

Fine ceramics (advanced ceramics, advanced technical ceramics) - Test methods for fracture toughness of monolithic ceramics - Single-edge V-notch beam (SEVNB) method (ISO 23146:2012)

## EESTI STANDARDI EESSÕNA

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English Version

Fine ceramics (advanced ceramics, advanced technical ceramics) - Test methods for fracture toughness of monolithic ceramics - Single-edge V-notch beam (SEVNB) method (ISO 23146:2012)

Céramiques techniques - Méthodes d'essai pour la détermination de la ténacité à la rupture des céramiques monolithiques - Méthode sur éprouvette à entaille en V sur une seule face (Méthode SEVNB) (ISO 23146:2012)

Hochleistungskeramik - Prüfverfahren zur Bestimmung der Bruchzähigkeit monolithischer Keramik - Verfahren für Biegeproben mit V-Kerb (SEVNB-Verfahren) (ISO 23146:2012)

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## European foreword

The text of ISO 23146:2012 has been prepared by Technical Committee ISO/TC 206 “Fine ceramics” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 23146:2016 by Technical Committee CEN/TC 184 “Advanced technical ceramics” the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by October 2016, and conflicting national standards shall be withdrawn at the latest by October 2016.

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## Endorsement notice

The text of ISO 23146:2012 has been approved by CEN as EN ISO 23146:2016 without any modification.

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# Fine ceramics (advanced ceramics, advanced technical ceramics) — Test methods for fracture toughness of monolithic ceramics — Single-edge V-notch beam (SEVNB) method

## 1 Scope

This International Standard specifies a method for the determination of the fracture toughness of advanced technical ceramics. The procedure makes use of single-edge V-notched bars, which are loaded in four-point bending until failure. It is applicable to monolithic ceramics with a grain size or major microstructural feature size larger than about 1  $\mu\text{m}$ .

The use of this International Standard for yttria tetragonal zirconia polycrystal material (Y-TZP) is not recommended. The method might also be unsuitable for some other very tough or soft ceramics in which a sharp crack does not form at the root of the V-notch.

## 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.

ISO 3611, *Geometrical product specifications (GPS) — Dimensional measuring instruments; 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 14704, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for flexural strength of monolithic ceramics at room temperature*

ISO 15732, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for fracture toughness of monolithic ceramics at room temperature by single edge precracked beam (SEPB) method*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15732 apply.

## 4 Principle

This method of conducting a fracture toughness test is based on the preparation and fracture of bar test pieces in which a sharp-tipped notch is machined. Using the technique of a reciprocating razor blade and diamond paste, a narrow notch can be honed into a test piece using either a manual method or a simple machine. Under well-controlled conditions, a notch-tip radius in the range of 1  $\mu\text{m}$  to 20  $\mu\text{m}$  can be prepared depending on the grain size of the test material. For many materials, this is a close approximation to a sharp crack, and the method has been found to give fracture toughness values very close to those of other methods such as the single-edge precracked beam method (ISO 15732) or the surface crack in flexure method (ISO 18756), provided that a sharp crack forms at the root of the notch either during its preparation or during the subsequent fracture sequence. The method has the advantage of simplicity of notch production compared with using a sharp-tipped diamond saw or a diamond impregnated wire in which the tip radius is normally greater than 50  $\mu\text{m}$ . The method is often