



SLOVENSKI STANDARD
SIST EN 14700:2023

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Nadomešča:
SIST EN 14700:2014

Dodajni in pomožni materiali za varjenje - Dodajni in pomožni materiali za trdo navarjanje

Welding consumables - Welding consumables for hard-facing

Schweißzusätze - Schweißzusätze zum Hartauftragen

Produits consommables de soudage - Produits consommables pour le rechargement dur

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ICS:

25.160.20 Potrošni material pri varjenju Welding consumables

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EUROPEAN STANDARD

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Welding consumables - Welding consumables for hard-facing

Produits consommables de soudage - Produits
consommables pour le rechargement dur

Schweißzusätze - Schweißzusätze zum Hartauftragen

This European Standard was approved by CEN on 30 October 2022.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 14700:2022) has been prepared by Technical Committee CEN/TC 121 “Welding and allied processes”, the secretariat of which 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of an identical text or by endorsement, at the latest by May 2023, and conflicting national standards shall be withdrawn at the latest by May 2023.

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

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EN 14700:2022 (E)**1 Scope**

This document is applicable to welding consumables for hardfacing. The range of application includes surfaces of new structural components, semi-finished products as well as repair of surfaces of structural components which have to resist to mechanical, chemical, thermal or combined stress.

This document specifies requirements for classification of the consumables based on their chemical composition of the all-weld metal of covered electrodes, cored wires, cored rods, cored strips, sintered strips, sintered rods and metal powders and on the chemical composition of solid wires, solid rods, solid strips and cast rods.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 544, *Welding consumables - Technical delivery conditions for filler materials and fluxes - Type of product, dimensions, tolerances and markings (ISO 544)*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1)*

EN ISO 6506-2, *Metallic materials - Brinell hardness test - Part 2: Verification and calibration of testing machines (ISO 6506-2)*

EN ISO 6506-3, *Metallic materials - Brinell hardness test - Part 3: Calibration of reference blocks (ISO 6506-3)*

EN ISO 6506-4, *Metallic materials - Brinell hardness test - Part 4: Table of hardness values (ISO 6506-4)*

EN ISO 6508-1, *Metallic materials - Rockwell hardness test - Part 1: Test method (ISO 6508-1)*

EN ISO 6508-2, *Metallic materials - Rockwell hardness test - Part 2: Verification and calibration of testing machines and indenters (ISO 6508-2)*

EN ISO 6508-3, *Metallic materials - Rockwell hardness test - Part 3: Calibration of reference blocks (ISO 6508-3)*

EN ISO 6847, *Welding consumables - Deposition of a weld metal pad for chemical analysis (ISO 6847)*

EN ISO 14174:2019, *Welding consumables - Fluxes for submerged arc welding and electroslag welding - Classification (ISO 14174:2019)*

EN ISO 14175:2008, *Welding consumables - Gases and gas mixtures for fusion welding and allied processes (ISO 14175:2008)*

EN ISO 14344, *Welding consumables - Procurement of filler materials and fluxes (ISO 14344)*

EN ISO 80000-1:2013, *Quantities and units - Part 1: General (ISO 80000-1:2009 + Cor 1:2011)*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Classification

The classification is divided in two compulsory parts and 3 optional parts:

Compulsory part:

- a) the first part gives a symbol indicating the product form, see 5.1;
- b) the second part gives an alloy symbol indicating the range of composition and the suitability, see Table 2.

Optional part:

- c) the third part indicates the typical composition, see 5.3;
- d) the fourth part indicates the range of hardness of the all-weld metal, see 5.4;
- e) the fifth part indicates the welding auxiliary material (shielding gas and fluxes), see 5.5.

The parts c), d) and e) will be hyphenated from the compulsory part.

5 Symbols and requirements

5.1 Symbol for the product form

The following symbols for the product forms shall be used (see Table 1).

Table 1 — Symbols for the product form

Symbol	Product form (consumable)
E	covered electrode
S	solid wire and solid rod
T	cored wire and cored rod
R	cast rod
B	solid strip
C	sintered rod, cored strip and sintered strip
P	metal powder

NOTE See also Table A.3.

EN 14700:2022 (E)**5.2 Symbol for the chemical composition**

The alloy symbols in Table 2 indicate the chemical composition of the all-weld metal of covered electrodes, cored wires, cored strips, sintered strips, sintered rods and metal powder or the chemical composition of solid wires, solid rods, solid wires and cast rods.

