INTERNATIONAL STANDARD

ISO 18274

Third edition
2023-04

Welding consumables — Solid wire electrodes, solid strip electrodes, solid wires and solid rods for fusion welding of nickel and nickel alloys — Classification

Produits consommables pour le soudage — Fils-électrodes pleins, feuillards pleins, fils pleins et baguettes pleines pour le soudage par fusion du nickel et des alliages de nickel — Classification

Reference number
ISO 18274:2023(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 3, *Welding consumables*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 121, *Welding and allied processes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 18274:2010), which has been technically revised.

The main changes are as follows:

— new restricted alloy symbols, commonly used in the USA, added to Table 1 and Table C.1;

— alloy symbols updated in Table 1 and Table C.1;

— a new EXAMPLE 4 added to Clause 11 for a Z classification.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html. Official interpretations of ISO/TC 44 documents, where they exist, are available from this page: https://committee.iso.org/sites/tc44/home/interpretation.html.

Introduction

For nickel welding consumables, there is no unique relationship between the product form, for example:

— solid wire electrode;

— solid strip electrode;

— solid wire;

— solid rod;

and the welding process used, for example:

— gas-shielded metal arc welding;

— gas tungsten arc welding;

— plasma arc welding;

— submerged arc welding;

— strip overlay welding;

— laser welding;

— other welding processes.

Consequently, solid wire electrodes, solid strip electrodes, solid wires or solid rods can be classified on the basis of any of these product forms and can be used, as appropriate, for more than one of these processes (see also Annex B).

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent.

ISO takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO. Information may be obtained from the patent database available at www.iso.org/patents.

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

Welding consumables — Solid wire electrodes, solid strip electrodes, solid wires and solid rods for fusion welding of nickel and nickel alloys — Classification

1 Scope

This document specifies requirements for classification of solid wire electrodes, solid strip electrodes, solid wires and solid rods for fusion welding of nickel and nickel alloys. The classification of the solid wire electrodes, solid strip electrodes, solid wires and solid rods is based on their chemical composition. It includes those compositions in which the nickel content exceeds that of any other element.

The principles of this document can be applied to metal powders for cladding, hard facing and additive manufacturing.

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.

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

ISO 14344, *Welding consumables — Procurement of filler materials and fluxes*

ISO 80000-1:2022, *Quantities and units — Part 1: General*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology 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 symbol for the classification is divided into two parts:

a) the first part indicates the product form, being solid wire electrode, solid strip electrode, solid wire or solid rod, see 5.1;

b) the second part gives a numerical symbol indicating the chemical composition of the solid wire electrode, solid strip electrode, solid wire or solid rod, see Table 1.

5 Symbols and requirements

5.1 Symbols for the product form

The symbol for the solid wire electrode, solid wire or solid rod shall be “S”.

The symbol for the solid strip electrode shall be “B”.

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

5.2 Symbol for the chemical composition

The initial symbol “Ni” in Table 1 identifies the welding consumable as a nickel base alloy. The following four digits indicate the chemical composition of the solid wire electrode, solid strip electrode, solid wire or solid 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 % (mass fraction) (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 % (mass fraction) (nickel-iron-chromium alloys);

— 9, an alloy that is precipitation hardenable.

The remaining digits indicate the alloy composition of the welding consumable. The basis of the system of designation is described in Annex A. A description of common uses of each welding consumable alloy is given in Annex B.

NOTE 1 In addition, the chemical symbol can be used.

NOTE 2 Corresponding national classifications are shown in Annex C, Table C.1.

Table 1 — Symbols and chemical composition requirements for solid wire electrodes, solid strip electrodes, solid wires and solid rods

Alloy symbols		Chemical composition, % (mass fraction)[a]													
Numerical[b]	Chemical	C	Mn	Fe	Si	Cu	Ni[c]	Co	Al	Ti	Cr	Nb[d]	Mo	W	Others[e, f]
Nickel															
Ni 2061	NiTi3	0,15	1,0	1,0	0,7	0,25	≥ 92,0	—	1,5	2,0 to 3,5	—	—	—	—	P 0,03
Ni 2061B	(NiTi3)	0,15	1,0	1,0	0,7	0,25	≥ 93,0	—	1,5	2,0 to 3,5	—	—	—	—	P 0,03
Nickel-copper															
Ni 4060	NiCu30Mn3Ti	0,15	4,0	2,5	1,2	28,0 to 32,0	62,0 to 69,0	—	1,2	1,5 to 3,0	—	0,3	—	—	—
Ni 4061	NiCu30Mn3Nb	0,15	4,0	2,5	1,25	28,0 to 32,0	≥ 60,0	—	1,0	1,0	—	3,0	—	—	—
Ni 5504	NiCu25Al3Ti	0,25	1,5	2,0	1,0	≥ 20,0	63,0 to 70,0	—	2,0 to 4,0	0,3 to 1,0	—	—	—	—	P 0,03
Nickel-chromium															
Ni 6072	NiCr44Ti	0,01 to 0,10	0,20	0,50	0,20	0,50	≥ 52,0	—	—	0,3 to 1,0	42,0 to 46,0	—	—	—	—
Ni 6073	NiCr38AlNbTi	0,03	0,50	1,0	0,30	0,30	≥ 63,0	1,0	0,75 to 1,20	0,25 to 0,75	36,0 to 39,0	0,25 to 1,00	0,50	—	P 0,02 B 0,003 Zr 0,02
Ni 6076	NiCr20	0,08 to 0,15	1,0	2,00	0,30	0,50	≥ 75,0	—	0,4	0,15 to 0,50	19,0 to 21,0	—	—	—	P 0,03
Ni 6082	NiCr20Mn3Nb	0,10	2,5 to 3,5	3,0	0,5	0,5	≥ 67,0	—	—	0,7	18,0 to 22,0	2,0 to 3,0	—	—	P 0,03

[a] Single values for all elements are maxima except where the ≥ sign is used.

[b] Symbols with B have more restricted chemical compositions than symbols without B. Symbols with B meet the requirements of symbols without B but not vice versa.

[c] Up to 1 % (mass fraction) of the nickel content can be cobalt unless otherwise specified. For certain applications, lower cobalt levels can required and should be agreed between contracting parties.

[d] Up to 20 % (mass fraction) of the niobium content can be tantalum.

[e] The total of unspecified elements shall not exceed 0,5 % (mass fraction).

[f] Phosphorus 0,020 % (mass fraction) maximum and sulfur 0,015 % (mass fraction) maximum unless otherwise stated.

[g] Ag ≤ 0,000 5 % (mass fraction), B ≤ 0,020 % (mass fraction), Bi ≤ 0,000 1 % (mass fraction), Pb ≤ 0,002 0 % (mass fraction), Zr ≤ 0,15 % (mass fraction).

[h] Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letters Ni Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z-classification are not interchangeable.

