SLOVENSKI STANDARD
SIST EN 15340:2007

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Vroļe brizganje ï Ugotavljanje odpornosti vroļe brizganih prevlek proti strińnim obremenitvam

Thermal spraying - Determination of shear load resistance of thermally sprayed coatings

Thermisches Spritzen - Bestimmung des Scherbeanspruchungswiderstandes bei thermisch gespritzten Schichten

Projection thermique - Détermination de la résistance au cisaillement des revetements obtenus par projection thermique

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25.220.20 Površinska obdelava Surface treatment

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English Version

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This European Standard was approved by CEN on 3 February 2007.

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Foreword

This document (EN 15340:2007) has been prepared by 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of an identical text or by endorsement, at the latest by September 2007, and conflicting national standards shall be withdrawn at the latest by September 2007.

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

Introduction

The test is conducted to determine the shear load resistance of the bond between the spray deposit and the parent material (adhesive strength) and/or the strength of the coating itself (cohesive strength). If adhesive strength of the sprayed coating to the base material supersedes the cohesive strength, primarily the cohesive strength of the deposit is determined. During the test the coating is loaded parallel to the interface of coating/substrate.

The test is used to evaluate the effects of parent material and spray material, surface preparation of the work piece before spraying, and the spraying conditions on the adhesive and/or cohesive strength of thermally sprayed coatings, or for quality control and routine supervision of the spray works.

1 Scope

This European Standard specifies the procedure for determination of the shear load resistance of thermally sprayed coatings, provided that a minimum thickness is given.

Additionally this European Standard defines the shear load resistance and the designation of the fracture's structure on the test specimen, which occurs when the shear adhesive or adhesive/ cohesive or cohesive strength of the coating or the coating system will be exceeded.

The test report is the basis for comparative statements regarding shear load resistance and structure of fracture.

NOTE The test for the determination of the shear load resistance is not recommended for sprayed coatings thinner than approximately 150 µm because the adjustment of shear distance becomes critical.

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 657:2005, *Thermal spraying — Terminology, classification*

EN ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system (ISO 7500-1:2004)*

ISO 1832, *Indexable inserts for cutting tools — Designation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 657:2005 and the following apply.

3.1
shear strength
FSa
maximum force that causes fracture of the specimen in the interface coating/substrate

NOTE This fracture mode is called "Mode 1".

3.2
shear adhesive/cohesive strength
FSa/c
maximum force that causes mixed fracture partially within coating material and partially in the interface coating/substrate

NOTE This fracture mode is called "Mode 2".

3.3
shear cohesive strength
FSc
maximum force that causes fracture of the specimen within the coating material

NOTE This fracture mode is called:

- "Mode 3a"
  - if in case of hard coatings continuous blistering of small or larger pieces of the coating occurs;
  - if soft and/or porous coatings will be compressed and continuously scraped off;
- "Mode 3b"
  - if the fracture path runs within the coating especially parallel to the interface coating/substrate and the coating part under the shear plate detaches in one piece

3.4
shear energy
ES
area below the force displacement curve provided by the shear test

NOTE The energy ES up to the first shear force maximum can be calculated using the force-displacement curve provided by the shear test. The energy ES relates to the energy absorption of the coating-substrate system until failure.

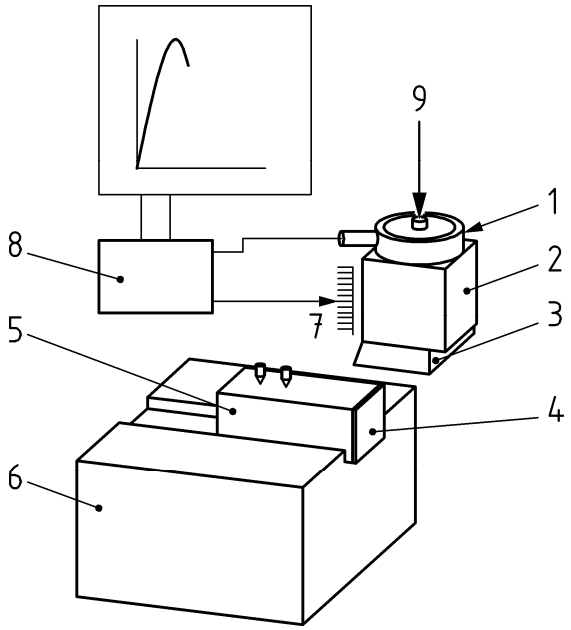
3.5
shear distance
d
distance between interface coating/substrate and the edge of the shear plate

3.6
shear load resistance
value of the first maximum of the load during the shear test process

4 Equipment

The shear test may be performed using a universal testing machine in accordance with EN ISO 7500-1 class 2.5 or using stand alone desk top machine which fulfils the corresponding requirements for accuracy and reproducibility.

The construction of the testing machine shall be able to apply a force required for the operation. The principle of the testing set up is demonstrated in Figure 1.



Key

1 load cell
2 guided punch
3 shear plate (cutting tool)
4 coating
5 specimen
6 specimen holder
7 displacement gauge
8 data processing
9 test load

Figure 1 — Principle of shear test

An exact fixation and alignment of the specimen in the specimen holder is necessary and any movement of the specimen during the shear test shall be avoided.

The shear plate is preferentially made of hard metal. A suitable cutting plate without “swarf crusher” (ISO 1832 standardized e.g. SP EW 120408 (turning, 11^0 clearance angle) or LC EW 1904PPF (milling, 7^0 clearance angle) ensures proper test conditions. The shear plate is fixed in a suitable manner to a punch or cantilever that allows a movement during loading in the guide ways without deviations or friction that affects the measured shear force. The edge of the shear plate shall be parallel to the interface coating/substrate and parallel to the upper face of the specimen. Thus a uniform loading of the coating is ensured.

5 Specimens

5.1 Shape

The dimensions of the specimen for the determination of the shear load resistance of sprayed coatings are shown in Figure 2.