

**Advanced technical ceramics - Methods
of test for ceramic coatings - Part 6:
Determination of the abrasion
resistance of coatings by a micro-
abrasion wear test**

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ceramic coatings - Part 6: Determination of the
abrasion resistance of coatings by a micro-abrasion
wear test

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 1071-6:2007 sisaldab Euroopa standardi EN 1071-6:2007 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 18.12.2007 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 1071-6:2007 consists of the English text of the European standard EN 1071-6:2007.</p> <p>This document is endorsed on 18.12.2007 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p>Käsitlusala:</p> <p>This part of EN 1071 specifies a method for measuring the abrasive wear rate of ceramic coatings by means of a micro-scale abrasion wear test, based on the well known crater grinding technique used for film thickness determination (see EN 1071-2). This method can provide data on both film and substrate wear rates, either by performing two separate tests or by careful analysis of data from a single test series. The test method can be applied to samples with planar or non-planar surfaces but the analysis described in clause 9 applies only to flat samples. For non-planar samples, a more complicated analysis, possibly requiring the use of numerical methods, is required</p>	<p>Scope:</p> <p>This part of EN 1071 specifies a method for measuring the abrasive wear rate of ceramic coatings by means of a micro-scale abrasion wear test, based on the well known crater grinding technique used for film thickness determination (see EN 1071-2). This method can provide data on both film and substrate wear rates, either by performing two separate tests or by careful analysis of data from a single test series. The test method can be applied to samples with planar or non-planar surfaces but the analysis described in clause 9 applies only to flat samples. For non-planar samples, a more complicated analysis, possibly requiring the use of numerical methods, is required</p>
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Võtmesõnad:

English Version

Advanced technical ceramics - Methods of test for ceramic coatings - Part 6: Determination of the abrasion resistance of coatings by a micro-abrasion wear test

Céramiques techniques avancées - Méthodes d'essai pour revêtements céramiques - Partie 6 : Détermination de la résistance à l'abrasion des revêtements par essai de micro-usure

Hochleistungskeramik - Verfahren zur Prüfung keramischer Schichten - Teil 6: Bestimmung der Beständigkeit gegen Abriebverschleiß von Schichten mittels Mikroabriebprüfung

This European Standard was approved by CEN on 30 September 2007.

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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 Management Centre has the same status as the official versions.

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Foreword

This document (EN 1071-6:2007) 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 May 2008, and conflicting national standards shall be withdrawn at the latest by May 2008.

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 ENV 1071-6:2002.

EN 1071 'Advanced technical ceramics - Methods of test for ceramic coatings' was prepared in 11 Parts:

- Part 1: Determination of coating thickness by contact probe profilometer
- Part 2: Determination of coating thickness by the crater grinding method
- Part 3: Determination of adhesion and other mechanical failure modes by a scratch test
- Part 4: Determination of chemical composition by electron probe microanalysis (EPMA)
- Part 5: Determination of porosity
- Part 6: Determination of the abrasion resistance of coatings by a micro-abrasion wear test
- Part 7: Determination of hardness and Young's modulus by instrumented indentation testing
- Part 8: Rockwell indentation test for evaluation of adhesion
- Part 9: Determination of fracture strain
- Part 10: Determination of coating thickness by cross sectioning
- Part 11: Determination of internal stress by the Stoney formula

Part 5, a European pre-standard, was withdrawn in 2007. Part 7, a Technical Specification, was withdrawn in 2007, following publication of EN ISO 14577-4. At the time of publication of this document, Parts 8 to 11 were Technical Specifications.

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, 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 the United Kingdom.

1 Scope

This part of EN 1071 specifies a method for measuring the abrasive wear rate of ceramic coatings by means of a micro-scale abrasion wear test, based on the well known crater grinding technique used for film thickness determination (see EN 1071-2).

This method can provide data on both film and substrate wear rates, either by performing two separate tests or by careful analysis of data from a single test series.

The test method can be applied to samples with planar or non-planar surfaces but the analysis described in clause 9 applies only to flat samples. For non-planar samples, a more complicated analysis, possibly requiring the use of numerical methods, is required.

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 ISO 17025, *General requirements for the competence of testing and calibration laboratories* (ISO/IEC 17025:2005)

ISO 3290, *Rolling bearings — Balls — Dimensions and tolerances*

3 Terms and definitions

For the purposes of this European Standard, the following term and definition applies.

3.1

abrasive wear rate, K

abrasive wear coefficient

volume of material removed in unit sliding distance under a normal contact load of 1 N

4 Significance and use

Although few protective coatings are subject to single wear processes, the abrasive wear resistance of such coatings can play a decisive role in their performance. Hence knowledge of the abrasive wear resistance of ceramic coatings can help in the proper selection of coatings for applications where abrasion plays a major role in their degradation. Although techniques exist to measure the abrasive wear behaviour of bulk materials and thick films (see [1 – 3]), these techniques are not easily applied to thin films and are difficult to interpret when used on curved surfaces.

The purpose of this European Standard is to provide a method for measuring the abrasion resistance of both thin and thick coatings and of bulk materials. The test can be performed on flat surfaces or surfaces with a known radius of curvature, and requires only a few mm² of sample. However, the analysis described in clause 9 applies only to flat samples, and is applicable to homogeneous single layer coatings only; errors may occur if the test is used on in-homogeneous coatings. [4] and [5] give details of analytical treatments for determining the wear rate for coatings on curved surfaces.

By proper treatment of the results, as indicated in 9.2, where the test produces penetration of the coating it can provide abrasive wear coefficients for both the coating and substrate from a single test series.