Table 1 *(continued)*

Alloy symbols		Chemical composition, % (mass fraction)[a]													
Numerical[b]	**Chemical**	**C**	**Mn**	**Fe**	**Si**	**Cu**	**Ni**[c]	**Co**	**Al**	**Ti**	**Cr**	**Nb**[d]	**Mo**	**W**	**Others**[e, f]
Ni 6699	NiCr29Al	0,005 to 0,10	0,5	2,5	0,50	0,50	≥ 60	—	1,9 to 3,0	0,60	26,0 to 30,0	0,50	—	—	Zr 0,10 N 0,05 S 0,01 B 0,008
Nickel-chromium-iron															
Ni 6002	NiCr21Fe18Mo9	0,05 to 0,15	1,0	17,0 to 20,0	1,0	0,5	≥ 44,0	0,5 to 2,5	—	—	20,5 to 23,0	—	8,0 to 10,0	0,2 to 1,0	P 0,04 S 0,03
Ni 6025	NiCr25Fe10AlY	0,15 to 0,25	0,5	8,0 to 11,0	0,5	0,1	≥ 59,0	1,0	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	≥ 36,0	5,0	—	—	28,0 to 31,5	0,3 to 1,5	4,0 to 6,0	1,5 to 4,0	P 0,04 S 0,02
Ni 6043	NiCr30Fe9Nb2	0,04	3,0	7,0 to 12,0	0,5	0,30	≥ 54,0	—	0,50	0,5	28,0 to 31,5	1,0 to 2,5	0,50	—	—
Ni 6045	NiCr28Fe23Si3	0,05 to 0,12	1,0	21,0 to 25,0	2,5 to 3,0	0,3	≥ 40,0	1,0	0,30	—	26,0 to 29,0	—	—	—	P 0,020 S 0,010
Ni 6052	NiCr30Fe9	0,04	1,0	7,0 to 11,0	0,5	0,3	≥ 54,0	—	1,1	1,0	28,0 to 31,5	0,10	0,5	—	Al + Ti < 1,5
Ni 6054	NiCr29Fe9	0,04	1,0	7,0 to 11,0	0,50	0,30	≥ 51,0	0,12	1,10	1,0	28,0 to 31,5	0,5 to 1,0	0,50	—	P 0,02

[a] Single values for all elements are maxima except where the ≥ sign is used.

[b] Symbols with B have more restricted chemical compositions than symbols without B. Symbols with B meet the requirements of symbols without B but not vice versa.

[c] Up to 1 % (mass fraction) of the nickel content can be cobalt unless otherwise specified. For certain applications, lower cobalt levels can required and should be agreed between contracting parties.

[d] Up to 20 % (mass fraction) of the niobium content can be tantalum.

[e] The total of unspecified elements shall not exceed 0,5 % (mass fraction).

[f] Phosphorus 0,020 % (mass fraction) maximum and sulfur 0,015 % (mass fraction) maximum unless otherwise stated.

[g] Ag ≤ 0,000 5 % (mass fraction), B ≤ 0,020 % (mass fraction), Bi ≤ 0,000 1 % (mass fraction), Pb ≤ 0,002 0 % (mass fraction), Zr ≤ 0,15 % (mass fraction).

[h] Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letters Ni Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z-classification are not interchangeable.

Table 1 *(continued)*

Alloy symbols		Chemical composition, % (mass fraction)[a]													
Numerical[b]	**Chemical**	**C**	**Mn**	**Fe**	**Si**	**Cu**	**Ni**[c]	**Co**	**Al**	**Ti**	**Cr**	**Nb**[d]	**Mo**	**W**	**Others**[e, f]
Ni 6054B	(NiCr29Fe9)	0,04	1,0	7,0 to 11,0	0,50	0,30	≥ 51,0	0,12	1,10	1,0	28,0 to 31,5	0,5 to 1,0	0,50	—	P 0,02 Al + Ti 1,5 B 0,005 Zr 0,02
Ni 6055	NiCr29Fe5Mo4Nb3	0,03	1,0	14,4	0,50	0,30	52,0 to 62,0	0,10	0,50	0,50	28,5 to 31,0	2,1 to 4,0	3,0 to 5,0	—	P 0,02 B 0,003 Zr 0,02
Ni 6056	NiCr27Fe2Nb2	0,020 to 0,055	2,5 to 3,5	1,0 to 3,0	0,50	0,3	≥ 61,0	0,10	0,60	0,10 to 0,40	26,0 to 28,0	2,0 to 2,8	—	—	P 0,02
Ni 6062	NiCr15Fe8Nb	0,08	1,0	6,0 to 10,0	0,3	0,5	≥ 70,0	—	—	—	14,0 to 17,0	1,5 to 3,0	—	—	P 0,03
Ni 6176	NiCr16Fe6	0,05	0,5	5,5 to 7,5	0,5	0,1	≥ 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	—	—	—	P 0,03
Ni 6693	NiCr29Fe4Al3	0,15	1,0	2,5 to 6,0	0,5	0,5	≥ 53,0	—	2,5 to 4,0	1,0	27,0 to 31,0	0,5 to 2,5	—	—	P 0,03 S 0,01
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 6975	NiCr25Fe13Mo6	0,03	1,0	10,0 to 17,0	1,0	0,7 to 1,2	47,0 to 52,0	—	—	0,70 to 1,50	23,0 to 26,0	—	5,0 to 7,0	—	P 0,03 S 0,03

[a] Single values for all elements are maxima except where the ≥ sign is used.

[b] Symbols with B have more restricted chemical compositions than symbols without B. Symbols with B meet the requirements of symbols without B but not vice versa.

[c] Up to 1 % (mass fraction) of the nickel content can be cobalt unless otherwise specified. For certain applications, lower cobalt levels can required and should be agreed between contracting parties.

[d] Up to 20 % (mass fraction) of the niobium content can be tantalum.

[e] The total of unspecified elements shall not exceed 0,5 % (mass fraction).

[f] Phosphorus 0,020 % (mass fraction) maximum and sulfur 0,015 % (mass fraction) maximum unless otherwise stated.

[g] Ag ≤ 0,000 5 % (mass fraction), B ≤ 0,020 % (mass fraction), Bi ≤ 0,000 1 % (mass fraction), Pb ≤ 0,002 0 % (mass fraction), Zr ≤ 0,15 % (mass fraction).

[h] Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letters Ni Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z-classification are not interchangeable.

