Thermal spraying - Characterization and testing of thermally sprayed coatings

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EESTI STANDARDI EESSÕNA **NATIONAL FOREWORD**

Käesolev Eesti standard EVS-EN ISO 14923:2003 sisaldab Euroopa standardi EN ISO 14923:2003 ingliskeelset teksti. Käesolev dokument on jõustatud 17.09.2003 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN ISO 14923:2003 consists of the English text of the European standard EN ISO 14923:2003. This document is endorsed on 17.09.2003 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: This standard specifies an overview of the characteristics of coatings produced by thermal spraying. It is not possible in this document to go into details regarding the different types of coatings and large numbers of coatings due to the fact that all meltable materials can be processed by thermal spraying and that so many and varied thermal spraying processes exist	**Scope:** This standard specifies an overview of the characteristics of coatings produced by thermal spraying. It is not possible in this document to go into details regarding the different types of coatings and large numbers of coatings due to the fact that all meltable materials can be processed by thermal spraying and that so many and varied thermal spraying processes exist

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Võtmesõnad: characteristics, chemical composition, coatings, definition, definitions, layers, metal spraying, physical properties, properties, testing, thermal spraying, welding engineering

EUROPEAN STANDARD
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English version

Thermal spraying

Characterization and testing of thermally sprayed coatings

(ISO 14923 : 2003)

Projection thermique – Caractérisation et essais des revêtements obtenus par projection thermique (ISO 14923 : 2003)

Thermisches Spritzen – Merkmale und Prüfung von thermisch gespritzten Schichten (ISO 14923 : 2003)

This European Standard was approved by CEN on 2003-03-11.

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

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CEN

European Committee for Standardization
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Europäisches Komitee für Normung

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Contents

Foreword

This document (EN ISO 14923:2003) has been prepared by Technical Committee CEN/TC 240 "Thermal spraying and thermally sprayed coatings", the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 107 "Metallic and other inorganic coatings".

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 January 2004, and conflicting national standards shall be withdrawn at the latest by January 2004.

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 gives guidance on tests used for characterizations of coatings produced by thermal spraying. It is not possible in this document to go into details regarding the different types of coatings and large numbers of coatings due to the fact that all meltable materials can be processed by thermal spraying and that so many and varied thermal spraying processes exist.

The tests listed are procedures and test criteria in general use for thermally sprayed coatings. Test methods not mentioned here are only used in special cases or under laboratory conditions.

NOTE Continuous further development and technical improvements mean that this standard cannot make any claim to completeness.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 571-1, *Non destructive testing — Penetrant testing — Part 1: General principles (identical with ISO/DIS 3452-1:1996).*

EN 582, *Thermal spraying — Determination of tensile adhesive strength.*

EN 623-2, *Advanced technical ceramics — Monolithic ceramics — General and textural properties — Part 2: Determination of density and porosity.*

EN 657, *Thermal spraying — Terminology, classification.*

EN 821-2, *Advanced technical ceramics — Monolithic ceramics — Thermo-physical properties — Part 2: Determination of thermal diffusivity by the laser flash (or heat pulse) method.*

EN 993-14, *Methods of testing dense shaped refractory products — Part 14: Determination of thermal conductivity by the hot-wire (cross-array) method.*

ENV 1071-1, *Advanced technical ceramics — Methods of test for ceramic coatings — Part 1: Determination of coating thickness by contact probe profilometer.*

EN 1071-2, *Advanced technical ceramics — Methods of test for ceramic coatings — Part 2: Determination of coating thickness by the crater grinding method.*

ENV 1071-3, *Advanced technical ceramics — Methods of test for ceramic coatings — Part 3: Determination of adhesion by a scratch test.*

ENV 1159-2, *Advanced technical ceramics — Ceramic composites — Thermophysical properties — Part 2: Determination of thermal diffusivity.*

EN 1274, *Thermal spraying — Powders — Composition — Technical supply conditions.*

EN 24624, *Paints and varnishes — Pull-off test (ISO 4624:1978).*

EN ISO 1463, *Metallic and oxide coatings — Measurement of coating thickness — Microscopical method (ISO 1463:1982).*

EN ISO 2064, *Metallic and other inorganic coatings — Definitions and conventions concerning the measurement of thickness (ISO 2064:1996).*

EN ISO 2178, *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — Magnetic method (ISO 2178:1982).*

EN ISO 2360, *Non-conductive coatings on non-magnetic basis metals — Measurement of coating thickness — Eddy current method (ISO 2360:1982).*

