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English version

**Advanced technical ceramics - Methods of test for ceramic
coatings - Part 8: Rockwell indentation test for evaluation of
adhesion**

Céramiques techniques avancées - Méthodes d'essai pour
revêtements céramiques - Partie 8: Evaluation de
l'adhérence par test de pénétration Rockwell

Hochleistungskeramik - Verfahren zur Prüfung keramischer
Schichten - Teil 8: Rockwell-Eindringprüfung zur Bewertung
der Haftung

This Technical Specification (CEN/TS) was approved by CEN on 6 June 2004 for provisional application.

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Foreword

This document (CEN/TS 1071-8:2004) has been prepared by Technical Committee CEN/TC 184 "Advanced technical ceramics", the secretariat of which is held by BSI.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

EN 1071 *Advanced technical ceramics — Methods of test for ceramic coatings* consists of eleven 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 adhesive 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 modulus by depth sensing indentation*
- 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: *Measurement of internal stress with the Stoney formula.*

1 Scope

This document specifies a method for the evaluation of the adhesion of ceramic coatings by indentation with a Rockwell diamond indenter. The formation of cracks after indentation may also reveal cohesive failure. The indentations are made with a Rockwell hardness test instrument.

The method described in this document may also be suitable for evaluating the adhesion of metallic coatings.

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 6508-1 *Metallic materials - Rockwell hardness test - Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T) (ISO 6508-1:1999)*

EN 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 6508-2:1999)*

3 Principle

An indentation is made into the coated surface of the specimen to be tested whereby the coating near the indent can be damaged. The indentation and surrounding area are examined for cracks and/or flaking with the aid of an optical microscope.

4 Apparatus

The indentations shall be made according to EN ISO 6508-1 following the procedure for a Rockwell hardness indentation.

The Rockwell hardness testing machine shall conform with the requirements of EN ISO 6508-2.

The contour of the diamond indenter shall be checked regularly by optical means (magnifying glass, optical microscope, stereomicroscope or projection screen). This check shall be made for at least four different axial sections. The indenter shall be replaced if this examination reveals any damage of the indenter (e.g. chipping). A magnification of at least 200:1 is recommended to detect ring cracks or microwear.

NOTE Although a research project to evaluate the effect of indentation parameters showed no major influence of load rate or holding time on the results (see [1]) they should be kept constant for reasons of repeatability. To conform with EN ISO 6508-1 requires that the loading time be between 1 s and 8 s and the hold time at $4 \text{ s} \pm 2 \text{ s}$. Neither loading time nor holding time need to be recorded.

5 Sampling and preparation of test specimens

Select a representative test specimen from the coating to be tested. Clean the specimen so that it is free from dust and other particles, and also from oil or other surface films.