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**Paints and varnishes - Scratch test using a spring-loaded pen
(English Translation)**

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Foreword

This document was drafted in accordance with the rules provided in GB/T 1.1-2020 Directives

for Standardization - Part 1.Rules for the Structure and Drafting of Standardizing Documents.

This document identically adopts ISO 22557.2019 Paints and Varnishes - Scratch Test Using a

Spring-loaded Pen.

The following minimal editorial change is made to this document.

---Additional information on corresponding scratch types is added to 7.6.

Please be noted that certain content of this document may involve patents. The institution issuing this document does not undertake the responsibility of identifying these patents.

This document was proposed by China Petroleum and Chemical Industry Federation.

This document shall be under the jurisdiction of National Technical Committee 5 on Paint Pigment of Standardization Administration of China (SAC/TC 5).

The drafting organizations of this document. Yejian New Material Co., Ltd.; Changzhou Guanghui New Materials Research Institute Co., Ltd.; Guohengxin (Changzhou) Testing and

Certification Technology Co., Ltd.; Biuged Precision Instruments (Guangzhou) Co., Ltd.; Fujian Wanan Group Co., Ltd.; Fujian University of Technology Geotechnical Engineering Research Institute Co., Ltd.; CNOOC Changzhou Paint and Coatings Industry Research Institute; Beijing Aerospace Xinli Technology Co., Ltd.; Guangdong Nippon Changrunfa Technology Materials Co., Ltd.; Shanghai Customs Industrial Products and Raw Materials Testing Technology Center; Minjiang University.

1 Scope

This document describes a method for determining the scratch resistance of coatings by inducing scratches using a commonly used handheld, loaded stylus.

Either point stylus (Method A) or disc stylus (Method B) can be used for the test.

Both methods are universally applicable and can be used in the field as well as on curved surfaces. Method A can also be used for small specimens (minimum size 30 mm x 50 mm).

This test can be performed as a "pass/fail" test (Test Requirement I) or as a grading test (Test Requirement II).

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only

versions with a specified date are applicable to this document. In terms of references without a

specified date, the latest version (including all the modifications) is applicable to this document.

ISO 868 Plastics and Ebonite - Determination of Indentation Hardness by Means of a Durometer (Shore hardness)

NOTE: GB/T 2411-2008 Plastics and Ebonite - Determination of Indentation Hardness by Means of a Durometer (shore hardness) (ISO 868.2003, IDT)

ISO 2808 Paints and Varnishes - Determination of Film Thickness

NOTE: GB/T 13452.2-2008 Paints and Varnishes - Determination of Film Thickness (ISO

2808.2007, IDT)

ISO 4618 Paints and Varnishes - Terms and Definitions

NOTE: GB/T 5206-2015 Paints and Varnishes - Terms and Definitions (ISO 4618.2014, IDT)

ISO 13076 Paints and Varnishes - Lighting and Procedure for Visual Assessments of Coatings

NOTE: GB/T 37356-2019 Paints and Varnishes - Lighting and Procedure for Visual Assessments of Coatings (ISO 13706.2012, IDT)

ISO 14526-1 Plastics - Phenolic Powder Molding Compounds (PF-PMCs) - Part 1.Designation

System and Basis for Specifications

NOTE: GB/T 1404.1-2008 Plastics - Phenolic Powder Molding Compounds - Part 1.Designation System and Basis for Specifications (ISO 14526-1.1999, IDT)

CEN/TS 13388 Copper and Copper Alloys - Compendium of Compositions and Products

EN 10027-2 Designation Systems for Steels - Part 2.Numerical System

3 Terms and Definitions

The terms and definitions defined in ISO 4618 and the following are applicable to this document.

ISO and IEC maintain terminology databases for standardization at the following addresses.

3.1 stylus

A scratching tool with a specified geometry.

3.2 writing effect

The effect of a loaded stylus (3.1) on the smoothness of the coating surface as it moves.

3.3 writing mark; gash

A scratch with continuous writing effect (3.2) damage.

3.4 metal marking

A writing mark (3.3) produced by a metal stylus (3.1) and covered by worn stylus material.

4 Principle

Manually move a stylus with a test load between 0.5 N and 20 N on the coating surface and visually inspect (using a magnifying glass) and assess the resulting damage.

The test can be performed using a point stylus (0.50 mm, 0.75 mm or 1.00 mm in diameter) in

accordance with Method A or using a disc stylus [made of stainless steel, copper, thermosetting

materials, or PMMA (polymethyl methacrylate)] in accordance with Method B.

5.1.1 By using a locking slide rod to compress a pressure spring, the test load is applied to the

stylus. The test load, in Newtons, can be read from the position of the slide rod on the scale.

To avoid altering the spring's elastic properties, the spring shall be loosened if the hardness pen

is not used for an extended period.

5.1.2 The test load range shall be between 0.5 N and 20 N.

For common hardness pen test loads, loads in the ranges of 0.5 N to 3 N (with a division value

of 0.1 N), 1.5 N to 10 N (with a division value of 0.5 N), and 3 N to 20 N (with a division value

of 1 N) are provided by replaceable pressure springs.

Due to the non-linear characteristics of the spring and friction within the hardness pen, the test

load shall not be lower than the lower limit of the specified range.

5.1.3 The detachable pen tip element respectively serves as a guide sleeve for the point stylus

or the test disc support. In the following cases, the test load set via the slide rod is effective.

---For the instrument shown in Figure 1, push the point stylus into the pen tip element, until only the tungsten carbide tip is exposed;

---For the instrument shown in Figure 2, push the test disc into the pen tip element, so that