
**Thermal spraying — Wires, rods and cords
for flame and arc spraying —
Classification — Technical supply
conditions**

*Projection thermique — Fils, baguettes et cordons pour projection
thermique à l'arc et au pistolet dans une flamme — Classification —
Conditions techniques d'approvisionnement*

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ISO 14919:2001

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 14919 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 107, *Metallic and other inorganic coatings*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "...this European Standard..." to mean "...this International Standard...".

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Foreword

The text of EN ISO 14919:2001 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 February 2002, and conflicting national standards shall be withdrawn at the latest by February 2002.

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies requirements for classification of metal and non metal wires (solid and cored), rods, cords processed by means of thermal spraying, especially by arc and flame spraying.

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.

EN 10204:1991

Metallic products – Types of inspection documents

3 Classification

3.1 Classification according to the manufacturing process and resulting structure

The thermal spray materials are classified according to the manufacturing process and the resulting structure, as given in table 1.

Table 1: Classification of thermal spraying material and resulting structure

Number	Term	Manufacturing process	Structure
1	solid wire/rod	metallurgical manufacturing and forming	homogeneous composition
2	solid wire/rod	powder metallurgical manufacturing and forming	homogeneous composition
3	cored wire (tube shaped wire)	filling up a metal tube and compressed by means of forming	seamless metal shell with powder filling
4	cored wire (folded wire)	forming a metal sheet with powder filling, binder and compressed by means of drawing	metal shell with powder filling
5	cords	simultaneous extruding of powder, binder and organic sheath	plastic shell with powder filling
6	ceramic rods	extruding and sintering of ceramic material	porous rod consisting of bonded ceramic particles

3.2 Classification according to material groups and chemical composition

The material groups are given in table 2, and the chemical composition shall comply with tables 3 to 10.

Table 2: Classification according to material groups

Code Number	Term
1	tin and tin alloys
2	zinc and zinc alloys
3	aluminium and aluminium alloys
4	copper and copper alloys
5	iron and iron alloys
6	nickel and nickel alloys
7	molybdenum
8	oxide ceramics

3.2.1 Tin and tin alloys

Table 3: Tin and tin alloys

code number	symbol	alloying elements mass fraction in %	other elements mass fraction in %	manu- facturing process
1.1	Sn99	Sn min. 99,95	total $\leq 0,05$ Sb $\leq 0,02$ Ag $\leq 0,01$ Bi $\leq 0,002$ Cu $\leq 0,01$ Fe $\leq 0,01$ Pb $\leq 0,02$ Al+Cd+Zn $\leq 0,002$	1
1.2	SnSbCu84	Sb 7 to 8 Cu 3 to 4 remainder Sn	Pb $\leq 0,35$ As $\leq 0,1$ Bi $\leq 0,08$ Fe $\leq 0,1$ Al $\leq 0,01$ Zn $\leq 0,01$ other: total $\leq 0,2$	1

3.2.2 Zinc and zinc alloys

Table 4: Zinc and zinc alloys

code number	symbol	alloying elements mass fraction in %	other elements mass fraction %	manu- facturing process
2.1	Zn99,99	Zn min. 99,99	total $\leq 0,010$ Pb $\leq 0,005$ Cd $\leq 0,005$ Pb+Cd $\leq 0,006$ Sn $\leq 0,001$ Fe $\leq 0,003$ Cu $\leq 0,002$ other: total $\leq 0,12$	1
2.2	Zn99	Zn min. 99	total $\leq 1,0$ Pb $\leq 0,005$ Cd $\leq 0,005$ Pb+Cd $\leq 0,006$ Sn $\leq 0,001$ Fe $\leq 0,01$ Cu $\leq 0,7$ Mo $\leq 0,01$ Ti $\leq 0,16$ Mg $\leq 0,01$ Al $\leq 0,01$ other: total $\leq 0,12$	1
2.3	ZnAl15	Zn 84 to 86 Al 14 to 16	total $\leq 0,17$ Pb $\leq 0,005$ Cd $\leq 0,005$ Pb+Cd $\leq 0,006$ Sn $\leq 0,001$ Fe $\leq 0,05$ Cu $\leq 0,01$ Si $\leq 0,12$	1

