

**Advanced technical ceramics - Methods of test for
ceramic coatings - Part 10: Determination of coating
thickness by cross sectioning**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 1071-10:2009 sisaldab Euroopa standardi EN 1071-10:2009 ingliskeelset teksti.

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English Version

**Advanced technical ceramics - Methods of test for ceramic
coatings - Part 10: Determination of coating thickness by cross
sectioning**

Céramiques techniques avancées - Méthodes d'essai pour
les revêtements céramiques - Partie 10: Détermination de
l'épaisseur du revêtement par découpage transverse

Hochleistungskeramik - Verfahren zur Prüfung keramischer
Schichten - Teil 10: Bestimmung der Schichtdicke mittels
Querschliff

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Foreword

This document (EN 1071-10:2009) 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of an identical text or by endorsement, at the latest by January 2010, and conflicting national standards shall be withdrawn at the latest by January 2010.

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 CEN/TS 1071-10:2004.

EN 1071 *Advanced technical ceramics — Methods of test for ceramic coatings* consists of the following 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- *Part 5: Determination of porosity [withdrawn]*
- *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- *Part 7: Determination of hardness and Young's modulus by instrumented indentation testing [withdrawn]*
- *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 12: Reciprocating wear test ¹⁾*
- *Part 13: Determination of wear rate by the pin-on-disk method ¹⁾*

Parts 7, 8 and 11 are Technical Specifications. Part 7 was withdrawn shortly after publication of EN ISO 14577-4:2007.

¹⁾ In preparation at the time of publication of this European Standard.

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.

Introduction

The thickness of a coating is an important property that controls its functional behaviour. Thickness determinations are also used as part of quality control in the production of coatings. It is normal to specify a thickness when defining a coating, so that valid methods of measurement are required. The method described here is direct, but is destructive, requiring preparation of a metallographic cross-section. A number of other standard non-destructive methods exist and some of these are listed in the Bibliography (references [1] to [7]).

1 Scope

This document specifies a method of measuring the thickness of ceramic coatings by means of examination of a metallographically prepared cross-section of the coating in a calibrated optical or scanning electron microscope. It draws strongly on EN ISO 9220 [8], modifying and updating as required to be relevant to ceramic coatings and current best practice.

2 Normative references

The following referenced document is 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.

ENV 13005, *Guide to the expression of uncertainty in measurement*

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

3 Terms and definitions

For the purposes of this document, the following term and definition apply.

3.1

local thickness

mean of the thickness measurements, of which a specified number is made within a reference area [EN ISO 2064:2000] [5]

4 Principle

This test procedure covers the measurement of coating thickness by examination of a cross-section in an optical or scanning electron microscope. Preparation of the cross-section requires care to ensure that the total thickness is revealed and that when viewed it is normal to the axis of the microscope. After proper calibration of the microscope, it is a simple matter to determine the coating thickness from knowledge of the magnification used. This can be done directly using a modern measuring microscope, or indirectly from photographic images obtained from an optical or scanning electron microscope.

5 Apparatus

5.1 Scanning electron microscope (SEM)

The SEM shall have a spatial resolution of 50 nm or better. Suitable instruments are available commercially.

5.2 Optical microscope

The optical microscope shall have a spatial resolution of 500 nm or better. Suitable instruments are available commercially.

NOTE 1 Microscopes that incorporate a system to automatically record the XY coordinates are available and, if the stage movement has been calibrated, can be used directly to measure coating thickness without the need