Table 1 *(continued)*

Alloy symbols		Chemical composition, % (mass fraction)[a]													
Numerical[b]	**Chemical**	**C**	**Mn**	**Fe**	**Si**	**Cu**	**Ni**[c]	**Co**	**Al**	**Ti**	**Cr**	**Nb**[d]	**Mo**	**W**	**Others**[e, f]
Ni 6985	NiCr22Fe20Mo7Cu2	0,01	1,0	18,0 to 21,0	1,0	1,5 to 2,5	≥ 40,0	5,0	—	—	21,0 to 23,5	0,50	6,0 to 8,0	1,5	P 0,04 S 0,03
Ni 7069	NiCr15Fe7Nb	0,08	1,0	5,0 to 9,0	0,50	0,50	≥ 70,0	—	0,4 to 1,0	2,0 to 2,7	14,0 to 17,0	0,70 to 1,20	—	—	P 0,03
Ni 7092	NiCr15Ti3Mn	0,08	2,0 to 2,7	8,0	0,3	0,5	≥ 67,0	—	—	2,5 to 3,5	14,0 to 17,0	—	—	—	P 0,03
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 8034	NiFe29Cr27Mo6Cu	0,10	1,0 to 4,0	24,5 - 33,5	0,10	0,5 to 1,5	33,5 to 35,0	—	0,3	—	26,0 to 27,0	—	6,0 to 7,0	—	N 0,10 to 0,25
Ni 8065	NiFe30Cr21Mo3	0,05	1,0	≥ 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	—	P 0,03 S 0,03
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	—	—
Ni 8827	NiFe30Cr22Mo6	0,015	0,5 to 0,9	≥ 22,0	0,2 to 0,5	1,60 to 2,30	39,0 to 43,0	0,5	0,06 to 0,25	—	21,0 to 23,0	0,15	4,5 to 6,5	—	N 0,03; B 0,002 to 0,004 S 0,005
Ni 9946	NiCr21Fe15Mo3Nb3	0,005 to 0,040	1,0	28,0	0,5	1,5 to 3,0	45,0 to 55,0	—	0,01 to 0,70	0,5 to 2,5	19,5 to 23,0	2,5 to 4,5	3,0 to 4,0	—	P 0,03

[a] Single values for all elements are maxima except where the ≥ sign is used.

[b] Symbols with B have more restricted chemical compositions than symbols without B. Symbols with B meet the requirements of symbols without B but not vice versa.

[c] Up to 1 % (mass fraction) of the nickel content can be cobalt unless otherwise specified. For certain applications, lower cobalt levels can required and should be agreed between contracting parties.

[d] Up to 20 % (mass fraction) of the niobium content can be tantalum.

[e] The total of unspecified elements shall not exceed 0,5 % (mass fraction).

[f] Phosphorus 0,020 % (mass fraction) maximum and sulfur 0,015 % (mass fraction) maximum unless otherwise stated.

[g] Ag ≤ 0,000 5 % (mass fraction), B ≤ 0,020 % (mass fraction), Bi ≤ 0,000 1 % (mass fraction), Pb ≤ 0,002 0 % (mass fraction), Zr ≤ 0,15 % (mass fraction).

[h] Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letters Ni Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z-classification are not interchangeable.

Table 1 *(continued)*

Alloy symbols		Chemical composition, % (mass fraction)[a]													
Numerical[b]	**Chemical**	**C**	**Mn**	**Fe**	**Si**	**Cu**	**Ni**[c]	**Co**	**Al**	**Ti**	**Cr**	**Nb**[d]	**Mo**	**W**	**Others**[e, f]
Nickel-molybdenum															
Ni 1001	NiMo28Fe	0,08	1,0	4,0 to 7,0	1,0	0,5	≥ 55,0	2,5	—	—	1,0	—	26,0 to 30,0	1,0	V 0,20 to 0,40 S 0,03
Ni 1003	NiMo17Cr7	0,04 to 0,08	1,0	5,0	1,0	0,50	≥ 65,0	0,20	—	—	6,0 to 8,0	—	15,0 to 18,0	0,50	V 0,50 S 0,02
Ni 1004	NiMo25Cr5Fe5	0,12	1,0	4,0 to 7,0	1,0	0,5	≥ 62,0	2,5	—	—	4,0 to 6,0	—	23,0 to 26,0	1,0	V 0,60 P 0,04 S 0,03
Ni 1008	NiMo19WCr	0,1	1,0	10,0	0,50	0,50	≥ 60,0	—	—	—	0,5 to 3,5	—	18,0 to 21,0	2,0 to 4,0	P 0,015
Ni 1009	NiMo20WCu	0,1	1,0	5,0	0,5	0,3 to 1,3	≥ 65,0	—	1,0	—	—	—	19,0 to 22,0	2,0 to 4,0	—
Ni 1024	NiMo25	0,03	0,80	2,0	0,80	0,50	≥ 59,0	1,0	0,50	—	7,0 to 9,0	—	24,0 to 26,0	—	P 0,030 B 0,006
Ni 1062	NiMo24Cr8Fe6	0,01	1,0	5,0 to 8,0	0,1	0,5	≥ 62,0	—	0,5	—	6,0 to 10,0	—	21,0 to 25,0	—	—
Ni 1066	NiMo28	0,02	1,0	2,0	0,1	0,5	≥ 64,0	1,0	—	0,5	1,0	—	26,0 to 30,0	1,0	P 0,04 S 0,03

[a] Single values for all elements are maxima except where the ≥ sign is used.

[b] Symbols with B have more restricted chemical compositions than symbols without B. Symbols with B meet the requirements of symbols without B but not vice versa.

[c] Up to 1 % (mass fraction) of the nickel content can be cobalt unless otherwise specified. For certain applications, lower cobalt levels can required and should be agreed between contracting parties.

[d] Up to 20 % (mass fraction) of the niobium content can be tantalum.

[e] The total of unspecified elements shall not exceed 0,5 % (mass fraction).

[f] Phosphorus 0,020 % (mass fraction) maximum and sulfur 0,015 % (mass fraction) maximum unless otherwise stated.

[g] Ag ≤ 0,000 5 % (mass fraction), B ≤ 0,020 % (mass fraction), Bi ≤ 0,000 1 % (mass fraction), Pb ≤ 0,002 0 % (mass fraction), Zr ≤ 0,15 % (mass fraction).

[h] Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letters Ni Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z-classification are not interchangeable.

