

Advanced technical ceramics — Mechanical properties of ceramic composites at room temperature —

Part 1: Determination of tensile properties

The European Standard EN 658-1:1998 has the status of a
British Standard

ICS 81.060.99

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents



Document Sharing Hub

National foreword

This British Standard is the English language version of EN 658-1:1998. It supersedes DD ENV 658-1:1993 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RPI/13, Advanced technical ceramics, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 13 and a back cover.

This British Standard, having been prepared under the direction of the Sector Committee for Materials and Chemicals, was published under the authority of the Standards Committee and comes into effect on 15 December 1998

© BSI 1998

ISBN 0 580 30277 6

Amendments issued since publication

Amd. No.	Date	Text affected

Descriptors: composite materials, reinforcing materials, ceramics, mechanical properties, determination, tensile strength, tension tests, environmental tests

English version

Advanced technical ceramics — Mechanical properties of ceramic composites at room temperature — Part 1: Determination of tensile properties

Céramiques techniques avancées — Propriétés
mécaniques des céramiques composites à
température ambiante — Partie 1: Détermination
des caractéristiques en traction

This European Standard was approved by CEN on 23 May 1998.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

© 1998 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 184, Advanced technical ceramics, the Secretariat of which is held by BSI.
This European Standard supersedes ENV 658-1:1993.
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 December 1998, and conflicting national standards shall be withdrawn at the latest by December 1998.
According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom

Contents

1	Scope	3
2	Normative references	3
3	Principle	3
4	Definitions and symbols	3
4.1	calibrated length, l	3
4.2	gauge length, L_o	3
4.3	initial cross section area, A_o	3
4.4	longitudinal deformation, ΔL	3
4.5	tensile strain, ϵ	3
4.6	tensile stress, σ	3
4.7	maximum tensile force, $F_{t,m}$	3
4.8	tensile strength, $\sigma_{t,m}$	3
4.9	proportional limit stress, σ_o	3
4.10	proportionality ratio or pseudo-elastic modulus E_p , elastic modulus, E	4
4.11	cumulative damage energy, Φ	4
4.12	axial strain	4
4.13	bending strain	4
4.14	percent bending	4

5	Apparatus	4
5.1	Test machine	4
5.2	Load train	4
5.3	Strain measurement	4
5.4	Data recording system	5
5.5	Micrometers	5
6	Test specimens	5
7	Test specimen preparation	8
7.1	Machining and preparation	8
7.2	Number of test specimens	8
8	Test procedure	8
8.1	Displacement rate	8
8.2	Measurement of test specimen dimensions	8
8.3	Testing technique	8
8.4	Test validity	8
9	Calculation of results	8
9.1	Test specimen origin	8
9.2	Tensile strength	8
9.3	Tensile strain at maximum tensile force	8
9.4	Proportionality ratio or pseudo-elastic modulus, elastic modulus	8
9.5	Cumulative damage energy	9
10	Test report	9

1 Scope

This standard specifies the conditions for the determination of tensile properties of ceramic matrix composite materials with continuous fibre reinforcement at ambient temperature.

This standard applies to all ceramic matrix composites with a continuous fibre reinforcement, unidirectional (1D), bidirectional (2D), and tridirectional (xD, with $2 < x \leq 3$), loaded along one principal axis of reinforcement.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and in the publications listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10002-2, *Metallic materials — Tensile testing — Part 2: Verification of the force measuring system of the tensile testing machines.*

EN 10002-4, *Metallic materials — Tensile test — Part 4: Verification of extensometers used in uniaxial testing.*

ISO 3611, *Micrometer callipers for external measurements.*

ENV 1892, *Advanced technical ceramics — Mechanical properties of ceramic composites at high temperature under inert atmosphere — Determination of tensile properties.*

ENV 1893, *Advanced technical ceramics — Mechanical properties of ceramic composites at high temperature in air at atmospheric pressure — Determination of tensile properties.*

HTMTC¹⁾, *Code of practice — Code of practice for the measurement of misalignment induced bending in uniaxially loaded tension compression test pieces.*

3 Principle

A test specimen of specified dimensions is loaded in tension. The test is performed at constant cross-head displacement rate, or constant deformation rate.

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

The force and longitudinal deformation are measured and recorded simultaneously.

4 Definitions and symbols

For the purposes of this European Standard, the following definitions apply:

4.1

calibrated length, l

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

4.2

gauge length, L_0

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

4.3

initial cross-section area, A_0

initial cross-section of the test specimen within calibrated length

4.4

longitudinal deformation, ΔL

increase in the gauge length between reference points under a tensile force. Its value corresponding to the maximum force shall be denoted $\Delta L_{t,m}$

4.5

tensile strain, ε

relative change in the gauge length defined as the ratio $\Delta L/L_0$. Its value corresponding to the maximum force shall be denoted $\varepsilon_{t,m}$

4.6

tensile stress, σ

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

4.7

maximum tensile force, $F_{t,m}$

highest recorded tensile force in a tensile test on the test specimen when tested to failure

4.8

tensile strength, $\sigma_{t,m}$

ratio of the maximum tensile force to the initial cross-section area

4.9

proportional limit stress, σ_0

the greatest stress that the test specimen is capable of sustaining without any deviation from proportionality of stress to strain

¹⁾ Published by JRC Institute for Advanced Materials, ISBN 92-826-9681-2, EUR 16138 EN.