.060.30 Sodobna keramika Advanced ceramics

oSIST prEN ISO 22459:2022 en,fr,de

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/922d63ff-ce73-4dfe-82c0-cb9cbd78bebd/sist-en-iso-22459-2022

oSIST prEN ISO 22459:2022

INTERNATIONAL STANDARD

ISO 22459

First edition
2020-06

Fine ceramics (advanced ceramics, advanced technical ceramics) — Reinforcement of ceramic composites — Determination of distribution of tensile strength and tensile strain to failure of filaments within a multifilament tow at ambient temperature

Céramiques techniques — Renfort de céramiques composites — Détermination de la distribution de la résistance en traction et de la déformation à la rupture en traction de filaments dans un fil multifilamentaire à température ambiante

iTeh Standards
(https://standards.iteh.ai)
Document Preview
SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/922d63ff-ce73-4dfe-82c0-cb9cbd78bebd/sist-en-iso-22459-2022

Reference number
ISO 22459:2020(E)

© ISO 2020

oSIST prEN ISO 22459:2022

iTeh Standards
(https://standards.iteh.ai)
Document Preview

SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/922d63ff-ce73-4dfe-82c0-cb9cbd78bebd/sist-en-iso-22459-2022

COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

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

oSIST prEN ISO 22459:2022

Contents

Page

iTeh Standards (https://standards.iteh.ai) Document Preview
SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/...-22459-2022

© ISO 2020 – All rights reserved

oSIST prEN ISO 22459:2022

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 206, *Fine ceramics*.

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.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/922d63ff-ce73-4dfe-82c0-cb9cbd78bebd/sist-en-iso-22459-2022

 © ISO 2020 – All rights reserved

oSIST prEN ISO 22459:2022

Fine ceramics (advanced ceramics, advanced technical ceramics) — Reinforcement of ceramic composites — Determination of distribution of tensile strength and tensile strain to failure of filaments within a multifilament tow at ambient temperature

1 Scope

This document specifies the conditions for the determination of the distribution of strength and rupture strain of ceramic filaments within a multifilament tow at room temperature by performing a tensile test on a multifilament tow.

This document applies to dry tows of continuous ceramic filaments that are assumed to act freely and independently under loading and exhibit linear elastic behaviour up to failure. The outputs of this method are not to be mixed up with the strengths of embedded tows determined by using ISO 24046[1)].

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.

iTeh Standards (https://standards.iteh.ai) Document Preview

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 10119, *Carbon fibre — Determination of density*

EN 1007-2, *Advanced technical ceramics — Ceramic composites — Methods of test for reinforcements — Part 2: Determination of linear density*

SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/922d63ff-ce73-4dfe-82c0-cb9cbd78bebd/sist-en-iso-22459-2022

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 http://www.electropedia.org/

3.1
gauge length
L_0
initial distance between two reference points on the tow

Note 1 to entry: Usually the gauge length is taken as the distance between the gripped ends of the tow.

3.2
initial cross-section area
S_0
cross-section area of the tow

1) Under preparation.

© ISO 2020 – All rights reserved

oSIST prEN ISO 22459:2022

3.3
tow elongation
A
increase of the gauge length during the tensile test

3.4.1
total compliance
C_t
ratio of the measured displacement to the corresponding force during the tensile test

3.4.2
load train compliance
C_l
ratio of the load train elongation, excluding the specimen contribution, to the corresponding force during the tensile test

3.5
strain
ε
ratio of the tow elongation A to the gauge length L_0

3.6
filament rupture strain
$\varepsilon_{r,j}$
strain at step j in the non-linear parts of the force-displacement curve

3.7
filament strength
$\sigma_{r,j}$
ratio of the tensile force to the cross-section area of all unbroken filaments at step j in the non-linear parts of the force-displacement curve

iTeh Standards
(https://standards.iteh.ai)
Document Preview

3.8
average filament strength
$\bar{\sigma}_r$
statistical average strength of the filaments in the tow for each test determined from the Weibull strength distribution parameters of the filaments

SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/932d63ff-ce73-4dfe-82c0-cb9cbd78bebd/sist-en-iso-22459-2022

3.9
mean filament strength
$\bar{\bar{\sigma}}_r$
arithmetic mean of the average strengths

4 Principle

A multifilament tow is loaded in tension at a constant displacement rate up to rupture of all the filaments in the tow. The force and displacement are measured and recorded. From the force-displacement curve the two-parameter Weibull distribution of the rupture strain and of the strength of the filaments is obtained by sampling the nonlinear parts of the curve at discrete intervals, j, which correspond to an increasing number of failed filaments in the tow.

