

Thermal spraying — Powders — Composition — Technical supply conditions

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British Standard

ICS 25.220.20

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- Aluminium Federation
- British Steel Industry
- Society of Motor Manufacturers and Traders Limited
- Thermal Spraying Association
- Welding Institute
- Zinc Development Association

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National foreword

This British Standard has been prepared by Technical Committee STI/40 and is the English language version of EN 1274 : 1996 *Thermal spraying — Powders — Composition — Technical supply conditions* published by the European Committee for Standardization (CEN).

Cross-references

Publication referred to	Corresponding British Standard
ISO 3923-2 : 1981	BS EN 23923 <i>Metallic powders — Determination of apparent density</i> Part 2 : 1993 <i>Scott volumeter method</i>
ISO 3954 : 1997	BS EN 23954 : 1993 <i>Powders for powder metallurgical purposes — Sampling</i>
ISO 4490 : 1978	BS 5600 : <i>Powder metallurgical materials and products</i> Part 2 : <i>Methods of sampling and testing metallic powders</i> Section 2.6 : 1985 <i>Determination of flowability by means of a calibrated funnel (Hall flowmeter)</i>

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 18, an inside back cover and a back cover.

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Descriptors: Metal coatings, metallic powder, alloys, thermal spraying, physical properties, chemical properties, chemical composition, particle size, classifications, designations, delivery

English version

Thermal spraying — Powders — Composition — Technical supply conditions

Projection thermique — Poudres — Composition —
Conditions techniques de livraison

Thermisches Spritzen — Pulver —
Zusammensetzung — Technische Lieferbedingungen

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 240, Thermal spraying and thermally sprayed coatings, of which the secretariat 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 December 1996, and conflicting national standards shall be withdrawn at the latest by December 1996.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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0 Introduction

It has been aimed to designate the most important thermal spray-coating powders on the basis of their composition and degree of purity respectively. The majority of commercially available powders is covered by and can be characterized and specified according to this Standard.

The Standard is meant to simplify understanding of the great product variety on the market for the manufacturer and user, and nevertheless offer a vast choice.

Due to the number of spray powders mentioned in this Standard some well known abbreviations are used when dealing with thermal spraying.

Exception is granted to details on the properties of sprayed coatings. Such properties resulting from spraying conditions not covered by this standard, e.g. gas composition, deposition efficiency, material flow rate, standoff distance, may differ greatly from the properties of the original material.

Applications of powders for thermal spraying have been explicitly described in the relevant literature, therefore a separate outline in this place is not necessary.

1 Scope

This standard covers powders, which are currently applicable in thermal spraying on the basis of the physical and chemical properties.

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 revision 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.

- | | |
|-------------------|---|
| ISO 3310-1 : 1990 | <i>Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth</i> |
| ISO 3923-2 : 1981 | <i>Metallic powders — Determination of apparent density — Part 2: Scott volumeter method</i> |
| ISO 3954 : 1977 | <i>Powders for powder metallurgical purposes — Sampling</i> |
| ISO 4490 : 1978 | <i>Metallic powders — Determination of flowability by means of a calibrated funnel (Hall flowmeter)</i> |

3 Properties and property determination of powders for thermal spraying

3.1 Sampling and sample splitting

Sampling and sample splitting is to be done from a homogeneous mixture uniform in grain size. Directions for adequate methods and equipment are included in ISO 3954.

3.2 Chemical composition

The chemical composition shall be defined by any suitable testing method, e.g. atomic absorption spectrometry, flame emission spectroscopy, X-ray fluorescent analysis, etc.

3.3 Particle size range

Typical particle size ranges cover powder units preferably applied in thermal spraying.

When determining the particle size distribution by particle size measurement (see ISO 3310-1), the given upper limits may be exceeded by a mass of 2 % maximum, up to the next but one standard screen size, and the particle sizes may fall below the lower limits by a mass of 5 % maximum.

Furthermore, attention is drawn to the fact that the resulted particle size depends on the measurement technique even for the same powder. The maximum permissible tolerances for upper and lower particle size range depends on the measuring method.

Measuring method, particle size range and maximum permissible tolerances for upper and lower particle size range should be agreed upon between powder manufacturer and user, if necessary to ensure the reproducibility of the thermal spraying process.

Powder will be supplied to suit the application and thermal spray process.

Examples of typical particle size ranges μm
22/5
45/22
90/45
45/5
63/16
106/32

3.4 Particle size distribution

For a precise indication of particle size ranges it is necessary to measure the particle sizes and their distribution. If possible, X-ray absorption and laser beam scattering methods should preferably be used because of their significantly higher reproducibility, rapidity, and resolution of the measuring method compared with screening methods.

It shall be considered that the results of particle size measurement and particle distribution are dependent on the methods employed, and in the case of agglomerated powders, are additionally determined by the solubility of the binder used. Therefore, it is necessary to verify the suitability of the powder to be analysed for the selected test method. A powder test certificate shall contain the test method applied in addition to the particle size distribution.

3.5 Process of manufacture — Particle shape

The manufacturing process of a powder shall be indicated using a term such as, for instance, fused, bonded, agglomerated, atomized etc. The shape of particles and their surface can be illustrated by means of scanning electron or stereo microscopy. In order to check for similarity the images may be compared to reference samples provided by the manufacturer.

Example illustrations are included in annex A.

3.6 Apparent density

Apparent powder density is to be determined as specified in ISO 3923-2, and to be expressed as g/cm^3 .

3.7 Flow properties, flowability

Powder flowability is to be determined as specified in ISO 4490, and expressed as s/50 g.

3.8 Microstructure

The microstructure of a powder particle can be represented in a metallographically prepared cross-section. The preparation method may be of decisive importance and should therefore be agreed upon between manufacturer and user.

3.9 Determination of phases

Determination of phases as regards type, quantity, shape, configuration, composition and size, in polyphase powders can be made by, e.g. X-ray microstructure analysis, microprobe, metallographic or quantitative image analysis.

3.10 Summary

A survey of the significance of spray powder properties depending on the spraying process and the material category is included in table 1.