SLOVENSKI STANDARD
SIST EN 1274:1999

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Vroļ e brizganje - Prahovi - Sestava - Tehniļ ni dobavni pogoji

Thermal spraying - Powders - Composition - Technical supply conditions

Thermisches Spritzen - Pulver - Zusammensetzung - Technische Lieferbedingungen

Projection thermique - Poudres - Composition - Conditions techniques de livraison

Ta slovenski standard je istoveten z: **EN 1274:1996**

ICS:

25.220.20 Površinska obdelava Surface treatment

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English version

Thermal spraying - Powders - Composition - Technical supply conditions

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CEN

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

Central Secretariat: rue de Stassart,36 B-1050 Brussels

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Contents

Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 240 "Thermal sraying 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of an identical text or by endorsement, at the latest by December 1996, and conflicting national standards shall be withdrawn at the latest by December 1996 .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, United Kingdom.

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 availabe powders is covered by and can be characterised and specified according to this Standard.

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

Due to the number of mentioned spray powders in this Standard some in thermal spraying well known abreviations are used.

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 Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth

ISO 3923-2:1981 Metallic powders - Determination of apparent density - Part 2: Scott volumeter method

ISO 3954:1977 Powders for powder metallurgical purposes - Sampling

ISO 4490:1978 Metallic powders - Determination of flowability by means of a calibrated funnel (Hall flowmeter)

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

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 und lower particle size range depends on the measuring method.

Measuring method, particle size range and max. permissible tolerances for upper und lower particle size range should be agreed upon between powder manufacturer and applier - if necessary in order to get the reproduceability 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 be preferably 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, additionally are determined by the solubility of the used binder. 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, atomised 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/cm³.

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.

4 Classification of powders

The powders for thermal spraying are categorised on the basis of their chemical composition into

- pure metals,

- metallic alloys and composits,

- carbides, carbides with metals, carbides with metallic alloys and composites,

- oxides, phospates and other non-carbide ceramics,

- organic materials.

Blended powders of several varying components are not itemised because of their innumerable number.

Table 1. The significance of spray powder properties depending on the spraying process and the material category

		Chemical composition	Particle size	Particle shape	Apparent density	Flowability	Micro-structure	Phase composition	Melting range
3.10.1	Pure metals	+++	+++	++	+	+	-	-	-
	Metallic alloys	+++	+++	++	+	+	-	+	++ 3)
	Carbides, carbides with metals, carbides with metallic alloys	+++	+++	++	+	+	++	++	-
	Oxides, phosphats and other non-carbide ceramics	+++	+++	++	+	+	+	+	-
	Organic materials	+++	+++	+	+	++	-	-	+++ 1)
3.10.2	Plasma spraying	++	+++	++	-	+	-	++ 2)	-
	Flame spraying	++	+++	+	-	+++	-	-	+++ 3)
	High velocity flame spraying	++	+++	+++	++	+	-	++ 2)	+

+++ Specification imperative/critical property
++ Specification recommended/important property
\+ Supplementary detail
\- without significance

1) In organic material spraying, decomposition temperature and oxidation resistance of the molten material, as wll as toxicological characteristics are additional criteria.

2) Necessary detail for the spraying of carbides and oxides (e.g. ZrO_2-Y_2O_3).

3) For SF - alloys.

4.1 Pure metals

Tabelle 2

Code No.	Main constituent	Chemical composition in % O max.	C max.	N max.	H max.	Al max.	Co max.
1.1	Ti 99	0,3	0,3	0,3	0,1	-	-
1.2	Nb 99	0,3	0,3	0,3	0,1	-	-
1.3	Ta 99	0,3	0,3	0,3	0,1	-	-
1.4	Cr 98,5	0,8	0,1	0,1	-	0,5	-
1.5	Mo 99	0,3	0,15	0,1	-	-	-
1.6	W 99	0,3	0,15	0,1	-	-	0,3
1.7	Ni 99,3	0,5	0,1	0,1	-	-	-
1.8	Cu 99	-	-	-	-	-	-
1.9	Al 99	0,5	-	-	-	-	-
1.10	Si 99	-	-	-	-	-	-

4.2 Metallic alloys and composites

4.2.1 Self-fluxing alloys

Table 3

Code No.	Symbols	Chemical Composition in % C	Ni	Co	Cr	Cu	W	Mo	Fe	B	Si	Others
2.1	NiCuBSi 76 20	max. 0,05	Rem	-	-	19 to 20	-	-	max. 0,5	0,9 to 1,3	1,8 to 2,0	max. 0,5
2.2	NiBSi 96	max. 0,05	Rem	-	-	-	-	-	max. 0,5	1,0 to 1,5	2,0 to 2,5	max. 0,5
2.3	NiBSi 94	max. 0,1	Rem	-	-	-	-	-	max. 0,5	1,5 to 2,0	2,8 to 3,7	max. 0,5
2.4	NiBSi 95	0,1 to 0,2	Rem	-	-	-	-	-	max. 2,0	1,2 to 1,7	2,2 to 2,8	max. 0,5
2.5	NiCrBSi 90 4	0,1 to 0,2	Rem	-	3 to 5	-	-	-	max. 1,0	1,4 to 1,8	2,8 to 3,5	max. 0,5
2.6	NiCrBSi 86 5	0,15 to 0,25	Rem	-	4 to 6	-	-	-	3,0 to 3,5	0,8 to 1,2	2,8 to 3,2	max. 0,5
2.7	NiCrBSi 88 5	0,15 to 0,25	Rem	-	4 to 6	-	-	-	1,0 to 2,0	1,0 to 1,5	3,5 to 4,0	max. 0,5
2.8	NiCrBSi 83 10	0,15 to 0,25	Rem	-	8 to 12	-	-	-	1,5 to 3,5	2,0 to 2,5	2,3 to 2,8	max. 0,5
2.9	NiCrBSi 85 8	0,15 to 0,25	Rem	-	6 to 10	-	-	-	1,5 to 2,0	1,5 to 2,0	2,6 to 3,4	max. 0,5
2.10	NiCrBSi 84 8	0,25 to 0,4	Rem	-	7 to 10	-	-	-	1,7 to 2,5	1,5 to 2,2	3,2 to 4,0	max. 0,5
2.11	NiCrBSi 88 4	0,3 to 0,4	Rem	-	3,5 to 4,5	-	-	-	max. 2	1,6 to 2,0	3,0 to 3,5	max. 0,5
2.12	NiCrBSi 80 11	0,35 to 0,6	Rem	-	10 to 12	-	-	-	2,5 to 3,5	2,0 to 2,5	3,5 to 4,0	max. 0,5
2.13	NiCrWBSi 64 11 16	0,5 to 0,6	Rem	-	10 to 12	-	15,5 to 16,5	-	3,5 to 4,0	2,3 to 2,7	3,0 to 3,5	max. 0,5
2.14	NiCrCuMoBSi 67 17 3 3	0,5 to 0,7	Rem	-	16 to 17	2,0 to 3,5	-	2,0 to 3,0	2,5 to 3,5	3,4 to 4,0	4,0 to 4,5	max. 0,5
2.15	NiCrCuMoWBSi 64 17 3 3 3	0,4 to 0,6	Rem	-	16 to 17	2,0 to 3,5	2,0 to 3,0	2,0 to 3,0	3,0 to 5,0	3,5 to 4,0	4,0 to 4,5	max. 0,5
2.16	NiCrBSi 74 15	0,75 to 1,0	Rem	-	16 to 17	-	-	-	3,5 to 5,0	2,8 to 3,5	3,6 to 4,5	max. 0,5

(continued)