
**Welding consumables — Wire and strip
electrodes, wires and rods for arc
welding of nickel and nickel alloys —
Classification**

*Produits consommables pour le soudage — Fils-électrodes et
feuillards, fils et baguettes pour le soudage à l'arc du nickel et des
alliages de nickel — Classification*

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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 the member bodies casting a vote.

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

ISO 18274 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 3, *Welding consumables*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read “...this European Standard...” to mean “...this International Standard...”.

It should be noted that, with regard to the corresponding EN standard, the designations given in Clause 9 have been adapted to the needs of international standardization.

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Foreword

This document (EN ISO 18274:2004) has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 44 "Welding and allied processes".

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of an identical text or by endorsement, at the latest by September 2004, and conflicting national standards shall be withdrawn at the latest by September 2004.

Annexes A, B and C are informative.

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

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Introduction

For nickel welding consumables there is no unique relationship between the product form (solid wire, strip or rod) and the welding process used (e.g. gas-shielded metal arc welding, gas tungsten arc welding, plasma arc welding, submerged arc welding, strip overlay welding, laser welding or other welding processes). For this reason the solid wire, strip or rod may be classified on the basis of any of the above product forms and can be used as appropriate, for more than one of the above processes.

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1 Scope

This standard specifies requirements for classification of solid wires, strips and rods for fusion welding of nickel and nickel alloys. The classification of the solid wires, strips and rods is based on their chemical composition.

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 (including amendments).

EN ISO 544, *Welding consumables – Technical delivery conditions for welding filler metals – Type of product, dimensions, tolerances and markings (ISO 544:2003)*.

ISO 31-0:1992, *Quantities and units – Part 0: General principles*.

ISO 14344, *Welding and allied processes – Flux and gas shielded electrical welding processes – Procurement guidelines for consumables*.

3 Classification

The classification is divided into two parts:

- a) the first part indicates the product form being solid wires, strips or rods, see 4.1;
- b) the second part gives a numerical symbol indicating the chemical composition of the solid wire, strip or rod, see Table 1.

4 Symbols and requirements

4.1 Symbols for the product form

The symbol for the solid wire and rod shall be S and for the solid strip it shall be B.

NOTE One product form may be used for more than one welding process.

4.2 Symbol for the chemical composition

The numerical symbol in Table 1 indicates the chemical composition of a solid wire, strip or rod, determined under conditions given in clause 6. The first digit is an indicator of the alloy group as follows:

- 1 Significant molybdenum addition without significant chromium addition (nickel-molybdenum alloys).
- 2 No significant alloy addition.
- 4 Significant copper addition (nickel-copper alloys).
- 5 Significant copper additions with aluminium and titanium for precipitation hardening.
- 6 Significant chromium addition, with iron less than 25% (nickel-chromium-iron and nickel-chromium-molybdenum alloys).
- 7 Same as 6, but with aluminium and titanium for precipitation hardening.
- 8 Significant chromium addition, with iron more than 25% (nickel-iron-chromium alloys).

The remaining digits indicate the particular alloy deposited. The basis of the system of designation is described in annex B (informative).

NOTE In addition the chemical symbol may be used.

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Table 1 — Symbols and chemical composition requirements for solid wires, strips and rods

