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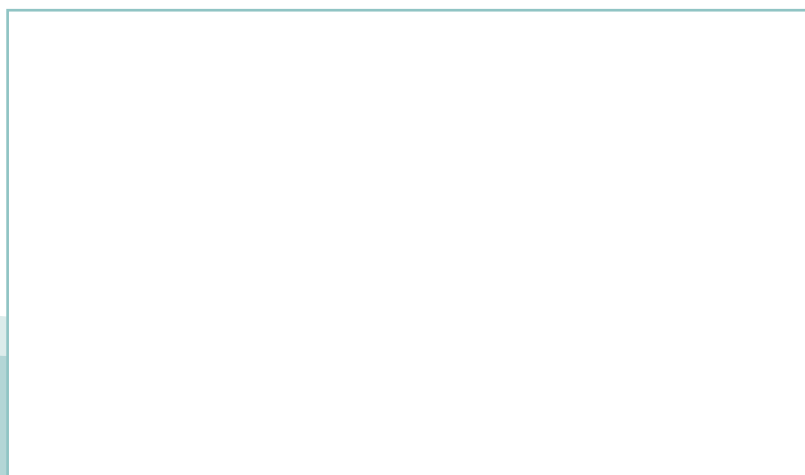
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Termisk sprutning – Bestämning av vidhäftning genom dragprovning (ISO 14916:2017)

Thermal spraying – Determination of tensile adhesive strength (ISO 14916:2017)



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Europastandarden EN ISO 14916:2017 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 14916:2017.

Denna standard ersätter SS-EN 582, utgåva 1.

The European Standard EN ISO 14916:2017 has the status of a Swedish Standard. This document contains the official version of EN ISO 14916:2017.

This standard supersedes the Swedish Standard SS-EN 582, edition 1.

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Denna standard är framtagen av kommittén för AGS 448 Termisk sprutning, SIS/TK 134/AG 08.

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EUROPEAN STANDARD

EN ISO 14916

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2017

ICS 25.220.20

Supersedes EN 582:1993

English Version

Thermal spraying - Determination of tensile adhesive strength (ISO 14916:2017)

Projection thermique - Mesure de l'adhérence par essais de traction (ISO 14916:2017)

Thermisches Spritzen - Ermittlung der Haftzugfestigkeit (ISO 14916:2017)

This European Standard was approved by CEN on 8 March 2017.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

SS-EN ISO 14916:2017 (E)

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European foreword

This document (EN ISO 14916:2017) has been prepared by Technical Committee ISO/TC 107 "Metallic and other inorganic coatings" in collaboration with Technical Committee CEN/TC 240 "Thermal spraying and thermally sprayed coatings" the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

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 EN 582:1993.

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Endorsement notice

The text of ISO 14916:2017 has been approved by CEN as EN ISO 14916:2017 without any modification.

SS-EN ISO 14916:2017 (E)**Introduction**

The determination of the tensile adhesive strength of a thermal spray coating can play an important role in the quality control of production. Deviations from the normal and qualified procedure can be recognized when preparing and spraying a component.

If the fracture occurs cohesively in the coating when applying the tensile adhesive strength test, the coating's strength in the direction normal to the surface is supplied. Influences of variations in spray conditions can be identified via proper interpretation of tensile test results. Microscopic investigations of the fractured surface can supply further information for judging the quality of the coating's structure.

A revision of the existing document had been required as a result of the identification of significant influences on the test results caused by the tensile test bonding procedure and by the properties of the adhesive itself. These findings were not adequately covered in the previous version of this document.

Thermal spraying — Determination of tensile adhesive strength

1 Scope

This document specifies the procedure to determine the tensile adhesive strength of thermally sprayed coatings under tension in the direction normal to the surface of the coating by applying a tensile test. By using this procedure, comparability of the test results is ensured.

The test is intended to determine the tensile adhesive strength between the thermally sprayed coating and the substrate material or between the bond and top coat and/or of the cohesive strength of the related coat of the coating system. In some cases, thermally sprayed coatings might have more than two layers. The method specified in this document applies also to determine the tensile adhesive strength between the interfaces of different layers in a coating system which consists of more than two layers.

This test is sufficient to compare coatings manufactured using same or similar feedstock materials and thermal spray processes with each other. The tensile adhesive strength test is not intended to provide absolute values for evaluation of the durability of coatings under operational use.

The test is used to assess the influence of substrate preparation, the spraying conditions and the process parameter on the tensile adhesive strength of thermally sprayed coatings. It can also be employed in order to monitor the consistency of the manufacturing and spraying processes.