Table 1 *(continued)*

Alloy symbols		Chemical composition, % (mass fraction)[a]													
Numerical[b]	**Chemical**	**C**	**Mn**	**Fe**	**Si**	**Cu**	**Ni**[c]	**Co**	**Al**	**Ti**	**Cr**	**Nb**[d]	**Mo**	**W**	**Others**[e, f]
Ni 1067	NiMo30Cr	0,01	3,0	1,0 to 3,0	0,1	0,2	≥ 65,0	3,0	0,5	0,2	1,0 to 3,0	0,2	27,0 to 32,0	3,0	V 0,20 P 0,03 Zr 0,10 Ta 0,02 Ni+Mo 94,0 to 98,0
Ni 1069	NiMo28Fe4Cr	0,01	1,0	2,0 to 5,0	0,1	0,5	≥ 65,0	1,0	0,1 to 0,5	0,3	0,5 to 1,5	0,5	26,0 to 30,0	—	—
Ni 1362	NiMo22Cr15	0,010	0,60	1,25	0,08	—	≥ 60,0	—	0,50	—	13,8 to 15,6	—	21,5 to 23,0	—	P 0,025 S 0,010
Nickel-chromium-molybdenum															
Ni 6007	NiCr22Fe19Mo6Nb2	0,05	1,0 to 2,0	18,0 to 21,0	1,0	1,5 to 2,5	≥ 36,0	2,5	—	—	21,0 to 23,5	1,75 to 2,50	5,5 to 7,5	1,0	P 0,04 S 0,03
Ni 6012	NiCr22Mo9	0,05	1,0	3,0	0,5	0,5	≥ 58,0	—	0,4	0,4	20,0 to 23,0	1,5	8,0 to 10,0	—	—
Ni 6022	NiCr21Mo13Fe4W3	0,01	0,5	2,0 to 6,0	0,08	0,5	≥ 49,0	2,5	—	—	20,0 to 22,5	—	12,5 to 14,5	2,5 to 3,5	V 0,3
Ni 6035	NiCr33Mo8	0,05	0,5	2,0	0,6	0,30	≥ 49,0	1,00	0,40	0,20	32,25 to 34,25	0,50	7,60 to 9,00	0,60	V 0,20 P 0,030
Ni 6057	NiCr30Mo11	0,02	1,0	2,0	1,0	—	≥ 53,0	—	—	—	29,0 to 31,0	—	10,0 to 12,0	—	V 0,4 P 0,04 S 0,03

[a] Single values for all elements are maxima except where the ≥ sign is used.

[b] Symbols with B have more restricted chemical compositions than symbols without B. Symbols with B meet the requirements of symbols without B but not vice versa.

[c] Up to 1 % (mass fraction) of the nickel content can be cobalt unless otherwise specified. For certain applications, lower cobalt levels can required and should be agreed between contracting parties.

[d] Up to 20 % (mass fraction) of the niobium content can be tantalum.

[e] The total of unspecified elements shall not exceed 0,5 % (mass fraction).

[f] Phosphorus 0,020 % (mass fraction) maximum and sulfur 0,015 % (mass fraction) maximum unless otherwise stated.

[g] Ag ≤ 0,000 5 % (mass fraction), B ≤ 0,020 % (mass fraction), Bi ≤ 0,000 1 % (mass fraction), Pb ≤ 0,002 0 % (mass fraction), Zr ≤ 0,15 % (mass fraction).

[h] Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letters Ni Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z-classification are not interchangeable.

Table 1 *(continued)*

Alloy symbols		Chemical composition, % (mass fraction)[a]													
Numerical[b]	**Chemical**	**C**	**Mn**	**Fe**	**Si**	**Cu**	**Ni**[c]	**Co**	**Al**	**Ti**	**Cr**	**Nb**[d]	**Mo**	**W**	**Others**[e, f]
Ni 6058	NiCr21Mo20	0,01	0,5	1,5	0,10	0,50	≥ 52,0	0,3	0,4	—	20,0 to 23,0	—	18,5 to 21,0	0,3	N 0,02 to 0,15 P 0,015 S 0,010
Ni 6059	NiCr23Mo16	0,01	0,5	1,5	0,1	0,5	≥ 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	≥ 52,0	2,0	0,5	—	22,0 to 24,0	—	15,0 to 17,0	—	P 0,025
Ni 6205	NiCr25Mo16	0,03	0,5	1,0	0,5	0,2	≥ 55,0	0,2	0,4	0,4	24,0 to 26,0	—	14,0 to 16,0	0,3	—
Ni 6276	NiCr15Mo16Fe6W4	0,02	1,0	4,0 to 7,0	0,08	0,5	≥ 50,0	2,5	—	—	14,5 to 16,5	—	15,0 to 17,0	3,0 to 4,5	V 0,35 P 0,04 S 0,03
Ni 6452	NiCr20Mo15	0,01	1,0	1,5	0,1	0,5	≥ 56,0	—	—	—	19,0 to 21,0	0,4	14,0 to 16,0	—	V 0,4
Ni 6455	NiCr16Mo16Ti	0,01	1,0	3,0	0,08	0,5	≥ 56,0	2,0	—	0,7	14,0 to 18,0	—	14,0 to 18,0	0,5	P 0,04 S 0,03
Ni 6625	NiCr22Mo9Nb	0,1	0,5	5,0	0,5	0,5	≥ 58,0	—	0,4	0,4	20,0 to 23,0	3,0 to 4,1	8,0 to 10,0	—	—
Ni 6625B	(NiCr22Mo9Nb)	0,1	0,5	5,0	0,5	0,5	≥ 58,0	—	0,4	0,4	20,0 to 23,0	3,2 to 4,1	8,0 to 10,0	—	—

[a] Single values for all elements are maxima except where the ≥ sign is used.

[b] Symbols with B have more restricted chemical compositions than symbols without B. Symbols with B meet the requirements of symbols without B but not vice versa.

[c] Up to 1 % (mass fraction) of the nickel content can be cobalt unless otherwise specified. For certain applications, lower cobalt levels can required and should be agreed between contracting parties.

[d] Up to 20 % (mass fraction) of the niobium content can be tantalum.

[e] The total of unspecified elements shall not exceed 0,5 % (mass fraction).

[f] Phosphorus 0,020 % (mass fraction) maximum and sulfur 0,015 % (mass fraction) maximum unless otherwise stated.

[g] Ag ≤ 0,000 5 % (mass fraction), B ≤ 0,020 % (mass fraction), Bi ≤ 0,000 1 % (mass fraction), Pb ≤ 0,002 0 % (mass fraction), Zr ≤ 0,15 % (mass fraction).

[h] Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letters Ni Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z-classification are not interchangeable.

