SLOVENSKI STANDARD
SIST EN 13144:2003

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Kovinske in druge anorganske prevleke - Metoda za kvantitativno merjenje adhezije z nateznim preskusom

Metallic and other inorganic coatings - Method for quantitative measurement of adhesion by tensile test

Metallische und andere anorganische Überzüge - Verfahren zur quantitativen Messung der Haftfestigkeit durch den Zugversuch

Revetements métalliques et autres revetements non organiques - Méthode de mesurage quantitatif de l'adhérence par essai de traction

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Metallic and other inorganic coatings - Method for quantitative measurement of adhesion by tensile test

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This European Standard was approved by CEN on 2 January 2003.

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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 Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 13144:2003) has been prepared by Technical Committee CEN /TC 262 "Metallic and other inorganic coatings" 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of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard describes a quantitative method for the measurement of adhesion of metallic and other inorganic coatings applied to metallic surfaces.

Typical coatings for which this European Standard applies are copper, nickel, nickel plus chromium, silver, tin, tin-nickel alloys, zinc, gold.

This European Standard does not apply to certain hot dip, spray and mechanical coatings.

The measurement is valid if the cohesion and adhesion properties of the adhesive are higher than those of the coating subjected to test.

2 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply:

2.1
measurement
set of operations having the object of determining a value of a quantity

NOTE The operations may be performed automatically.

[International Vocabulary of Basic and General Terms in Metrology, 1993, definition 2.1]

2.2
principle of measurement
scientific basis of a measurement

EXAMPLES

a) the thermoelectric effect applied to the measurement of temperature;

b) the Josephson effect applied to the measurement of electric potential difference;

c) the Doppler effect applied to the measurement of velocity;

d) the Raman effect applied to the measurement of the wave number of molecular vibrations

[International Vocabulary of Basic and General Terms in Metrology, 1993, definition 2.3]

2.3
method of measurement
logical sequence of operations, described generically, used in the performance of measurements

NOTE Methods of measurement may be qualified in various ways such as:

— substitution method

— differential method

— null method.

[International Vocabulary of Basic and General Terms in Metrology, 1993, definition 2.4]

2.4
measurement procedure
set of operations, described specifically, used in the performance of particular measurements according to a given method

NOTE A measurement procedure is usually recorded in a document that is sometimes itself called a "measurement procedure" (or a measurement method) and is usually in sufficient detail to enable an operator to carry out a measurement without additional information.

[International Vocabulary of Basic and General Terms in Metrology, 1993, definition 2.5]

2.5
adhesion
force required to separate a coating from its substrate

NOTE Adhesion may be deemed inadequate in the presence of blisters, scaling and any defect that results from the separation of the coating from its substrate.

2.6
cohesion
physical property resulting from the magnitude of forces joining the atoms and/or molecules of a coating

3 Determination of adhesion by measurement

3.1 Principle

The tensile strength required to separate the coating from its substrate (see 2.5) is measured perpendicular to the substrate.

The result of the measurement is influenced not only by the mechanical properties of the system to be characterized, but also by the nature and preparation of the substrate (see 3.2.4 and 3.3.2).

The result of the measurement can also be affected by internal stress in the deposit, which influences adhesion.

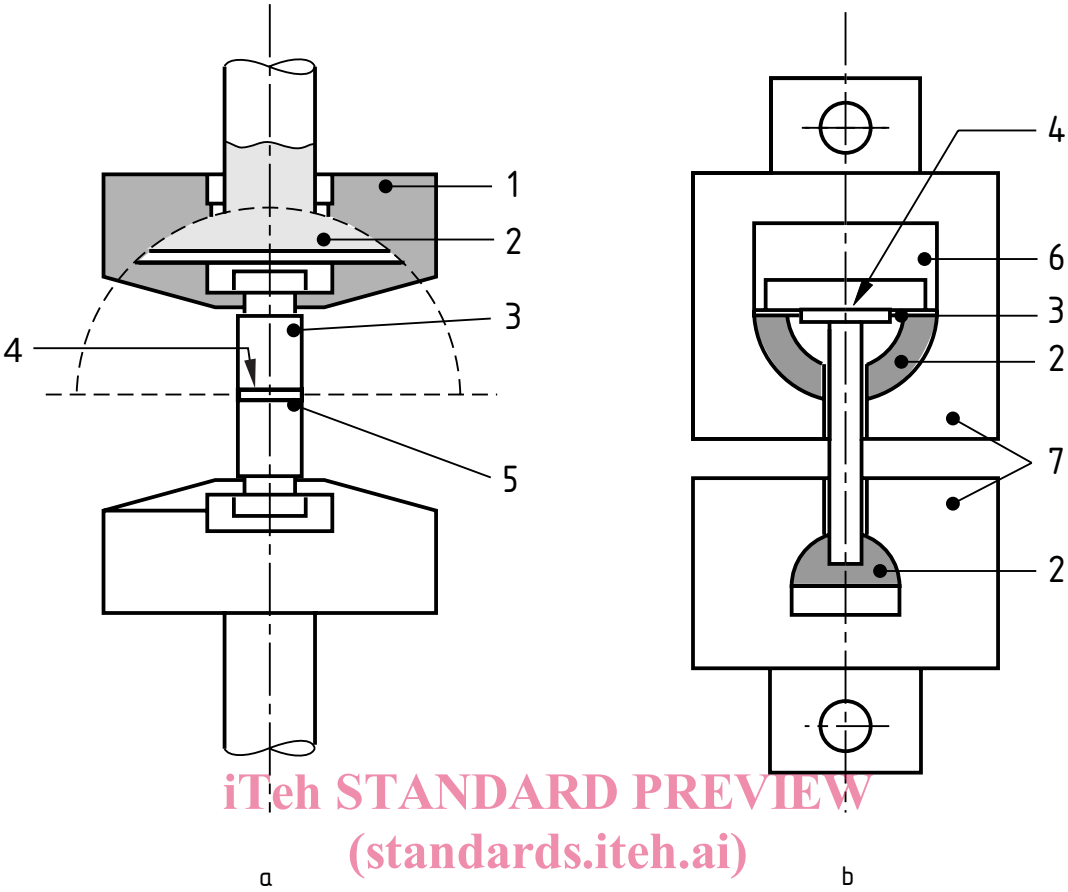
The result of the measurement is the tensile strength required to break the weakest interface or the weakest constituent of the test assembly. A combination of both adhesion and cohesive ruptures can also occur.

