SLOVENSKI STANDARD
SIST EN ISO 18610:2021

01-marec-2021

Fina keramika (sodobna keramika, sodobna tehnična keramika) - Mehanske lastnosti keramičnih kompozitov pri temperaturi okolice in pri zračnem tlaku - Ugotavljanje elastičnih lastnosti z ultrazvokom (ISO 18610:2016)

Fine ceramics (advanced ceramics, advanced technical ceramics) - Mechanical properties of ceramic composites at ambient temperature in air atmospheric pressure - Determination of elastic properties by ultrasonic technique (ISO 18610:2016)

Hochleistungskeramik - Mechanische Eigenschaften von keramischen Verbundwerkstoffen bei Raumtemperatur - Bestimmung der elastischen Eigenschaften durch eine Ultraschallmethode (ISO 18610:2016)

Céramiques techniques (céramiques avancées, céramiques techniques avancées) - Propriétés mécaniques des céramiques composites à température ambiante sous air à pression atmosphérique - Détermination des propriétés élastiques par méthode ultrasonore (ISO 18610:2016)

Ta slovenski standard je istoveten z: EN ISO 18610:2021

ICS:

81.060.30	Sodobna keramika	Advanced ceramics

SIST EN ISO 18610:2021   **en,fr,de**

iTeh STANDARD PREVIEW
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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 18610

January 2021

ICS 81.060.30

English Version

Fine ceramics (advanced ceramics, advanced technical ceramics) - Mechanical properties of ceramic composites at ambient temperature in air atmospheric pressure - Determination of elastic properties by ultrasonic technique (ISO 18610:2016)

Céramiques techniques (céramiques avancées, céramiques techniques avancées) - Propriétés mécaniques des céramiques composites à température ambiante sous air à pression atmosphérique - Détermination des propriétés élastiques par méthode ultrasonore (ISO 18610:2016)

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This European Standard was approved by CEN on 20 December 2020.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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EN ISO 18610:2021 (E)

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European foreword

The text of ISO 18610:2016 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 18610:2021 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 July 2021, and conflicting national standards shall be withdrawn at the latest by July 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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iTeh STA**Endorsement notice**IEW

The text of ISO 18610:2016 has been approved by CEN as EN ISO 18610:2021 without any modification.

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INTERNATIONAL STANDARD

ISO
18610

First edition
2016-09-15

Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at ambient temperature in air atmospheric pressure — Determination of elastic properties by ultrasonic technique

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Céramiques techniques (céramiques avancées, céramiques techniques avancées) — Propriétés mécaniques des céramiques composites à température ambiante sous air à pression atmosphérique — Détermination des propriétés élastiques par méthode ultrasonore

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ISO 18610:2016(E)

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

INTERNATIONAL STANDARD   **ISO 18610:2016(E)**

Fine ceramics (advanced ceramics, advanced technical ceramics) — Mechanical properties of ceramic composites at ambient temperature in air atmospheric pressure — Determination of elastic properties by ultrasonic technique

1 Scope

This document specifies an ultrasonic method to determine the components of the elasticity tensor of ceramic matrix composite materials at room temperature. Young's moduli shear moduli and Poisson coefficients, can be determined from the components of the elasticity tensor.

This document applies to ceramic matrix composites with a continuous fibre reinforcement: unidirectional (1D), bidirectional (2D), and tridirectional (×D, with $2 < × \leq 3$) which have at least orthotropic symmetry, and whose material symmetry axes are known.

This method is applicable only when the ultrasonic wavelength used is larger than the thickness of the representative elementary volume, thus imposing an upper limit to the frequency range of the transducers used.

NOTE   Properties obtained by this method might not be comparable with moduli obtained by ISO 15733, ISO 20504 and EN 12289.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 equipment: Micrometers for external measurements — Design and metrological characteristics*

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

EN 1389, *Advanced technical ceramics — Ceramic composites — Physical properties — Determination of density and apparent porosity*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TR 13233 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

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ISO 18610:2016(E)

3.1
stress-strain relations for orthotropic material
elastic anisotropic behaviour of a solid homogeneous body described by the elasticity tensor of fourth order C_{ijkl}, represented in the contracted notation by a symmetrical square matrix (6 × 6)

Note 1 to entry: If the material has at least orthotropic symmetry, its elastic behaviour is fully characterized by nine independent stiffness components C_{ij}, of the stiffness matrix (C_{ij}), which relates stresses to strains, or equivalently by nine independent compliance components S_{ij} of the compliance matrix (S_{ij}), which relates strains to stresses. The stiffness and compliance matrices are the inverse of each other.

If the reference coordinate system is chosen along the axes of symmetry, the stiffness matrix C_{ij} and the compliance matrix S_{ij} can be written as follows:

$$\begin{bmatrix} \sigma_1 \\ \sigma_2 \\ \sigma_3 \\ \sigma_4 \\ \sigma_5 \\ \sigma_6 \end{bmatrix} = \begin{bmatrix} C_{11} & C_{12} & C_{13} & 0 & 0 & 0 \\ C_{12} & C_{22} & C_{23} & 0 & 0 & 0 \\ C_{13} & C_{23} & C_{33} & 0 & 0 & 0 \\ 0 & 0 & 0 & C_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & C_{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & C_{66} \end{bmatrix} \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \end{bmatrix}$$

$$\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \end{bmatrix} = \begin{bmatrix} S_{11} & S_{12} & S_{13} & 0 & 0 & 0 \\ S_{12} & S_{22} & S_{23} & 0 & 0 & 0 \\ S_{13} & S_{23} & S_{33} & 0 & 0 & 0 \\ 0 & 0 & 0 & S_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & S_{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & S_{66} \end{bmatrix} \begin{bmatrix} \sigma_1 \\ \sigma_2 \\ \sigma_3 \\ \sigma_4 \\ \sigma_5 \\ \sigma_6 \end{bmatrix}$$

Note 2 to entry: For symmetries of higher level than the orthotropic symmetry, the C_{ij} and S_{ij} matrices have the same form as here above. Only the number of independent components reduces.

3.2
engineering constants
compliance matrix components of an orthotropic material which are in terms of engineering constants:

$$\left[S_{ij} \right] = \begin{bmatrix} \dfrac{1}{E_{11}} & \dfrac{-\nu_{21}}{E_{22}} & \dfrac{-\nu_{31}}{E_{33}} & 0 & 0 & 0 \\ \dfrac{-\nu_{12}}{E_{11}} & \dfrac{1}{E_{22}} & \dfrac{-\nu_{32}}{E_{33}} & 0 & 0 & 0 \\ \dfrac{-\nu_{13}}{E_{11}} & \dfrac{-\nu_{23}}{E_{22}} & \dfrac{1}{E_{33}} & 0 & 0 & 0 \\ 0 & 0 & 0 & \dfrac{1}{G_{23}} & 0 & 0 \\ 0 & 0 & 0 & 0 & \dfrac{1}{G_{13}} & 0 \\ 0 & 0 & 0 & 0 & 0 & \dfrac{1}{G_{12}} \end{bmatrix}$$

where

E_{11}, E_{22} and E_{33} are the elastic moduli in directions 1, 2 and 3, respectively;

G_{12}, G_{13} and G_{23} are the shear moduli in the corresponding planes;

ν_{12}, ν_{13}, ν_{23} are the respective Poisson coefficients.