5.3 Designation of the typical composition

Additional to the alloy symbols in Table 2 the typical chemical composition of the all-weld metal of covered electrodes, cored wires, cored strips, sintered strips, sintered rods and metal powder or the chemical composition of solid wires, solid rods, solid wires and cast rods will be indicated. The designation of the typical composition will be indicated by the chemical symbol of the most important alloying elements, except the base, followed by their percentage.

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Table 2 — Alloy symbols and chemical composition

Alloy symbol	Suitability	Chemical composition in % (by weight) ^c												
		C	Cr	Ni	Mn	Mo	W	V	Nb	Fe	Co	Cu	Al	Other
Fe1	p	≤ 0,4	≤ 3,5	≤ 3	≤ 4,5	≤ 1	≤ 1	≤ 1	—	Balance	—	—	—	Si, Ti
Fe2	p (g) (s)	0,4 to 1,5	≤ 7	≤ 1	≤ 3	≤ 4	≤ 1	≤ 1	—	Balance	≤ 1	≤ 1	—	Si, Ti
Fe3	s t	0,1 to 0,5	1 to 15	≤ 5	≤ 3	≤ 5	≤ 10	≤ 1,5	≤ 3	Balance	≤ 13	—	—	Si, Ti
Fe4	s t (p)	0,2 to 1,5	2 to 10	≤ 4	≤ 3	≤ 10	≤ 20	≤ 4	—	Balance	≤ 5	—	—	Si, Ti
Fe5	c p s t w	≤ 0,5	≤ 0,1	17 to 22	≤ 1	3 to 5	—	—	—	Balance	10 to 15	—	≤ 1	Si, Ti
Fe6	g p s	≤ 2,5	≤ 10	—	≤ 3	≤ 3	—	—	≤ 10	Balance	—	—	—	Si, Ti
Fe7	c p t	≤ 0,2	11 to 30	≤ 6	≤ 3	≤ 2	—	≤ 1	≤ 1	Balance	—	—	—	Si, N
Fe8	g p t	0,2 to 2	5 to 20	—	≤ 3	≤ 5	≤ 2	≤ 2	≤ 10	Balance	—	—	—	Si, Ti
Fe9	k p (n)	≤ 1,2	≤ 20	≤ 5	9 to 20	≤ 2	—	≤ 1	—	Balance	—	—	—	Si, Ti
Fe10	c k p z (n)	≤ 0,25	17 to 22	7 to 11	3 to 8	≤ 1,5	—	—	≤ 1,5	Balance	—	—	—	Si
Fe11	c n z	≤ 0,3	17 to 32	8 to 20	≤ 3	≤ 4	—	—	≤ 1,5	Balance	—	—	—	Si, Cu
Fe12	c n (z)	≤ 0,12	17 to 27	9 to 26	≤ 3	≤ 4	—	—	≤ 1,5	Balance	—	—	—	Si
Fe13	g	≤ 1,5	≤ 7	≤ 4	≤ 3	≤ 4	—	—	—	Balance	—	—	—	Si, B, Ti
Fe14	g (c)	1,5 to 4,5	25 to 40	≤ 4	≤ 3	≤ 4	—	—	—	Balance	—	—	—	Si
Fe15	g	3 to 7	20 to 40	≤ 4	≤ 3	≤ 2	—	—	≤ 10	Balance	—	—	—	Si, B
Fe16	g z	4 to 8	10 to 40	—	≤ 3	≤ 10	≤ 10	≤ 10	≤ 10	Balance	—	—	—	Si, B
Fe17	c k p v	≤ 0,3	≤ 20	≤ 5	8 to 20	≤ 2	≤ 0,3	—	—	Balance	10 to 15	—	—	Si
Fe20	c g t z	—	—	—	—	—	—	—	—	Balance	—	—	—	hard material ^b
Ni1	c p t	≤ 1	15 to 30	Balance	≤ 1	≤ 6	≤ 2	≤ 1	—	≤ 5	—	—	—	Si, B