3.2 Apparatus

3.2.1 Tensile testing machine

-capable of being used in accordance with 3.5.

NOTE Suitable devices for the application of the tensile force are shown in Figure 1.



Key

1 Support
2 Ball joint
3 Test block
4 Coating
5 Substrate
6 Test specimen
7 Support designed so as to permit an articulated assembly

Figure 1 — Devices for the application of the tensile force

3.2.2 Tests blocks

- for use with the tensile testing machine (3.2.1), made of machined steel, having a diameter of 20 mm (unless otherwise agreed) and such thickness as to ensure the absence of deformations during the test.

The length of the block shall be not less than half its diameter (10 mm). Prior to use, the faces shall be machined perpendicular to the major axis of the block.

3.2.3 Cutting device

- for example a carbide tool or a scribing iron, capable of cutting the coating through to the substrate, along the circumference of the test block.

3.2.4 Adhesives

Special attention shall be given to the selection of adhesives for use in the test (see 3.1).

NOTE 1 The adhesion at the interface of the adhesive and coating can be improved by slightly abrading the surface of the coating prior to applying the adhesive to the appropriate surface of the test block.

NOTE 2 In the majority of cases, cyanoacrylate adhesives, solvent-free bi-component epoxides and peroxide catalysed polyesters can be used, although their adhesion properties are inferior to those of metallic coatings.

3.3 Procedure

3.3.1 Test conditions

The test shall be carried out at a temperature of (23 ± 2) °C and at a relative humidity (50 ± 5) %.

3.3.2 Adhesive

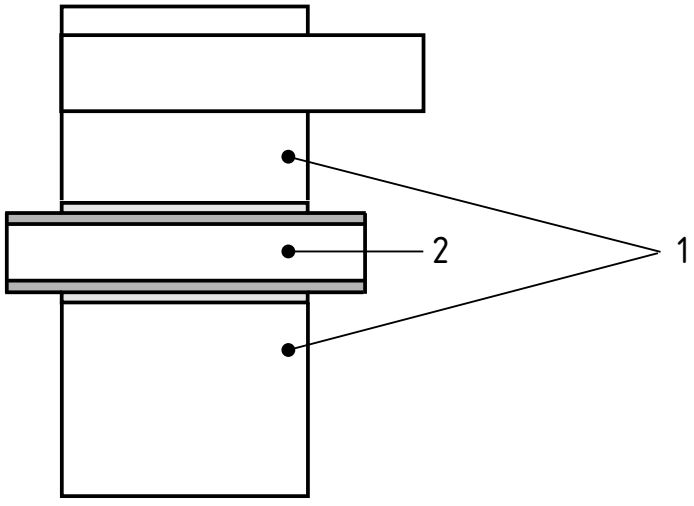
The adhesive shall be prepared and applied in accordance with the manufacturer's instructions. The minimum quantity of adhesive necessary to obtain a uniform joint between the constituents of the test assembly shall be used; any excess adhesive shall be removed.

For deformable substrates, the substrate should be coated on both faces and subjected the "sandwich" method (see 3.4.1).

3.4 Test assembly

3.4.1 "Sandwich" assembly

Cut a test specimen in the shape of a 30 mm diameter disc or a 30 mm sided square from the coated substrate. Taking care not to deform the specimen, apply the adhesive uniformly over the faces of two freshly cleaned test blocks (3.2.2) of the same test area. Place the specimen between the two adhesive coated faces of the test blocks so that the axes of the blocks are aligned with the centre of the specimen and apply a constant pressure during the setting time of the adhesive. At the end of the setting time, cut the coating under test around the circumference of the test blocks through to the substrate (see Figure 2).



Key

1 Adhesive coated test block

2 Coated substrate

Figure 2 — "Sandwich" assembly corresponding to Figure 1a)