Table 1 *(continued)*

Alloy symbols		Chemical composition, % (mass fraction)[a]													
Numerical[b]	**Chemical**	**C**	**Mn**	**Fe**	**Si**	**Cu**	**Ni**[c]	**Co**	**Al**	**Ti**	**Cr**	**Nb**[d]	**Mo**	**W**	**Others**[e, f]
Ni 6650	NiCr20Fe14Mo11WN	0,03	0,5	12,0 to 16,0	0,5	0,3	≥ 44,0	1,0	0,05 to 0,50	—	19,0 to 21,0	0,05 to 0,50	9,5 to 12,5	0,5 to 2,5	N 0,05 to 0,20 S 0,010 V 0,30
Ni 6660	NiCr22Mo10W3	0,03	0,5	2,0	0,5	0,3	≥ 58,0	0,2	0,4	0,4	21,0 to 23,0	0,2	9,0 to 11,0	2,0 to 4,0	—
Ni 6686	NiCr21Mo16W4	0,01	1,0	5,0	0,08	0,5	≥ 49,0	—	0,5	0,25	19,0 to 23,0	—	15,0 to 17,0	3,0 to 4,4	S 0,02
Ni 7725	NiCr21Mo8Nb3Ti	0,03	0,3	≥ 8,0	0,20	—	55,0 to 59,0	—	0,35	1,0 to 1,7	19,0 to 22,5	2,75 to 4,00	7,0 to 9,5	—	—
Nickel-chromium-cobalt															
Ni 6160	NiCr28Co30Si3	0,02 to 0,10	1,0	3,5	2,4 to 3,0	0,5	≥ 30,0	27,0 to 32,0	0,40	0,2 to 0,6	26,0 to 29,0	0,3	0,7	0,5	P 0,03
Ni 6617	NiCr22Co12Mo9	0,05 to 0,15	1,0	3,0	1,0	0,5	≥ 44,0	10,0 to 15,0	0,8 to 1,5	0,6	20,0 to 24,0	—	8,0 to 10,0	—	P 0,03
Ni 7090	NiCr20Co18Ti3	0,13	1,0	1,5	1,0	0,2	≥ 50,0	15,0 to 18,0	1,0 to 2,0	2,0 to 3,0	18,0 to 21,0	—	—	—	[g]
Ni 7740	NiCr24Co19	0,01 to 0,06	1,0	3,0	1,0	0,50	≥ 37,0	15,0 to 22,9	0,5 to 2,0	0,8 to 2,5	23,5 to 25,5	0,5 to 2,5	2,0	—	P 0,03
Ni 7208	NiCr19Co10Mo8	0,04 to 0,08	0,30	1,5	0,15	0,1	≥ 53,0	9,0 to 11,0	1,38 to 1,65	1,90 to 2,30	18,5 to 20,5	0,3	8,0 to 9,0	0,05	P 0,015

[a] Single values for all elements are maxima except where the ≥ sign is used.

[b] Symbols with B have more restricted chemical compositions than symbols without B. Symbols with B meet the requirements of symbols without B but not vice versa.

[c] Up to 1 % (mass fraction) of the nickel content can be cobalt unless otherwise specified. For certain applications, lower cobalt levels can required and should be agreed between contracting parties.

[d] Up to 20 % (mass fraction) of the niobium content can be tantalum.

[e] The total of unspecified elements shall not exceed 0,5 % (mass fraction).

[f] Phosphorus 0,020 % (mass fraction) maximum and sulfur 0,015 % (mass fraction) maximum unless otherwise stated.

[g] Ag ≤ 0,000 5 % (mass fraction), B ≤ 0,020 % (mass fraction), Bi ≤ 0,000 1 % (mass fraction), Pb ≤ 0,002 0 % (mass fraction), Zr ≤ 0,15 % (mass fraction).

[h] Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letters Ni Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z-classification are not interchangeable.

Table 1 *(continued)*

Alloy symbols		Chemical composition, % (mass fraction)[a]													
Numerical[b]	**Chemical**	**C**	**Mn**	**Fe**	**Si**	**Cu**	**Ni**[c]	**Co**	**Al**	**Ti**	**Cr**	**Nb**[d]	**Mo**	**W**	**Others**[e, f]
Ni 7263	NiCr20Co20Mo6Ti2	0,04 to 0,08	0,6	0,7	0,4	0,2	≥ 47,0	19,0 to 21,0	0,3 to 0,6	1,9 to 2,4	19,0 to 21,0	—	5,6 to 6,1	—	Al+Ti 2,4 to 2,8 S 0,007 Ag 0,000 5 B 0,005 Bi 0,000 1
Nickel-chromium-tungsten															
Ni 6231	NiCr22W14Mo2	0,05 to 0,15	0,3 to 1,0	3,0	0,25 to 0,75	0,50	≥ 48,0	5,0	0,2 to 0,5	—	20,0 to 24,0	—	1,0 to 3,0	13,0 to 15,0	P 0,03
Ni 6231B	(NiCr22W14Mo2)	0,05 to 0,15	0,3 to 1,0	3,0	0,25 to 0,75	0,50	≥ 48,0	5,0	0,2 to 0,5	—	20,0 to 24,0	—	1,0 to 3,0	13,0 to 15,0	P 0,03 B 0,003 La 0,050
Ni 6680	NiCr20Mo7W6Nb4	0,03	—	0,50	0,1	—	56,0 to 65,0	1,0	0,5	1,2 to 3,0	17,0 to 23,0	3,0 to 5,0	5,0 to 8,0	4,0 to 8,0	P 0,02
Any other agreed composition															
	Ni Z[h]	Any other agreed composition with a minimum nickel content greater than the minimum value for any other element													

[a] Single values for all elements are maxima except where the ≥ sign is used.

[b] Symbols with B have more restricted chemical compositions than symbols without B. Symbols with B meet the requirements of symbols without B but not vice versa.

[c] Up to 1 % (mass fraction) of the nickel content can be cobalt unless otherwise specified. For certain applications, lower cobalt levels can required and should be agreed between contracting parties.

[d] Up to 20 % (mass fraction) of the niobium content can be tantalum.

[e] The total of unspecified elements shall not exceed 0,5 % (mass fraction).

[f] Phosphorus 0,020 % (mass fraction) maximum and sulfur 0,015 % (mass fraction) maximum unless otherwise stated.

[g] Ag ≤ 0,000 5 % (mass fraction), B ≤ 0,020 % (mass fraction), Bi ≤ 0,000 1 % (mass fraction), Pb ≤ 0,002 0 % (mass fraction), Zr ≤ 0,15 % (mass fraction).

[h] Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letters Ni Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z-classification are not interchangeable.

6 Chemical analysis

Chemical analysis shall be performed on specimens of the product or the stock from which it is made. Any analytical technique can be used, but in cases of dispute reference shall be made to established published methods.

NOTE 1 The shielding gas or flux can influence the chemical composition of the all-weld metal compared with the chemical analysis of the product or stock.

NOTE 2 See Annex B.

7 Mechanical properties of the weld metal

Mechanical properties of the all-weld metal are not required for classification.

NOTE Information on typical weld metal tensile strengths, where they exist, can be found in Annex C.

8 Rounding procedure

Actual test values obtained shall be subject to ISO 80000-1:2022, B.3, Rule A. If the measured values are obtained by equipment calibrated in units other than those of this document, the measured values shall be converted to the units of this document before rounding. If an average value is to be compared with the requirements of this document, rounding shall be done only after calculating the average. The rounded results shall fulfil the requirements of the appropriate table for the classification under test.

9 Retests

If any test fails to meet the requirement(s), it shall be repeated twice. The results of both retests shall meet the requirement. Specimens for the retest may be taken from the sample or from one or two new samples. For chemical analysis, retests need only be for those specific elements that failed to meet the requirement. If the results of one or both retests fail to meet the requirement, the material under test shall be considered as not meeting the requirements of this document for that classification.

