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Thermal spraying — Spraying and fusing of self-fluxing alloys

Projection thermique — Projection et fusion d'alliages autofondants

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword - Supplementary information

ISO 14920 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 240, *Thermal spraying and thermally sprayed coatings*, in collaboration with Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 14920:1999), which has been technically revised.

Introduction

Requests for official interpretations of any aspect of this standard should be directed to the secretariat of ISO/TC 107/WG 1 via your national standards body, a complete listing which can be found at www.iso.org.

Thermal spraying — Spraying and fusing of self-fluxing alloys

1 Scope

This International standard defines the procedure for thermal spraying of self-fluxing alloys that are simultaneously or subsequently fused to create a homogeneous, diffusion bonded coating.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11124-1, *Preparation of steel substrates before application of paints and related products — Specifications for metallic blast-cleaning abrasives — Part 1: General introduction and classification*

ISO 11126-1, *Preparation of steel substrates before application of paints and related products — Specifications for non-metallic blast-cleaning abrasives — Part 1: General introduction and classification*

ISO 12679, *Thermal spraying — Recommendations for thermal spraying*

ISO 14924, *Thermal spraying — Post-treatment and finishing of thermally sprayed coatings*

EN 1274, *Thermal spraying — Powders — Composition, technical supply conditions*

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

3 Influence on the substrate and design

3.1 Substrate metal

Due to the heat transfer into the substrate metal when fusing the coating, in order to bond the coating with the substrate metal by diffusion, the possible effects of such heating on the substrate metal shall be considered:

a) scaling;

b) the need to stress relieve;

c) an irreversible transformation of the mechanical and/or metallurgical properties.

Martensitic steels are susceptible to stress cracking and alloys containing significant amounts of C, Al, Ti, Mg, S, sulfides, P, and nitrogen can create porosity in the coating and may render the substrate metal liable to stress cracking.

3.2 Design

The preparation of the component for spraying and fusing of a coating usually includes a reduction of the design dimensions, if pre-machining is applied. Consideration shall be given to the effect of such a reduction on the loading of the component, as the coating does not contribute to the strength of the component. Consideration shall be given, to the fact that the sprayed and fused coating will have differing physical properties to the substrate material.

The fatigue strength, the deformation resistance, and other properties of the component can be affected by the application of the coating.

Due to the heat input during fusing unacceptable deformation of the component may occur. Measures to prevent distortion or deformation can be used, such as, to erect or hang the parts along their centre-of-gravity axis or by the use of supporting jigs.

4 Spray material of the self-fluxing alloy

4.1 Selection

The properties of the coating are determined by the selection of the spray material and the spray and fuse procedure, e.g.:

a) hardness;

b) resistance to wear and/or corrosion;

c) machinability;

d) suitability for the foreseen application.

4.2 Composition

The chemical composition of the spray material and the structure of the coating determine its metallurgical and technological properties as well as its machinability.

For substrate alloys, which can create a martensitic structure, see 6.3.5.

Table A.1, contains reference values for the expected hardness of the fused coating.

5 Preparation of the component

5.1 General

5.1.1 All components to be coated shall be free from surface contamination such as oil, grease, rust and other dirt. Particular attention shall be paid to porous components, because oil and grease can exude out of the pores during the preheating or coating process.

5.1.2 Any prior surface treatments, for example nitriding, galvanic or other protective coatings shall be removed before the preparation of the surface to be coated.

5.1.3 If the area to be coated and the bordering areas of the component are to be machined then this preparation shall be suitable for the coating process. Recommendations for suitable designs are given in ISO 12679.

Where the coating is required to terminate at a point other than the end or edge of the component, the depression shall be machined to provide an angle of 30° to 40° at each end, blending smoothly with the adjoining surface. Alternatively, if the coating can be continued around a chamfered and/or rounded edge, the risk of spalling of the coating will be reduced.

Where the coating shall finish to a square edge, the component shall be left longer than the proposed finished overall size and the excess shall be machined off after finishing the coating process.

5.2 Methods of surface preparation

5.2.1 Surface preparation shall be carried out according to EN 13507.

The surface to be coated should be grit blasted using suitable angular grit according to ISO 11124-1 or ISO 11126-1.

NOTE The choice of the grit blasting material can influence the bond strength of the coating.

5.2.2 The grit blasting operation shall be confined to the area to be coated. The adjacent areas shall be masked, so that the surfaces will not be damaged and will not be coated later on. The masking material shall resist the grit blasting and shall not contaminate the prepared surface to be sprayed.

5.2.3 Masking material, intended to prevent the adherence of spray particles, shall be able to withstand the preheating and spray particle temperatures.

5.2.4 Drilled holes and other orifices, which are required not to be grit blasted and coated, shall be plugged. Plugs of steel or rubber are recommended for this purpose, they shall be shaped and positioned in such a manner as not to mask any part of the surface to be prepared. After grit blasting the plugs shall be replaced with pieces of carbon suitably shaped to prevent ingress of the coating material. They shall protrude with their top surface to be caught for subsequent machining.

5.3 Cleanliness

After preparation the surface to be coated shall not be contaminated with oil, grease, water or fingerprints. In the case of contamination the surface shall be completely re-prepared.

6 Spray and fusion process

6.1 Spraying with simultaneous fusion

6.1.1 Procedure

This operation of spraying with simultaneous fusion is carried out manually using an oxy/acetylene torch, which is fitted with a hopper for the spray powder.

A suitable self-fluxing powder is fed from the hopper into the gas stream and heated by the flame, accelerated and sprayed to the component, where it is simultaneously fused to the substrate metal. Using this continuous process a coating is created, whose properties depend on the self-fluxing powder used.

6.1.2 Particle size and particle size range of the powder particles

The suitable grain size and the particle size range depend on the design of the powder feed system. In order to avoid powder feed restrictions and blockages the powder size range recommended by the torch supplier shall be used.

6.1.3 Coating thickness

A limitation on deposit thickness is dependent on the chosen alloy, the required coating quality, and the acceptable residual stresses, which will increase with deposit thickness.

NOTE Spraying and fusing of thicker coatings demands higher skill from the executing operator.