Alloy symbols		Chemical composition in % (m/m) ^{a b}													
Numerical	Chemical	C	Mn	Fe	Si	Cu	Ni ^c	Co ^c	Al	Ti	Cr	Nb ^d	Mo	W	Others ^{e f}
NICKEL															
Ni 2061	NiTi3	0,15	1,0	1,0	0,7	0,2	Min. 92,0	—	1,5	2,0 to 3,5	—	—	—	—	—
NICKEL – COPPER															
Ni 4060	NiCu30Mn3Ti	0,15	2,0 to 4,0	2,5	1,2	28,0 to 32,0	Min. 62,0	—	1,2	1,5 to 3,0	—	—	—	—	—
Ni 4061	NiCu30Mn3Nb	0,15	4,0	2,5	1,25	28,0 to 32,0	Min. 60,0	—	1,0	1,0	—	3,0	—	—	—
Ni 5504	NiCu25Al3Ti	0,25	1,5	2,0	1,0	Min. 20,0	63,0 to 70,0	—	2,0 to 4,0	0,3 to 1,0	—	—	—	—	—
NICKEL – CHROMIUM															
Ni 6072	NiCr44Ti	0,01 to 0,10	0,20	0,50	0,20	0,50	Min. 52,0	—	—	0,3 to 1,0	42,0 to 46,0	—	—	—	—
Ni 6076	NiCr20	0,08 to 0,25	1,0	2,00	0,30	0,50	Min. 75,0	—	0,4	0,5	19,0 to 21,0	—	—	—	—
Ni 6082	NiCr20Mn3Nb	0,10	2,5 to 3,5	3,0	0,5	0,5	Min. 67,0	—	—	0,7	18,0 to 22,0	2,0 to 3,0	—	—	—
NICKEL – CHROMIUM – IRON															
Ni 6002	NiCr21Fe18Mo9	0,05 to 0,15	2,0	17,0 to 20,0	1,0	0,5	Min. 44,0	0,5 to 2,5	—	—	20,5 to 23,0	—	8,0 to 10,0	0,2 to 1,0	—
Ni 6025	NiCr25Fe10AlY	0,15 to 0,25	0,5	8,0 to 11,0	0,5	0,1	Min. 59,0	—	1,8 to 2,4	0,1 to 0,2	24,0 to 26,0	—	—	—	Y 0,05 to 0,12; Zr 0,01 to 0,10
Ni 6030	NiCr30Fe15Mo5W	0,03	1,5	13,0 to 17,0	0,8	1,0 to 2,4	Min. 36,0	5,0	—	—	28,0 to 31,5	0,3 to 1,5	4,0 to 6,0	1,5 to 4,0	—
Ni 6052	NiCr30Fe9	0,04	1,0	7,0 to 11,0	0,5	0,3	Min. 54,0	—	1,1	1,0	28,0 to 31,5	0,10	0,5	—	Al + Ti < 1,5
Ni 6062	NiCr15Fe8Nb	0,08	1,0	6,0 to 10,0	0,3	0,5	Min. 70,0	—	—	—	14,0 to 17,0	1,5 to 3,0	—	—	—

Table 1 — Symbols and chemical composition requirements for solid wires, strips and rods (continued)

Alloy symbols		Chemical composition in % (m/m) ^{a b}													
Numerical	Chemical	C	Mn	Fe	Si	Cu	Ni ^c	Co ^c	Al	Ti	Cr	Nb ^d	Mo	W	Others ^{e f}
Ni 6176	NiCr16Fe6	0,05	0,5	5,5 to 7,5	0,5	0,1	Min. 76,0	0,05	—	—	15,0 to 17,0	—	—	—	—
Ni 6601	NiCr23Fe15Al	0,10	1,0	20,0	0,5	1,0	58,0 to 63,0	—	1,0 to 1,7	—	21,0 to 25,0	—	—	—	—
Ni 6701	NiCr36Fe7Nb	0,35 to 0,50	0,5 to 2,0	7,0	0,5 to 2,0	—	42,0 to 48,0	—	—	—	33,0 to 39,0	0,8 to 1,8	—	—	—
Ni 6704	NiCr25FeAl3YC	0,15 to 0,25	0,5	8,0 to 11,0	0,5	0,1	Min. 55,0	—	1,8 to 2,8	0,1 to 0,2	24,0 to 26,0	—	—	—	Y 0,05 to 0,12; Zr 0,01 to 0,10
Ni 6975	NiCr25Fe13Mo6	0,03	1,0	10,0 to 17,0	1,0	0,7 to 1,2	Min. 47,0	—	—	0,70 to 1,50	23,0 to 26,0	—	5,0 to 7,0	—	—
Ni 6985	NiCr22Fe20Mo7Cu2	0,01	1,0	18,0 to 21,0	1,0	1,5 to 2,5	Min. 40,0	5,0	—	—	21,0 to 23,5	0,50	6,0 to 8,0	1,5	—
Ni 7069	NiCr15Fe7Nb	0,08	1,0	5,0 to 9,0	0,50	0,50	Min. 70,0	—	0,4 to 1,0	2,0 to 2,7	14,0 to 17,0	0,70 to 1,20	—	—	—
Ni 7092	NiCr15Ti3Mn	0,08	2,0 to 2,7	8,0	0,3	0,5	Min. 67,0	—	—	2,5 to 3,5	14,0 to 17,0	—	—	—	—
Ni 7718	NiCr19Fe19Nb5Mo3	0,08	0,3	24,0	0,3	0,3	50,0 to 55,0	—	0,2 to 0,8	0,7 to 1,1	17,0 to 21,0	4,8 to 5,5	2,8 to 3,3	—	B 0,006, P 0,015
Ni 8025	NiFe30Cr29Mo	0,02	1,0 to 3,0	30,0	0,5	1,5 to 3,0	35,0 to 40,0	—	0,2	1,0	27,0 to 31,0	—	2,5 to 4,5	—	—
Ni 8065	NiFe30Cr21Mo3	0,05	1,0	Min. 22,0	0,5	1,5 to 3,0	38,0 to 46,0	—	0,2	0,6 to 1,2	19,5 to 23,5	—	2,5 to 3,5	—	—
Ni 8125	NiFe26Cr25Mo	0,02	1,0 to 3,0	30,0	0,5	1,5 to 3,0	37,0 to 42,0	—	0,2	1,0	23,0 to 27,0	—	3,5 to 7,5	—	—
NICKEL — MOLYBDENUM															
Ni 1001	NiMo28Fe	0,08	1,0	4,0 to 7,0	1,0	0,5	Min. 55,0	2,5	—	—	1,0	—	26,0 to 30,0	1,0	V 0,20 to 0,40
Ni 1003	NiMo17Cr7	0,04 to 0,08	1,0	5,0	1,0	0,50	Min. 65,0	0,20	—	—	6,0 to 8,0	—	15,0 to 18,0	0,50	V 0,50