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Alloy symbol	Suitability	Chemical composition in % (by weight) ^c																					
		C	Cr	Ni	Mn	Mo	W	V	Nb	Fe	Co	Cu	Al	Other									
Ni2	c k p t z	≤ 0,1	14 to 30	Balance	≤ 1,5	10 to 30	≤ 8	≤ 1	≤ 5	≤ 10	≤ 5	—		Si, Ti									
Ni3	c p t	≤ 1	≤ 15	Balance	≤ 1	≤ 6	≤ 2	≤ 1	-	≤ 5	—	—	—	Si, B									
Ni4	c k p t z	≤ 0,1	1 to 20	Balance	≤ 1,5	≤ 30	≤ 8	≤ 1	≤ 5	≤ 3	≤ 15	—	≤ 3	Si, Ti									
Ni20	c g t z	—	—	Balance	—	—	—	—	—	—	—	—	—	hard material ^b									
Co1	c k t z	≤ 0,6	20 to 35	≤ 10	0,1 to 2	≤ 10	≤ 15	—	≤ 1	≤ 5	Balance	—	—	Si									
Co2	t z (c) (s)	0,6 to 3	20 to 35	≤ 4	0,1 to 2	—	4 to 10	—	—	≤ 5	Balance	—	—	Si									
Co3	t z (c) (s)	1 to 3	20 to 35	≤ 4	≤ 2	≤ 1	6 to 15	—	—	≤ 5	Balance	—	—	Si									
Cr1	g n	1 to 5	Balance	—	≤ 1	—	—	15 to 30	—	≤ 5	—	—	—	Si, B, Zr									
Cu1	c (n)	—	—	≤ 6	≤ 2	—	—	—	—	≤ 5	—	Balance	7 to 15	Sn									
Cu2	c (n)	—	—	≤ 6	≤ 15	—	—	—	—	≤ 5	—	Balance	≤ 9	Sn									
Al1	c n	—	—	10 to 35	≤ 0,5	—	—	—	—	—	—	≤ 6	Balance	Si									
Z	—	Any other agreed composition ^a																					
Suitability:		c:	resistance to rusting	n:	cannot be magnetised	v:	cavitation resistance	g:	resistance to abrasion	p:	impact resistance	t:	heat resistance	k:	work hardenable	s:	edge retention	z:	scaling resistance	():	limited suitability or may not apply to all alloys of this type	w:	precipitation hardened
^a Consumables for which the chemical composition is not listed in the table shall be symbolized indicating the chemical composition and prefixed by the letter Z. The chemical composition ranges are not specified, and it is possible that two products with the same Z-classification are not interchangeable.																							
^b Tungsten fused carbide or tungsten carbide fused, crushed or spherical.																							
^c Single values shown in the table are maximum values.																							

5.4 Symbol for the range of hardness

The symbol (see Table 3) indicates the range of hardness of the all-weld metal without post-treatment. The following symbol for the maximal range of hardness after post weld heat treatment or cold work hardening can be indicated in brackets. The hardness test shall be performed according to EN ISO 6506 parts 1 to 4 for the Brinell hardness, and according to EN ISO 6508 parts 1 to 3 for the Rockwell hardness.

Table 3 — Symbol for the range of hardness

Symbol	Range of hardness
150	125 HB and \leq 175 HB
200	> 175 HB and \leq 225 HB
250	> 225 HB and \leq 275 HB
300	> 275 HB and \leq 325 HB
350	> 325 HB and \leq 375 HB
400	> 375 HB and \leq 450 HB
40	37 HRC and \leq 42 HRC
45	> 42 HRC and \leq 47 HRC
50	> 47 HRC and \leq 52 HRC
55	> 52 HRC and \leq 57 HRC
60	> 57 HRC and \leq 62 HRC
65	> 62 HRC and \leq 67 HRC
70	> 67 HRC

5.5 Symbol for the auxiliary material

The designation of the symbol for the auxiliary material shall follow the EN ISO 14175:2008, Table 2, for shielding gases and the EN ISO 14174:2019, Table 1, for fluxes. If metal or flux cored wires will be used without gas protection, the symbol "NO" is applicable.

6 Alloy types, form of supply, requirements and applications

The most usual alloy types are listed in Table 2. Typical application is given in Table A.1. The forms of supply listed in Tables A.2 and A.3 may support the decision making as regards applicable welding processes.

The applications shown in Table A.4 give reference to the suitability of individual alloy types for different kind of requirements and system structures. It may be concluded that other alloy types may also be considered with regard to complex kind of requirements.

7 Chemical composition

The chemical analysis shall be performed on specimens of solid wires, solid rods and solid strips according to EN ISO 6847 respectively or on any suitable all-weld metal specimen and cast rods (covered electrodes, cored wires, cored strips, sintered rods, sintered strips and metal powder). Any analytical technique can be used, but in case of dispute reference shall be made to established published methods.

NOTE See Bibliography.