3.2.3 Aluminium and aluminium alloys

Table 5: Aluminium and aluminium alloys

code number	symbol	alloying elements mass fraction in %	other elements mass fraction in %	manu- facturing process
3.1	Al99,98	Al min. 99,98	total $\leq 0,02$ Si $\leq 0,01$ Zn $\leq 0,01$ Fe $\leq 0,006$ Cu $\leq 0,003$ Ti $\leq 0,003$ other: particular $\leq 0,003$	1

(continued)

Table 5 (concluded)

code number	symbol	alloying elements mass fraction in %	other elements mass fraction in %	manu- facturing process
3.2	Al99,5	Al min. 99,5	total $\leq 0,5$ Si $\leq 0,3$ Fe $\leq 0,4$ Ti $\leq 0,05$ Cu $\leq 0,05$ Zn $\leq 0,07$ Mn $\leq 0,05$ other: particular $\leq 0,03$	1
3.3	AlMg5	Mg 4,5 to 5,5 Mn 0 to 0,5 Cr 0 to 0,3 Ti 0,10 to 0,25 remainder Al	total $\leq 0,9$ Si $\leq 0,25$ Fe $\leq 0,40$ Cu $\leq 0,05$ Zn $\leq 0,2$ other: particular $\leq 0,05$	1
3.4	AlZn5	Zn 4,5 to 5,1 remainder Al	total ≤ 1 Si $\leq 0,30$ Fe $\leq 0,40$ Cu $\leq 0,05$ Sn $\leq 0,20$ other: particular $\leq 0,05$	1
3.5	AlSi5	Si 4,5 bis 5,5 remainder Al	total ≤ 1 Si $\leq 0,30$ Fe $\leq 0,40$ Cu $\leq 0,05$ Sn $\leq 0,20$ other: particular $\leq 0,05$	1

3.2.4 Copper and copper alloys

Table 6: Copper and copper alloys

code number	symbol	alloying elements mass fraction in %	other elements mass fraction in %	manu- facturing process
4.1	Cu99	Cu $\geq 99,9$	other $\leq 0,01$	1
4.2	CuZn37	Cu 62,0 to 64 remainder Zn	Al $\leq 0,03$ Fe $\leq 0,1$ Mn $\leq 0,1$ Ni $\leq 0,3$ Pb $\leq 0,1$ Sb $\leq 0,01$ Sn $\leq 0,1$ other: total $\leq 0,5$	1
4.3	CuZn39	Cu 56 to 62 Sn 0,5 to 1,5 Si 0,1 to 0,5 remainder Zn	Ni $\leq 1,5$ Mn $\leq 1,0$ Fe $\leq 0,5$ Al $\leq 0,01$ Pb $\leq 0,03$ other: total $\leq 0,2$	1
4.4	CuSn6	Sn 5,0 to 8,0 remainder Cu	Fe $\leq 0,1$ Al $\leq 0,01$ Zn $\leq 0,1$ Pb $\leq 0,02$ P 0,01 to 0,4 other: total $\leq 0,4$	1
4.5	CuSn12	Sn 11,0 to 13,0 remainder Cu	Fe $\leq 0,1$ Al $\leq 0,01$ Zn $\leq 0,1$ Pb $\leq 0,02$ P 0,01 to 0,4 other: total $\leq 0,4$	1
4.6	CuAl8	Al 7,5 to 9,5 remainder Cu	Mn $\leq 1,8$ Ni $\leq 0,8$ Fe $\leq 0,5$ Si $\leq 0,2$ Zn $\leq 0,2$ other: total $\leq 0,5$	1

(continued)

Table 6 (concluded)

code number	symbol	alloying elements mass fraction in %	other elements mass fraction in %	manufacturing process
4.7	CuAl10	Al 9,0 to 11,0 Fe 2,0 to 4,0 Mn 1,5 to 3,5 remainder Cu	Ni $\leq 1,0$ Pb $\leq 0,05$ Si $\leq 0,2$ Zn $\leq 0,5$ other: total $\leq 0,3$	1

