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Thermal spraying — Recommendations for thermal spraying

Projection thermique — Recommandations pour la projection thermique



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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Introduction

Thermal spraying encompasses processes used in the production of coatings and free-standing bodies for which spray materials are surface-melted, melted off or melted and then propelled onto suitably prepared workpiece surfaces. The workpiece surfaces are not surface-melted. In order to achieve specific coating properties, the spray coating can undergo additional post-treatment, either thermal or otherwise, for example, sealing.

Thermally sprayed coatings serve to improve the surface properties of a workpiece by manufacturing or repair operations. This can be done, for example, in relation to wear, corrosion, heat transfer or heat insulation, electrical conductivity or insulation, appearance and/or for restoring the part to working order. In certain cases, a spray coating can render a surface solderable.

Chiefly due to their bonding mechanism, thermally sprayed coatings without thermal post-treatment can be distinguished from coatings applied with other processes, such as deposition welding, brazing, physical vapour deposition (PVD) or chemical vapour deposition (CVD).

The advantages of thermal spraying are the following.

- The workpieces to be coated are only slightly heated so that distortion and any other undesired structural changes to the parent material are avoided. This does not apply if the coatings are thermally treated during or after the spraying process.
- The application is not dependent on the size of the workpiece or component. The operation can be stationary or mobile depending on the spraying process.
- Even geometrically complex components can be coated using the appropriate spray set-up.
- The untreated surface of spray coatings generally provides a good bond coat for painting.
- Depending on the spraying process and spray material, different coating thicknesses can be applied, although a coating thickness of approximately 10 µm is currently considered to be the lower limit.

Process-related disadvantages are as follows:

- the bond strength of thermally sprayed coatings without thermal post-treatment derives from adhesive forces only;
- the bond strength can be influenced due to an expansion mismatch between the coating and substrate material, especially in the case of a high operation temperature;
- spray coatings are micro-porous;
- the thicker the spray coating, the higher the residual stresses in the coating, and the degree of multi-axial stress thus increases;
- spray coatings without additional thermal post-treatment are sensitive to edge pressure, localized and linear loads and to impact stresses;
- there are restrictions in relation to the geometric dimensions, for example, for the inner coatings of workpieces whose inner diameter is too small.