5 Significance and use

Because measurement of the displacement directly on the tow is difficult, it is usually obtained indirectly via a compliance measurement which includes contributions of the loading train, the grips and the tabbing materials. These contributions have to be corrected for in the analysis. When it is possible to measure the tow elongation directly (by using a suitable extensometer system) this

© ISO 2020 – All rights reserved

oSIST prEN ISO 22459:2022

correction is not needed. The calculation of the results in Clause 10 also applies in this case by setting the load train compliance equal to zero.

The evaluation method is based on an analysis of the nonlinear domain of the force-displacement curve, which is caused by progressive filament failure during the test. The size of this domain is promoted by higher stiffness of the loading and gripping system. When the force-displacement curve does not show this nonlinear domain, the evaluation method of this document cannot be applied.

The distribution of filament rupture strains does not depend on the initial number of filaments for those tows that contain a large number of filaments; hence, it is not affected by the number of filaments which are broken before the test, provided this number remains limited. The determination of the filament strength distribution requires knowledge of the initial cross-sectional area of the tow. The variation in filament diameters, which affects the strength values, is not accounted for.

The Weibull parameters determined by this test method and extrapolated to the respective gauge length cannot be compared directly with those obtained from tensile tests on monofilaments according to ISO 19630 because of variability in test conditions[1].

6 Apparatus

6.1 Tensile testing equipment

The test machine shall be equipped with a system for measuring the force applied to the specimen and the displacement, or directly the tow elongation. The machine shall conform to grade 1 or better in ISO 7500-1. The grips shall align the specimen with the direction of the force. Slipping of the specimen in the grips shall be prevented.

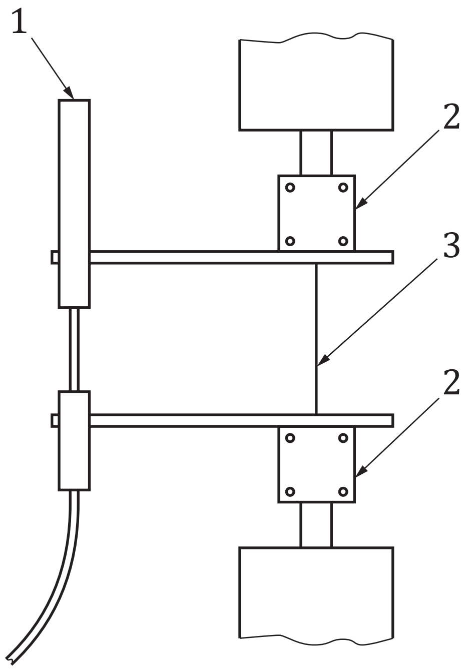
NOTE The use of a displacement transducer placed at the ends of the grips[5][6] (see Figure 1) or on the tow itself[4][5][6] will probably limit the contribution of different parts of the load train to the measured displacement, and hence increase the accuracy.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/922d63ff-ce73-4dfe-82c0-cb9cbd78bebd/sist-en-iso-22459-2022

© ISO 2020 – All rights reserved

oSIST prEN ISO 22459:2022



Key

1 displacement transducer

2 grip

3 test specimen

iTeh Standards

Figure 1 — Test setup (principle sketch)

(https://standards.iteh.ai)
Document Preview

6.2 Data recording

A calibrated recorder shall be used to record force-displacement curves. The use of a digital data recording system is recommended.

SIST EN ISO 22459:2022
https://standards.iteh.ai/catalog/standards/sist/922d63ff-ce73-4dfe-82c0-cb9cbd78bebd/sist-en-iso-22459-2022

7 Test specimen

7.1 General

Specimens with a gauge length of 200 mm shall be used to establish the filament strength and filament rupture strain distributions. Specimens with gauge lengths of 100 mm and 300 mm shall be used to determine the load train compliance. Examples of two types of test specimen are given below.

7.2 Window type specimen

A window type specimen is shown in Figure 2. A stretched tow is fixed between two identical plates of material, each containing a central window. When the displacement is not measured directly on the tow, the height of the window defines the gauge length.

NOTE This type of specimen has the advantage of easy handling.

© ISO 2020 – All rights reserved