In the event that during preparation or after completion of any test it is clearly determined that prescribed or proper procedures were not followed in preparing the sample(s) or test specimen(s), or in conducting the tests, the test shall be considered invalid. This determination is made without regard to whether the test was actually completed or whether the test results met, or failed to meet, the requirements. The test shall be repeated following the proper prescribed procedures. In these cases, the requirement for doubling the number of test specimens does not apply.

10 Technical delivery conditions

Technical delivery conditions shall meet the requirements of ISO 544 and ISO 14344.

11 Designation

The designation of solid wire electrodes, solid strip electrodes, solid wires and solid rods shall follow the principle given in the following examples.

EXAMPLE 1 A solid wire (S) for gas-shielded metal arc welding having a chemical composition within the limits for the alloy symbol 6625 (NiCr22Mo9Nb) of Table 1 is designated:

ISO 18274 – S Ni 6625

or alternatively:

ISO 18274 – S Ni 6625 (NiCr22Mo9Nb)

EXAMPLE 2 A solid rod (S) for gas tungsten arc welding is designated:

ISO 18274 – S Ni 6625

or alternatively:

ISO 18274 – S Ni 6625 (NiCr22Mo9Nb)

EXAMPLE 3 A solid strip (B) for submerged arc or electroslag welding is designated:

ISO 18274 – B Ni 6625

or alternatively:

ISO 18274 – B Ni 6625 (NiCr22Mo9Nb)

where:

ISO 18274	is the number of this document;
S or B	is the product form (see 5.1);
Ni 6625	is the chemical composition of the welding consumable (see Table 1);
NiCr22Mo9Nb	is the optional chemical symbol of the welding consumable (see Table 1).

EXAMPLE 4 A solid wire (S) for tungsten inert gas welding with a nominal chemical composition of 28 % Cr, 2 % Al nickel base that is not listed in Table 1 is designated:

ISO 18274 – S Ni Z (NiCr28Al2)

where:

ISO 18274	is the number of this document;
S	is the product form: solid wire electrode, solid wire or solid rod (see 5.1);
Ni Z	indicates the chemical composition is not specified (see Table 1).
NiCr28Al2	is the nominal chemical composition limit as agreed between the manufacturer and the customer (see Table 1).

Annex A
(informative)

System for designation of welding consumables

The system provides for one or two initial alpha designators:

— the first letter representing the type of filler metal;

— the second, the alloy system.

A four-digit numeric designator follows the initial letters.

For a number of alloy welding consumables, the four-digit designator is similar to those assigned by the unified numbering system (UNS). In this way, the welding consumables are frequently related to the base metals with which they are often used (see Annex B).

Annex B
(informative)

Description and uses of welding consumables

B.1 General

The following non-exhaustive details are included to provide an indication of the typical application for which individual classes of consumables are commonly used. More particular information on welding consumable selection, information and techniques to be applied when using consumables depositing nickel-base alloys should be sought from the manufacturer.

B.2 Nickel

Ni 2061 and Ni 2061B

Consumables of this classification are used for welding wrought and cast forms of commercially pure nickel (e.g. UNS N02200 or UNS N02201) and welding the clad side of nickel-clad steel and surfacing of steel for dissimilar metal welding.

B.3 Nickel-copper

Ni 4060, Ni 4061

Consumables of these classifications are used for welding nickel-copper alloys (e.g. UNS N04400) to each other, welding the clad side of nickel-copper alloy-clad steel and surfacing of steel.

Ni 5504

Consumables of this classification are used for welding age-hardening nickel-copper alloy (UNS N05500) to itself using gas tungsten arc welding, gas-shielded metal arc welding, submerged arc welding and plasma arc welding. The weld metal age-hardens on heat treatment.

B.4 Nickel-chromium

Ni 6072

Consumables of this classification are used for gas-shielded metal arc welding and gas tungsten arc welding of 50/50 (mass fraction) nickel-chromium alloy, overlaying steel, cladding nickel-chromium alloy on to nickel-iron-chromium tubing and casting repair. The weld metal is resistant to high-temperature corrosion, including fuel-ash corrosion in atmospheres containing sulfur and vanadium.

Ni 6073

Consumables of this classification are used for overlay cladding of ferrous materials used in high-temperature applications and welding of nickel-chromium-iron alloy having UNS number N06690 to itself and to steels. Welds made with this composition are particularly resistant to high-temperature oxidation, carburization and sulfidation.

Ni 6076

Consumables of this classification are used for welding nickel-chromium-iron alloys (e.g. UNS N06600, N06075) to each other, for the clad side of joints in steel clad with nickel-chromium-iron alloy, for surfacing steel with nickel-chromium-iron weld metal and for joining steel to nickel-base alloys using

gas tungsten arc welding, gas-shielded metal arc welding, submerged arc welding and plasma arc welding.

Ni 6082

Consumables of this classification are used for welding nickel-chromium alloys (e.g. UNS N06075, UNS N07080), nickel-chromium-iron alloys (e.g. UNS N06600, UNS N06601) and nickel-iron-chromium alloys (e.g. UNS N08800 and UNS N08801). They are also used for cladding and for welding dissimilar metal joints. They may be used for welding nickel steels for cryogenic applications.

Ni 6699

Consumables of this classification are used for welding of matching alloy UNS N06699 and other high-temperature materials. The weld metal is in particular characterized by high resistance against metal dusting in chemical or petrochemical applications.

B.5 Nickel-chromium-iron

Ni 6002

Consumables of this classification are used for welding low-carbon nickel-chromium-molybdenum alloys (especially UNS N06002), for welding the clad side in steel clad with low-carbon nickel-chromium-molybdenum alloy and for welding low-carbon nickel-chromium-molybdenum alloys to steel and other nickel-base alloys.

Ni 6025

Consumables of this classification are used for welding nickel-base alloys of similar composition (e.g. UNS N06025, UNS N06603). Welds exhibit resistance to oxidation, carburization and sulfidation and are used at temperatures up to 1 200 °C.

Ni 6030

Consumables of this classification are used for welding nickel-chromium-molybdenum alloy (e.g. UNS N06030) to itself, to steel and to other nickel-base alloys, and for cladding steel with nickel-chromium-molybdenum weld metal using gas tungsten arc welding, gas-shielded metal arc welding and plasma arc welding.

Ni 6043

Consumables of this classification are used for producing corrosion-resistant overlays on low-alloy and stainless steels. They may also be used for welding high-chromium nickel-base alloys (e.g. UNS N06690) and for dissimilar metal joints.

Ni 6045

Consumables of this classification are used for welding nickel-chromium-iron alloy having UNS number N06045 to itself, to steel and to other nickel-base alloys.

