

Fine ceramics (advanced ceramics, advanced technical ceramics) - Microstructural characterization - Part 1: Determination of grain size and size distribution (ISO 13383-1:2012)

## EESTI STANDARDI EESSÕNA

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English Version

Fine ceramics (advanced ceramics, advanced technical ceramics) - Microstructural characterization - Part 1:  
Determination of grain size and size distribution (ISO 13383-1:2012)

Céramiques techniques - Caractérisation  
microstructurale - Partie 1: Détermination de la taille  
et de la distribution des grains (ISO 13383-1:2012)

Hochleistungskeramik - Mikrostrukturelle  
Charakterisierung - Teil 1: Bestimmung der Korngröße  
und der Korngrößenverteilung (ISO 13383-1:2012)

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## European foreword

The text of ISO 13383-1:2012 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 13383-1:2016 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of an identical text or by endorsement, at the latest by October 2016, and conflicting national standards shall be withdrawn at the latest by October 2016.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 13383-1:2012 has been approved by CEN as EN ISO 13383-1:2016 without any modification.

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# Fine ceramics (advanced ceramics, advanced technical ceramics) — Microstructural characterization —

## Part 1: Determination of grain size and size distribution

### 1 Scope

This part of ISO 13383 describes manual methods of making measurements for the determination of grain size of fine ceramics (advanced ceramics, advanced technical ceramics) using photomicrographs of polished and etched test pieces. The methods described in this part do not yield the true mean grain diameter, but a somewhat smaller parameter depending on the method applied to analyse a two-dimensional section. The relationship to true grain dimensions depends on the grain shape and the degree of microstructural anisotropy. This part contains two principal methods, A and B.

Method A is the mean linear intercept technique. Method A1 applies to single-phase ceramics, and to ceramics with a principal crystalline phase and a glassy grain-boundary phase of less than about 5 % by volume for which intercept counting suffices. Method A2 applies to ceramics with more than about 5 % by volume of pores or secondary phases, or ceramics with more than one major crystalline phase where individual intercept lengths are measured, which can optionally be used to create a size distribution. This latter method allows the pores or phases to be distinguished and the mean linear intercept size for each to be calculated separately.

**NOTE** A method of determining volume fraction(s) of secondary phase(s) can be found in ISO 13383:2; this will provide a means of determining whether Method A1 or Method A2 should be applied in borderline cases.

Method B is the mean equivalent circle diameter method, which applies to any type of ceramic with or without a secondary phase. This method may also be employed for determining grain aspect ratio and a size distribution.

Some users of this part of ISO 13383 may wish to apply automatic or semiautomatic image analysis to micrographs or directly captured microstructural images. This is permitted by this part provided that the technique employed simulates the manual methods (see Clause 4 and 8.4).

### 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/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

### 3 Terms and definitions

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

#### 3.1

##### **grain size**

size of the distinct crystals in a material, and for the purposes of this method of test, that of the primary or major phase