International Standard

ISO 15733

Third edition
2026-06

Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at ambient temperature in air atmospheric pressure — Determination of tensile properties

Céramiques techniques — Propriétés mécaniques des céramiques composites à température ambiante sous air à pression atmosphérique — Détermination des propriétés en traction

Reference number
ISO 15733:2026(en)

COPYRIGHT PROTECTED DOCUMENT

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

Published in Switzerland

Contents

Page

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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*.

This third edition cancels and replaces the second edition (ISO 15733:2015), which has been technically revised.

The main changes are as follows:

— broader range of tensile properties: tensile modulus, Poisson’s ratio, strength, fracture strain, lateral deformations;

— test validity: possible singularities of force-deformation curves;

— editorial changes.

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.

Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at ambient temperature in air atmospheric pressure — Determination of tensile properties

1 Scope

This document specifies the conditions for determining the tensile properties (including tensile modulus, Poisson's ratio, strength, strain at maximum force and fracture strain) of ceramic matrix composite materials with continuous fibre reinforcement at room temperature. This document applies to all ceramic matrix composites with a continuous fibre reinforcement, including unidirectional (1D), bi-directional (2D), and multi-directional (xD, with $x > 2$), reinforcement, loaded along a principal axis of reinforcement.

NOTE In most cases, ceramic matrix composites to be used at high temperature in air are coated with an antioxidation coating.

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 3611, *Geometrical product specifications (GPS) — Dimensional measuring equipment — Design and metrological characteristics of micrometers for external measurements*

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*

ASTM E2208–02S–2018, *Standard Guide for Evaluating Non-Contacting Optical Strain Measurement Systems*

3 Terms, definitions and symbols

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
calibrated length
l
part of the test specimen that has uniform and minimum cross-section area

3.2
gauge length
L_o
initial distance between reference points on the test specimen in the *calibrated length* (3.1)

3.3
lateral gauge length
L_{02}
gauge length in direction perpendicular to the specific direction of loading

3.4
initial cross-section area
S_o
cross-section area of the test specimen within the calibrated length before loading

3.5
effective cross-section area
$S_{o,eff}$
total area corrected by a factor, to account for the presence of a coating

3.6
longitudinal deformation
A
increase in the gauge length parallel to the load direction under a tensile force

Note 1 to entry: Longitudinal deformation refers to axial deformation

3.7
lateral deformation
A_2
change of the lateral gauge length in a direction perpendicular to the specific direction of loading

3.8
longitudinal deformation at maximum tensile force
A_m
value of deformation corresponding to the maximum tensile force

3.9
tensile strain
ε
ratio of deformation to initial gauge length defined as the ratio of longitudinal deformation/gauge length (A/L_0)

3.10
tensile strain at maximum force
ε_m
value of strain corresponding to the maximum tensile force

3.11
fracture strain
strain at ultimate fracture of the test specimen

3.12
lateral strain
ε_2
ratio of lateral deformation to initial lateral gauge length defined as the ratio of lateral deformation/lateral gauge length (A_2/L_{02})

3.13
tensile stress
σ
ratio of the force carried by the test piece to the initial cross-section area (S_o)

3.14
effective tensile stress
σ_{eff}
ratio of the force carried by the test piece to the effective cross-section area ($S_{o,eff}$)

3.15
maximum tensile force
F_m
maximum force during a test

3.16
tensile strength
σ_m
ratio of the maximum tensile force to the initial cross-section area (S_o)

3.17
effective tensile strength
$\sigma_{m,eff}$
ratio of the maximum tensile force to the effective cross-section area

3.18
tensile modulus
E
slope of the initial linear section of the stress-strain curve, at or near the origin

Note 1 to entry: The linear part could not exist or not start at the origin. The different situations are then described in Annex A.

Note 2 to entry: Two tensile moduli depending of initial cross-section area can be defined as follows.

3.18.1
apparent tensile modulus
E_{app}
slope of the linear part of the stress-strain curve at or near the origin when the apparent tensile stress is used

3.18.2
effective tensile modulus
E_{eff}
slope of the linear part of the stress-strain curve at or near the origin when the effective tensile stress is used

3.19
Poisson's ratio
ν
negative of the ratio of lateral strain to axial strain in an axially stressed body

4 Principle

A test specimen of specified dimensions is loaded in tension. The test is performed at constant crosshead displacement rate, or constant deformation rate. Force and deformations are measured and recorded simultaneously. Either longitudinal or both longitudinal and lateral deformations are measured.

NOTE The use of constant stress rate gives a valid tensile curve only when the material behaves linearly up to failure.