NOTE This tensile test can also be applied to very thin coatings. Moreover, the infiltration of bonding agent into the thermally sprayed coatings containing a required level of porosity can be minimized using an appropriate bonding agent (foil rather than liquid). For further instructions, please refer to 6.5.3. This tensile test is inappropriate for determining the adhesive strength of fused spray coatings deposited using self-fluxing alloys due to their inherent high adhesion strength values.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 14917, *Thermal spraying — Terminology, classification*

EN 13507, *Thermal spraying — Pre-treatment of surfaces of metallic parts and components for thermal spraying*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

SS-EN ISO 14916:2017 (E)**3.1
adhesive strength**

R_H
tensile strength measured in the tension test, which is calculated from the quotient of the maximum load F_{\max} and the cross-section area of the fractured face

**3.2
adhesive failure**
fracture, which runs along the interface between coating and substrate

Note 1 to entry: The coating will be totally separated away from the substrate.

Note 2 to entry: The inter-particle bonding (cohesive strength) is higher than the adhesive strength of the coating.

**3.3
cohesive failure**
fracture, which takes place within the coating

Note 1 to entry: The inter-particle bonding (cohesive strength) is lower than the adhesion strength of the coating.

**3.4
adhesive-cohesive failure**
fracture, which is partially located in the interface of the coating to the substrate and partially within the coating**3.5
internal adhesive strength**
adhesive strength between the layers of a coating system, e.g. between a bond and top coat**3.6
test disc**
test specimen formed like a disc coated on one side

Note 1 to entry: This is to be positioned and glued between two loading blocks when preparing the tensile test specimen.

**3.7
reference specimen**
specimen for determination of the strength of bonding agent

Note 1 to entry: This consists of two uncoated loading blocks glued together using the same joining procedure as for all other tested specimens.

4 Principles

The test methods listed in this document are recommended for quality control or characterization of coatings and/or coating systems in order to improve thermal spray processes or to develop coatings with increased adhesive and cohesive strength as well as with improved microstructure.

Thermally sprayed coatings exhibit as a thumb of rule — inherent to the characteristics of the process — a porous microstructure. Due to the requirements of their targeted application areas, they may contain a high level of porosity. Due to the possibility of infiltration of the coating by the bonding agent, the porous character of a coating can be unfavourable. The development of incorrect types or quantities of bonding agents can lead to significant changes in the coating properties so that the measurement results can be invalid.

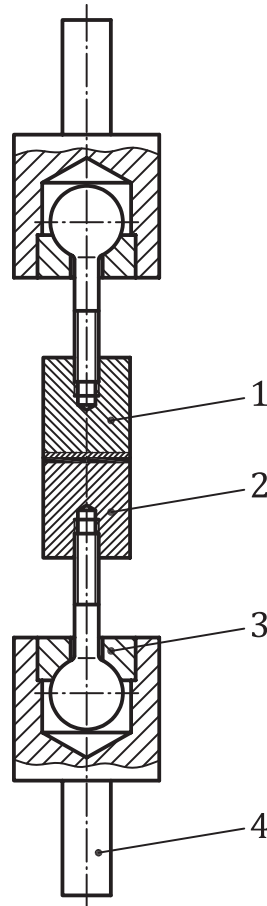
Furthermore, only loads normal to the coating surface, which are free of bending or torsion moments, shall be applied during tensile loading. Therefore, adequate clamping and centring devices shall be used during the entire manufacturing process of the test specimens and during the testing.

5 Equipment for testing and measuring and auxiliary equipment

5.1 Test instruments

A tensile testing machine according to ISO 7500-1, class 1, with a suitable clamping system shall be used, which ensures clamping and loading of the specimens through the centre line following no bending and torsion moments.

This can be achieved by a ball joint which is specified in this document (for details, see [Figure 1](#)) or by a universal suspension [examples are according to ASTM C633-13 (see [Figure B.4](#)), EN 13144 and ISO 13779-4). The M16 threaded drill hole shall bear and transfer the load to the specimen.].



Key

- 1 loading block
- 2 substrate block
- 3 ball joint
- 4 clamping part

Figure 1 — Arrangement for the tensile adhesion test with test specimen according to form A

5.2 Measurement instrument

Measurements can be carried out, when preparing the loading block and test specimens, using measurement instruments in accordance with standard commercial practices. Recommendations and examples for special gauges to measure the concentricity (see [Figure B.2](#)) and parallelism of specimens with a 25,0 mm diameter are given in [Annex B](#).