

Fine ceramics (advanced ceramics, advanced technical ceramics) - Determination of adhesion of ceramic coatings by scratch testing (ISO 20502:2005 including Cor 1:2009)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 20502:2016 sisaldab Euroopa standardi EN ISO 20502:2016 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 20502:2016 consists of the English text of the European standard EN ISO 20502:2016.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 20.04.2016.	Date of Availability of the European standard is 20.04.2016.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 81.060.30

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:

Aru 10, 10317 Tallinn, Eesti; koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Aru 10, 10317 Tallinn, Estonia; homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

Fine ceramics (advanced ceramics, advanced technical ceramics) - Determination of adhesion of ceramic coatings by scratch testing (ISO 20502:2005 including Cor 1:2009)

Céramiques techniques - Détermination de l'adhérence des revêtements céramiques par essai de rayure (ISO 20502:2005, y compris Cor 1:2009)

Hochleistungskeramik - Bestimmung der Haftung von keramischen Schichten mit dem Ritztest (ISO 20502:2005 einschließlich Cor 1:2009)

This European Standard was approved by CEN on 18 March 2016.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of ISO 20502:2005 including Cor 1:2009, 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 20502:2016 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.

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

This document supersedes EN 1071-3:2005.

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

Endorsement notice

The text of ISO 20502:2005 including Cor 1:2009, has been approved by CEN as EN ISO 20502:2016 without any modification.

Contents

Page

Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Principle	1
4 Apparatus and materials	2
4.1 Scratch tester	2
4.2 Diamond stylus	2
5 Preparation of test piece	3
5.1 General requirements	3
5.2 Surface roughness, waviness and levelling	3
5.3 Specimen cleaning	3
5.4 Coating-substrate parameters relevant to a test.....	4
6 Test procedure	4
6.1 General.....	4
6.2 Equipment preparation.....	4
6.3 Environmental conditions.....	5
6.4 Scratching procedure.....	5
6.4.1 General.....	5
6.4.2 Progressive-force scratch test	5
6.4.3 Constant-force scratch test	5
6.4.4 Multi-pass scratch test	5
6.5 Scratch evaluation and critical normal-force determination.....	6
6.5.1 General.....	6
6.5.2 Microscope observation	6
6.5.3 Acoustic emission (AE) and frictional force (FF) recording.....	6
7 Repeatability and limits.....	7
8 Test report	7
Annex A (normative) Procedure for calibration of a scratch testing system	12
Annex B (informative) Typical failure modes obtained in scratch testing	19
Bibliography	31

Fine ceramics (advanced ceramics, advanced technical ceramics) — Determination of adhesion of ceramic coatings by scratch testing

1 Scope

This International Standard describes a method of testing ceramic coatings by scratching with a diamond stylus. During a test, either a constant or increasing force normal to the surface under test is applied to the stylus so as to promote adhesive and/or cohesive failure of the coating-substrate system. The test method is suitable for evaluating ceramic coatings up to a thickness of 20 µm and might also be suitable for evaluating other coating types and thicknesses.

The International Standard is intended for use in the macro (1 to 100 N) force range. The procedures may also be applicable to other force ranges. However, appropriate calibration is essential if the normal forces at which failure occurs are to be quantified.

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 4288, *Geometric Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

ISO 6508-2, *Metallic materials — Rockwell hardness test — Part 2: Verification and calibration of testing machines (scales A, B, C, D, E, F, G, H, K, N, T)*

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

3 Principle

The scratch test is designed for the assessment of the mechanical integrity of coated surfaces. The test method consists of generating scratches with a stylus of defined shape (usually a diamond with a Rockwell C geometry) by drawing it across the surface of the coating-substrate system to be tested, either under a constant or progressive normal force (see Figure 1). Failure events are detected by direct microscopic observation of the scratch and sometimes by using acoustic emission and/or friction force measurement.

The driving forces for the failure of the coating-substrate system in the scratch test are a combination of elastic-plastic indentation stresses, frictional stresses and the residual internal stress present in the coating. The normal force at which failure occurs is called the critical normal force L_c .

NOTE 1 The term “critical load” is frequently used in place of “critical normal force”. The use of the term “critical load” is deprecated because the failure is typically initiated by the application of a force rather than a load.