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

*Céramiques techniques — Détermination de l'adhérence
des revêtements céramiques par essai de rayure*



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Published in Switzerland

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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.

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ISO 20502 was prepared by Technical Committee ISO/TC 206, *Fine ceramics*.

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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.