Ni 6052

Consumables of this classification are used for welding high-chromium nickel-base alloys (e.g. UNS N06690). They may also be used for producing corrosion-resistant overlays on low-alloy and stainless steels and for dissimilar metal joints.

Ni 6054 and Ni 6054B

Consumables of this classification are used for welding nickel-chromium-iron alloy having UNS number N06690 to itself, to steels and to weld overlay steels. Welds made with this composition are particularly resistant to ductility-dip cracking (DDC) and oxide inclusions.

Ni 6055

Consumables of this classification are used for welding nickel-chromium-iron alloy having UNS number N06690 to itself, to steels and to weld overlay steels. Welds made with this composition are particularly resistant to ductility-dip cracking (DDC) and oxide inclusions.

Ni 6056

Consumables of this classification are used for welding nickel-chromium-iron alloy having UNS number N06690 to itself, to steels and to weld overlay steels in nuclear pressure vessel applications. They also show excellent resistance to primary water stress corrosion cracking in intended service conditions similar to the base metal N06690.

Ni 6062

Consumables of this classification are used for welding nickel-chromium-iron alloy (e.g. UNS N06600) to itself using gas tungsten arc welding, gas-shielded metal arc welding, submerged arc welding and plasma arc welding. The higher niobium content of these consumables is intended to minimize cracking where high welding stresses are encountered, as in thick-section base metal.

Ni 6176

Consumables of this classification are used for welding nickel-chromium-iron alloys (e.g. UNS N06600 and UNS N06601), for the clad side of joints in steel with nickel-chromium-iron alloy and for surfacing steel. They have good dissimilar metal welding capability. They may be used for applications at temperatures up to 980 °C but their weld metal does not exhibit optimum oxidation resistance and strength above 820 °C.

Ni 6601

Consumables of this classification are used for welding nickel-chromium-iron-aluminium alloy (e.g. UNS N06601) to itself and to other high-temperature compositions using gas tungsten arc welding. They are used for severe applications where the exposure temperature can exceed 1 150 °C.

Ni 6693

Consumables of this classification are used for welding nickel-chromium-iron alloy having UNS number N06693 to itself, to steels and to weld overlay steels. Welds made with this composition are particularly resistant to metal dusting in chemical and petrochemical applications. The alloy is resistant to carburization, sulfidation and other high-temperature corrosion forms.

Ni 6701

Consumables of this classification are used for welding matching nickel-chromium-iron alloys to each other and to high-temperature alloys for application temperatures up to 1 200 °C.

Ni 6975

Consumables of this classification are used for welding nickel-chromium-molybdenum alloy (UNS N06975) to itself, to steel and to other nickel-base alloys, and for cladding steel with nickel-chromium-molybdenum weld metal using gas tungsten arc welding, gas-shielded metal arc welding, submerged arc welding and plasma arc welding.

Ni 6985

Consumables of this classification are used for welding nickel-chromium-iron-molybdenum alloys (UNS N06007, UNS N06985) to each other, steel and other nickel-base alloys, and for cladding steel with nickel-chromium-iron-molybdenum weld metal.

Ni 7069

Consumables of this classification are used for cladding steel with nickel-chromium-iron weld metal and for joining steel to nickel-base alloys using gas tungsten arc welding, gas-shielded metal arc welding, submerged arc welding and plasma arc welding. The weld metal age-hardens on heat treatment.

Ni 7092

Consumables of this classification are used for welding nickel-iron-chromium alloys (e.g. UNS N08800) and nickel-chromium-iron alloys (e.g. UNS N06600) and have particular application to dissimilar material welds. They may be used for applications at temperatures up to about 980 °C but their weld metal does not exhibit optimum oxidation resistance and strength above 820 °C.

Ni 7718

Consumables of this classification are used for welding nickel-chromium-niobium-molybdenum alloy (e.g. UNS N07718) to itself using gas tungsten arc welding. The weld metal age-hardens on heat treatment. For specific information concerning age-hardening, consult the manufacturer or the accompanying technical literature.

Ni 8025

Consumables of this classification deposit weld metals of higher chromium content than Ni 8125 or Ni 8065 consumables. They are used for welding copper alloyed chromium-nickel-molybdenum alloys (e.g. UNS N08904) and nickel-iron-chromium molybdenum alloys (e.g. UNS N08825). They may also be used for surfacing of steel.

Ni 8034

Consumables of this classification are used for overlay welding or joining of matching alloy UNS N08034. The weldments exhibit good resistance against corrosion in high oxidizing environment, where high Cr-content in combination with medium-high Mo-content is beneficial (e.g. pulp and paper industry or pickling baskets).

Ni 8065, Ni 8125

Consumables of these classifications are used for welding copper alloyed chromium-nickel-molybdenum alloys (e.g. UNS N08904) and nickel-iron-chromium-molybdenum alloys (e.g. UNS N08825). They may also be used for surfacing of steel; a nickel alloy barrier layer is typically applied prior to weld overlay.

Ni 8827

Consumables of this classification are used for welding matching alloy UNS N08827. The weld metal is especially characterized by its high resistance to pitting and crevice corrosion as well as chloride-induced stress corrosion cracking.

Ni 9946

Consumables of this classification are used for welding nickel-iron-chromium alloy approved by ISO 15156-3 for oil and gas applications (having UNS number N09945 or N09946) to itself, to steels and to weld overlay steels using the gas tungsten arc welding and gas metal arc welding processes. The weld metal will age-harden on heat treatment. The weld metal is resistant to sulfide-induced stress corrosion cracking.

B.6 Nickel-molybdenum

Ni 1001

Consumables of this classification are used for welding nickel-molybdenum alloy UNS N10001.

Ni 1003

Consumables of this classification are used for welding nickel-molybdenum alloy (e.g. UNS N10003) to itself, to steel and to other nickel-base alloys, and for cladding steel with nickel-molybdenum weld metal using gas tungsten arc welding and gas-shielded metal arc welding.

Ni 1004

Consumables of this classification are used for welding dissimilar metal combinations of nickel-base, cobalt-base and iron-base alloys.

Ni 1008, Ni 1009

Consumables of these classification are used for welding 9 % (mass fraction) nickel steel (e.g. UNS K81340) to itself using gas tungsten arc welding, gas-shielded metal arc welding and submerged arc welding.

Ni 1024

Consumables of this classification are used for welding nickel-molybdenum alloy having UNS number N10242 to itself and for cladding steel with nickel-molybdenum weld metal using gas tungsten arc welding and gas metal arc welding processes.

Ni 1062

Consumables of this classification are used for welding nickel-molybdenum alloys (especially UNS N10629), for welding the clad side in steel clad with a nickel-molybdenum alloy and for welding nickel-molybdenum alloys to steel and other nickel-base alloys.

Ni 1066

Consumables of this classification are used for welding nickel-molybdenum alloys (especially UNS N10665), for welding the clad side in steel clad with a nickel-molybdenum alloy and for welding nickel-molybdenum alloys to steel and other nickel-base alloys.