Table 1 — Symbols and chemical composition requirements for solid wires, strips and rods (continued)

Alloy symbols		Chemical composition in % (m/m) ^{a b}													
Numerical	Chemical	C	Mn	Fe	Si	Cu	Ni ^c	Co ^c	Al	Ti	Cr	Nb ^d	Mo	W	Others ^{e f}
Ni 1004	NiMo25Cr5Fe5	0,12	1,0	4,0 to 7,0	1,0	0,5	Min. 62,0	2,5	—	—	4,0 to 6,0	—	23,0 to 26,0	1,0	V 0,60
Ni 1008	NiMo19WCr	0,1	1,0	10,0	0,50	0,50	Min. 60,0	—	—	—	0,5 to 3,5	—	18,0 to 21,0	2,0 to 4,0	—
Ni 1009	NiMo20WCu	0,1	1,0	5,0	0,5	0,3 to 1,3	Min. 65,0	—	1,0	—	—	—	19,0 to 22,0	2,0 to 4,0	—
Ni 1062	NiMo24Cr8Fe6	0,01	0,5	5,0 to 7,0	0,1	0,4	Min. 62,0	—	0,1 to 0,4	—	7,0 to 8,0	—	23,0 to 25,0	—	—
Ni 1066	NiMo28	0,02	1,0	2,0	0,1	0,5	Min. 64,0	1,0	—	—	1,0	—	26,0 to 30,0	1,0	—
Ni 1067	NiMo30Cr	0,01	3,0	1,0 to 3,0	0,1	0,2	Min. 52,0	3,0	0,5	0,2	1,0 to 3,0	0,2	27,0 to 32,0	3,0	V 0,20
Ni 1069	NiMo28Fe4Cr	0,01	1,0	2,0 to 5,0	0,05	0,01	Min. 65,0	1,0	0,5	—	0,5 to 1,5	—	26,0 to 30,0	—	—
NICKEL – CHROMIUM – MOLYBDENUM															
Ni 6012	NiCr22Mo9	0,05	1,0	3,0	0,5	0,5	Min. 58,0	—	0,4	0,4	20,0 to 23,0	1,5	8,0 to 10,0	—	—
Ni 6022	NiCr21Mo13Fe4W ₃	0,01	0,5	2,0 to 6,0	0,1	0,5	Min. 49,0	2,5	—	—	20,0 to 22,5	—	12,5 to 14,5	2,5 to 3,5	V 0,3
Ni 6057	NiCr30Mo11	0,02	1,0	2,0	1,0	—	Min. 53,0	—	—	—	29,0 to 31,0	—	10,0 to 12,0	—	V 0,4
Ni 6059	NiCr23Mo16	0,01	0,5	1,5	0,1	—	Min. 56,0	0,3	0,1 to 0,4	—	22,0 to 24,0	—	15,0 to 16,5	—	—
Ni 6200	NiCr23Mo16Cu2	0,01	0,5	3,0	0,08	1,3 to 1,9	Min. 52,0	2,0	—	—	22,0 to 24,0	—	15,0 to 17,0	—	—
Ni 6205	NiCr25Mo16	0,02	0,5	2,0	0,2	2,0	Min. 50,0	—	0,4	—	22,0 to 27,0	—	13,5 to 16,5	—	—
Ni 6276	NiCr15Mo16Fe6W ₄	0,02	1,0	4,0 to 7,0	0,08	0,5	Min. 50,0	2,5	—	—	14,5 to 16,5	—	15,0 to 17,0	3,0 to 4,5	V 0,3