3.2.5 Iron and iron alloys

Table 7: Iron and iron alloys

code number	symbol	alloying elements mass fraction in %	other elements mass fraction in %	manufacturing process
5.1	10 Mn	C 0,04 to 0,12 Mn 0,42 to 0,68 remainder Fe	Si traces Cr $\leq 0,15$ Cu $\leq 0,20$ Ni $\leq 0,15$ P $\leq 0,030$ S $\leq 0,030$	1
5.2	10 MnSi4	C 0,07 to 0,14 Si 0,07 to 0,14 Mn 1,3 to 1,6 remainder Fe	Cr $\leq 0,15$ Cu $\leq 0,20$ Mo $\leq 0,15$ Ni $\leq 0,15$ P $\leq 0,025$ S $\leq 0,025$	1
5.3	80 MnSi	C 0,8 to 0,85 Si 0,15 to 0,35 Mn 0,50 to 0,70 remainder Fe	P $\leq 0,035$ S $\leq 0,035$	1
5.4	150 Cr4	C 1,4 to 1,6 Si 0,15 to 0,30 Mn 0,50 to 0,70 Cr 1,3 to 1,5 remainder Fe	P $\leq 0,035$ S $\leq 0,035$	1
5.5	110 Cr3	C 0,9 to 1,2 Si 0,20 to 0,40 Mn 0,20 to 0,40 Cr 0,9 to 1,1 remainder Fe	P $\leq 0,030$ S $\leq 0,030$	1

(continued)

Table 7 (continued)

code number	symbol	alloying elements mass fraction in %	other elements mass fraction in %	manu- facturing process
5.6	110 MnCrTi5 5	C 0,97 to 1,23 Si 0,12 to 0,38 Mn 1,76 to 2,27 Cr 1,65 to 1,95 remainder Fe	Ti 0,13 to 0,35 P ≤ 0,025 S ≤ 0,025	1
5.7	X 45 Cr13 a) with Cu plating b) without Cu plating	C 0,3 to 0,50 Si ≤ 1,0 Mn ≤ 1,0 Cr 12 to 14 remainder Fe	P ≤ 0,045 S ≤ 0,030	1
5.8	X 20 CrMo 13 1	C 0,17 to 0,22 Si ≤ 1,0 Mn ≤ 1,0 Cr 12 to 14 Mo 0,9 to 1,3 remainder Fe	Ni ≤ 1,0 P ≤ 0,045 S ≤ 0,030	1
5.9	X 6 CrAl 22 4	C ≤ 0,055 Si ≤ 0,65 Mn ≤ 0,45 Al 3,5 to 5,5 Cr 21 to 23 remainder Fe	P ≤ 0,040 S ≤ 0,025	1
5.10	X 6 CrNi19 9	C ≤ 0,06 Si ≤ 1,5 Mn ≤ 2,0 Cr 18 to 20 Ni 8,5 to 10,5 remainder Fe	P ≤ 0,030 S ≤ 0,020	1
5.11	X 5 CrNiMo17 12 2	C ≤ 0,07 Si ≤ 1,0 Mn ≤ 2,0 Cr 16,5 to 18,5 Mo 2 to 2,5 Ni 10,5 to 13,5 remainder Fe	P ≤ 0,045 S ≤ 0,030	1
5.12	X 12 CrNiMn 18 8 6	C ≤ 0,20 Si ≤ 1,0 Mn 5,5 to 8,0 Cr 17 to 20 Ni 7,5 to 9,5 remainder Fe	P ≤ 0,040 S ≤ 0,025	1
5.13	X 12 CrNi25 20	C ≤ 0,15 Si ≤ 1,5 Mn 1,5 to 3,5 Cr 24 to 27 Ni 19 to 22 remainder Fe	P ≤ 0,025 S ≤ 0,020	1

(continued)