Ni 1067

Consumables of this classification are used for welding nickel-molybdenum alloy (e.g. UNS N10675) to itself, for welding the clad side of joints in steel clad with nickel-molybdenum alloy and for welding nickel-molybdenum alloys to steel and to other nickel-base alloys using gas tungsten arc welding, gas-shielded metal arc welding and plasma arc welding.

Ni 1069

Consumables of this classification are used for welding dissimilar metal combinations of nickel-base, cobalt-base and iron-base alloys.

Ni 1362

Consumables of this classification are used for welding nickel-molybdenum-chromium alloy having UNS number N10362 to itself and for cladding steel using the gas tungsten arc welding and gas metal arc welding processes.

B.7 Nickel-chromium-molybdenum

Ni 6007

Consumables of this classification are used for welding nickel-chromium-molybdenum alloy having UNS number N06007 to itself, to steel and to other nickel-base alloys, and for cladding steel using the gas tungsten arc welding, gas metal arc welding and plasma arc welding processes.

Ni 6012

Consumables of this classification are used for welding high-alloyed austenitic stainless steels of the 6 Mo type. The weldments exhibit very good resistance to pitting and crevice corrosion in chloride-containing environments. The low niobium content improves weldability.

Ni 6022

Consumables of this classification are used for welding low-carbon nickel-chromium-molybdenum alloys (especially UNS N06022) and chromium-nickel-molybdenum austenitic stainless steels, for welding the clad side in steel clad with low-carbon nickel-chromium-molybdenum alloy and for joining low-carbon nickel-chromium-molybdenum alloys to steel and other nickel-base alloys, as well as for surfacing of steel with nickel-chromium-molybdenum alloys.

Ni 6035

Consumables of this classification are used for welding nickel-chromium-molybdenum alloy having UNS number N06035 to itself and for cladding steel with nickel-chromium-molybdenum weld metal.

Ni 6057

Consumables of this classification are used for corrosion-resistant (especially excellent to crevice corrosion) overlaying with gas tungsten arc welding, gas-shielded metal arc and plasma arc welding processes.

Ni 6058

Consumables of this classification are used for welding nickel-chromium-molybdenum alloys (especially UNS N06058) to each other, to steel and to other nickel-base alloys, and for cladding steel with nickel-chromium-molybdenum weld metal.

Ni 6059

Consumables of this classification are used for welding low-carbon nickel-chromium-molybdenum alloys (especially UNS N06059) and chromium-nickel-molybdenum austenitic stainless steels, for welding the clad side in steel clad with low-carbon nickel-chromium-molybdenum alloy and for welding low-carbon nickel-chromium-molybdenum alloys to steel and other nickel-base alloys.

Ni 6200

Consumables of this classification are used for welding the nickel-chromium-molybdenum alloy UNS N06200 to itself, to steel and to other nickel-base alloys, and for cladding steel.

Ni 6205

Consumables of this classification are used for welding nickel-chromium-molybdenum alloys (especially UNS N06058) to each other and welding chromium-nickel-molybdenum austenitic stainless steels to steel and to other nickel-base alloys, and for cladding steel with nickel-chromium-molybdenum weld metals.

Ni 6276

Consumables of this classification are used for welding low-carbon nickel-chromium-molybdenum alloys (especially UNS N10276) for welding the clad side in steel clad with low-carbon nickel-chromium-molybdenum alloy, and for welding low-carbon nickel-chromium-molybdenum alloys to steel and other nickel-base alloys.

Ni 6452, Ni 6455

Consumables of these classifications are used for welding low-carbon nickel-chromium-molybdenum alloys (especially UNS N06455), for welding the clad side in steel clad with low-carbon nickel-chromium-molybdenum alloy and for welding low-carbon nickel-chromium-molybdenum alloys to steel and other nickel-base alloys.

Ni 6625 and Ni 6625B

Consumables of these classifications are used for welding nickel-chromium-molybdenum alloys (especially UNS N06625) to each other and to steel, and for surfacing steel with nickel-chromium-molybdenum alloys. The weld metal is comparable to UNS N06625 for corrosion resistance and high-temperature applications.

Ni 6650

Consumables of this classification are used for welding low-carbon nickel-chromium-molybdenum alloys and chromium-nickel-molybdenum austenitic stainless steels for offshore and chemical industry applications (e.g. UNS N08926). They are also used for cladding and for welding dissimilar metal joints, such as low-carbon nickel-chromium-molybdenum alloys welded to carbon steel or nickel-base alloys. They may also be used for the welding of 9 % nickel steel.

Ni 6660

Consumables of this classification are used for gas-shielded metal arc welding and gas tungsten arc welding of superduplex, superaustenitic and cryogenic 9 % nickel steels and for coating of low-alloyed steels. Compared with Ni 6625, the weld metal shows a good or better corrosion resistance, no hot cracking problem and a good toughness at low temperature for cryogenic applications.

Ni 6686

Consumables of this classification are used for welding low-carbon nickel-chromium-molybdenum alloys (especially UNS N06686) and chromium-nickel-molybdenum austenitic steels, for welding the clad side in steel clad with low-carbon nickel-chromium-molybdenum alloy and for welding low-carbon nickel-chromium-molybdenum alloys to steel and other nickel-base alloys, as well as for surfacing of steel with nickel-chromium-molybdenum-tungsten alloys.

Ni 7725

Consumables of this classification are used for welding high-strength corrosion-resistant nickel alloys (especially UNS N07725 and UNS N09925) to each other and to steel, and for surfacing with high-strength nickel-chromium-molybdenum alloy. Post-weld precipitation hardening is required to develop maximum strength; a variety of heat treatments can be used.

B.8 Nickel-chromium-cobalt

Ni 6160

Consumables of this classification are used for welding the nickel-cobalt-chromium-silicon alloy (UNS N12160) to itself using gas tungsten arc welding, gas-shielded metal arc welding and plasma arc welding. This alloy is sensitive to iron pickup. Alternative consumables are required to weld the base alloy to iron-bearing alloys. The weld metal has excellent resistance to sulfidation and chloride attack in both reducing and oxidizing environments, and can withstand temperatures up to 1 200 °C.

Ni 6617

Consumables of this classification are used for welding low-carbon nickel-chromium-cobalt-molybdenum alloys (especially UNS N06617) to each other and to steel and for surfacing steel. They are also used for joining dissimilar alloys where high-temperature strength and oxidation resistance are required up to about 1 150 °C (e.g. for UNS N08800, UNS N08811, and cast high-nickel alloys).

Ni 7090

Consumables of this classification are used for welding nickel-chromium-cobalt alloys (e.g. UNS N07090) to each other using gas tungsten arc welding. The weld metal age-hardens on heat treatment. For specific information concerning age-hardening, consult the manufacturer or the accompanying technical literature.