EN ISO 3543, *Metallic and non-metallic coatings — Measurement of thickness — Beta backscatter method (ISO 3543:2000).*

EN ISO 3868, *Metallic and other non-organic coatings — Measurement of coating thicknesses — Fizeau multiple-beam interferometry method (ISO 3868:1976).*

EN ISO 3882, *Metallic and other non-organic coatings — Review of methods of measurement of thickness (ISO 3882:1986).*

EN ISO 4518, *Metallic coatings — Measurement of coating thickness — Profilometric method (ISO 4518:1980).*

EN ISO 4541, *Metallic and other non-organic coatings — Corrodkote corrosion test (CORR test) (ISO 4541:1978).*

EN ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method (ISO 6507-1:1997).*

EN ISO 6507-2, *Metallic materials — Vickers hardness test — Part 2: Verification of testing machines (ISO 6507-2:1997).*

EN ISO 6507-3, *Metallic materials — Vickers hardness test — Part 3: Calibration of reference blocks (ISO 6507-3:1997).*

EN ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)(ISO 6508-1:1999).*

EN ISO 6988, *Metallic and other non-organic coatings — Sulfur dioxide test with general condensation of moisture (ISO 6988:1985).*

EN ISO 9220, *Metallic coatings — Measurement of coating thickness — Scanning electron microscope method (ISO 9220:1988).*

EN ISO 14919, *Thermal spraying — Wires, rods and cords for flame and arc spraying — Classification — Technical supply conditions (ISO 14919:2001).*

EN ISO 14922-1, *Thermal spraying — Quality requirements of thermally sprayed structures — Part 1: Guidance for selection and use (ISO 14922-1:1999).*

EN ISO 14922-2, *Thermal spraying — Quality requirements of thermally sprayed structures — Part 2: Comprehensive quality requirements (ISO 14922-2:1999).*

EN ISO 14922-3, *Thermal spraying — Quality requirements of thermally sprayed structures — Part 3: Standard quality requirements (ISO 14922-3:1999).*

EN ISO 14922-4, *Thermal spraying — Quality requirements of thermally sprayed structures — Part 4: Elementary quality requirements (ISO 14922-4:1999).*

IEC 60093, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials.*

IEC 60167, *Methods of test for the determination of the insulation resistance of solid insulating materials.*

IEC 60345, *Method of test for electrical resistance and resistivity of insulating materials at elevated temperatures.*

IEC 60468, *Method of measurement of resistivity of metallic materials.*

ISO 2063, *Metallic and other inorganic coatings — Thermal spraying — Zinc, aluminium and their alloys.*

ISO 3274, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Nominal characteristics of contact (stylus) instruments.*

ISO 4287, *Geometrical Product Specification (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters.*

ISO 4516, *Metallic and related coatings — Vickers and Knoop microhardness tests.*

ISO 8301, *Thermal insulation — Determination of steady-state thermal resistance and related properties — Heat flow meter apparatus.*

ISO 8894-1, *Refractory materials — Determination of thermal conductivity — Part 1: Hot-wire method (cross-array).*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests.*

ISO 13565-1, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Surface having stratified functional properties — Part 1: Filtering and general measurement conditions.*

ISO 13565-2, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Surface having stratified functional properties — Part 2: Height characterization using the linear material ratio curve.*

ISO 14577-1, *Metallic materials — Instrumentation indentation test for hardness and material parameters — Part 1: Test method.*

ISO 14577-2, *Metallic materials — Instrumentation indentation test for hardness and material parameters — Part 2: Verification and calibration of testing machines.*

ISO 14577-3, *Metallic materials — Instrumentation indentation test for hardness and material parameters — Part 3: Calibration of reference block.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 657 and the following apply.

3.1
coating structure
sprayed coating is built up of lamellae. Process dependent factors such as materials (auxiliary materials), type of material and spray parameters affect the coating structure. The lamella type and size, structure, cracks, segmentation and similar features have to be differentiated

3.2
crack
parting of the coating structure or separation of the sprayed particles from one another, or within a particle

NOTE They occur vertical and/or parallel to the substrate surface as macro- or microcracks, or mixed.

3.3
flaking
area detached from the coating due to insufficient cohesion resulting from external loads (thermal and/or mechanical) or internal loads (internal stresses from the spraying process)

3.4
inclusion of the same or different material
particle which did not melt, or which solidified before contacting the coating surface