
**Fine ceramics (advanced ceramics,
advanced technical ceramics) —
Mechanical properties of ceramic
composites at high temperature
in air at atmospheric pressure —
Determination of fatigue properties at
constant amplitude**

*Céramiques techniques — Propriétés mécaniques des composites
céramiques à haute température sous air à pression atmosphérique
— Détermination des propriétés de fatigue à amplitude constante*





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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 206, *Fine ceramics*.

Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at high temperature in air at atmospheric pressure — Determination of fatigue properties at constant amplitude

1 Scope

This International Standard specifies the conditions for the determination of properties at constant-amplitude of load or strain in uniaxial tension/tension or in uniaxial tension/compression cyclic fatigue of ceramic matrix composite materials (CMCs) with fibre reinforcement for temperature up to 1 700 °C in air at atmospheric pressure.

This International Standard applies to all ceramic matrix composites with fibre reinforcement, unidirectional (1D), bi-directional (2D), and tri-directional (xD, where $2 < x \leq 3$).

The purpose of this International Standard is to determine the behaviour of CMC when subjected to mechanical fatigue and oxidation simultaneously. Tests for the determination of fatigue properties at high temperature in inert atmospheres differ from those in oxidative atmospheres. Contrary to an inert atmosphere, damage in an oxidative atmosphere accumulates due to the influence of purely mechanical fatigue and to chemical effects of the material's oxidation.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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: Micrometers for external measurements — Design and metrological characteristics*

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

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

ISO 4574, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at high temperature — Determination of compression properties*

ISO 14574, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at high temperature — Determination of tensile properties*

ISO 15733, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at ambient temperature in air atmospheric pressure — Determination of tensile properties*

IEC 60584-1, *Thermocouples — Part 1: EMF specifications and tolerances*

IEC 60584-2, *Thermocouples — Part 2: Tolerances*

CEN/TR 13233, *Advanced technical ceramics — Notations and symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TR 13233¹⁾ and the following apply.

3.1 General

3.1.1 test temperature

T

temperature of the test specimen at the centre of the gauge length

3.1.2 calibrated length

l

part of the test specimen which has uniform and minimum cross-section area

3.1.3 gauge length

L_0

initial distance between reference points on the test specimen in the calibrated length

3.1.4 controlled temperature zone

part of the calibrated length including the gauge length where the temperature is within 50 °C of the test temperature

3.1.5 initial cross-section area

S_0

initial cross-section area of the test specimen within the calibrated length, at the test temperature

Note 1 to entry: Two initial cross-section areas of the test specimen can be defined:

- apparent cross-section area: this is the total area of the cross-section, $S_{0\text{ app}}$;
- effective cross-section area: this is the total area corrected by a factor to account for the presence of a coating, $S_{0\text{ eff}}$.

3.1.6 longitudinal deformation

A

change in the gauge length between reference points under an uniaxial force

3.1.7 strain

ε

relative change in the gauge length defined as the ratio, A/L_0

3.1.8 stress

σ

force supported by the test specimen at any time in the test, divided by the initial cross-section area

Note 1 to entry: Two stresses can be distinguished:

- apparent stress, σ_{app} , when the apparent cross-section area (or total cross-section area) is used;
- effective stress, σ_{eff} , when the effective cross-section area is used.

1) Intended to be substituted by a future International Standard.