

Advanced technical ceramics — Mechanical properties of ceramic composites at ambient temperature — Evaluation of the resistance to crack propagation by notch sensitivity testing

The European Standard EN 13234:2006 has the status of a
British Standard

ICS 81.060.30

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 13234:2006. It supersedes DD ENV 13234:2000 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RPI/13, Advanced technical ceramics.

A list of organizations represented on RPI/13 can be obtained on request to its secretary.

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 December 2006

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ISBN 0 580 49864 6

Amendments issued since publication

Amd. No.	Date	Comments

English Version

**Advanced technical ceramics - Mechanical properties of ceramic
composites at ambient temperature - Evaluation of the
resistance to crack propagation by notch sensitivity testing**

Céramiques techniques avancées - Propriétés mécaniques
des céramiques composites à température ambiante -
Evaluation de la résistance à la propagation de fissure par
un essai de sensibilité à l'entaille

Hochleistungskeramik - Mechanische Eigenschaften von
keramischen Verbundwerkstoffen bei
Umgebungstemperatur - Beurteilung der
Rissausbreitungsbeständigkeit durch die
Kerbempfindlichkeitsprüfung

This European Standard was approved by CEN on 11 September 2006.

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Foreword

This document (EN 13234:2006) has been prepared by Technical Committee CEN/TC 184 “Advanced technical ceramics”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by April 2007, and conflicting national standards shall be withdrawn at the latest by April 2007.

This document supersedes ENV 13234:1998.

ENV 13234 was approved by CEN/TC 184 for development into a full European Standard. The principal changes to the ENV are in the normative references, as follows:

- in 6.1, reference to EN 10002-2 has been replaced by reference to EN ISO 7500-1;
- in 6.2.1, reference to WI 136 has been removed.

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

1 Scope

This European Standard describes a method for the classification of ceramic matrix composite (CMC) materials with respect to their sensitivity to crack propagation using tensile tests on notched specimens with different notch depths. Two classes of ceramic matrix composite materials can be distinguished: materials whose strength is sensitive to the presence of notches and materials whose strength is not affected. For sensitive materials, this European Standard defines a method for determining equivalent fracture toughness.

The parameter, K_{eq} , is defined as the fracture toughness of a homogeneous material which presents the same sensitivity to crack propagation as the ceramic matrix composite material which is being considered. The definition of the K_{eq} parameter offers the possibility to compare ceramic matrix composite materials with other materials with respect to sensitivity to crack propagation.

For notch insensitive materials, the concept of K_{eq} does not apply.

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

2 Normative references

The following referenced documents are indispensable for the application 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 658-1:1998, *Advanced technical ceramics — Mechanical properties of ceramic composites at room temperature — Part 1: Determination of tensile properties*

EN 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 7500-1:2004)*

ISO 3611, *Micrometer callipers for external measurement*

3 Principle

Tensile tests are carried out on double edge notched test specimens with notches of different depths. The results of these tests are compared with the results of tensile tests on specimens without notches. The cross sectional dimensions of the notched specimens between the notches are equal to those of the un-notched specimens.

The strength values observed on both types of specimens as a function of notch depth allow the determination of the range of notch size for which the tested composite is sensitive to the presence of notches.