BRITISH STANDARD

BS EN ISO
14343:2007

Welding consumables — Wire electrodes, strip electrodes, wires and rods for fusion welding of stainless and heat resisting steels — Classification

The European Standard EN ISO 14343:2007 has the status of a British Standard

ICS 25.160.20

National foreword

This British Standard was published by BSI. It is the UK implementation of EN ISO 14343:2007. It is identical with ISO 14343:2002, incorporating amendment 1, March 2006. It supersedes BS EN 12072:2000 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/39, Welding consumables.

A list of organizations represented on WEE/39 can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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EUROPEAN STANDARD

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English Version

Welding consumables - Wire electrodes, strip electrodes, wires and rods for fusion welding of stainless and heat resisting steels - Classification (ISO 14343:2002 and ISO 14343:2002/Amd1:2006)

Produits consommables pour le soudage - Fils-électrodes, fils d'apport et baguettes d'apport pour le soudage à l'arc des aciers inoxydables et des aciers résistant aux températures élevées - Classification (ISO 14343:2002 et ISO 14343:2002/Amd1:2006)

Schweißzusätze - Drahtelektroden, Bandelektroden, Drähte und Stäbe zum Schmelzschweißen von nichtrostenden und hitzebeständigen Stählen - Einteilung (ISO 14343:2002 und ISO 14343:2002/Amd1:2006)

This European Standard was approved by CEN on 21 January 2007.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN ISO 14343:2007: E

Foreword

The text of ISO 14343:2002 and ISO 14343:2002/Amd1:2006 have been prepared by Technical Committee IIW "International Institute of Welding" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 14343:2007 by Technical Committee CEN/TC 121 "Welding" 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 August 2007, and conflicting national standards shall be withdrawn at the latest by August 2007.

This document supersedes EN 12072:1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Endorsement notice

The text of ISO 14343:2002 and ISO 14343:2002/Amd1:2006 have been approved by CEN as a EN ISO 14343:2007 without any modifications.

INTERNATIONAL STANDARD

ISO 14343

First edition
2002-02-15

Welding consumables — Wire electrodes, wires and rods for arc welding of stainless and heat resisting steels — Classification

Produits consommables pour le soudage — Fils-électrodes, fils d'apport et baguettes d'apport pour le soudage à l'arc des aciers inoxydables et des aciers résistant aux températures élevées — Classification

Reference number
ISO 14343:2002(E)

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.

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 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 14343 was prepared in collaboration with the International Institute of Welding which has been approved by the ISO Council as an international standardizing body in the field of welding.

Annex A of this International Standard is for information only.

Introduction

It is recognized that there are two somewhat different approaches in the global market to classifying a given stainless steel welding consumable, and that market allows for either or both to be used, to suit a particular market need. One is termed the “Nominal Composition” approach, which uses designators that indicate the principal alloying elements at their nominal levels, in a particular sequence, sometimes followed by chemical element symbols to indicate compositional modifications to the original grade. The other is termed the “Alloy Type” approach, which uses tradition-based three or four digit designations for certain original grades, sometimes followed by one or more chemical element symbols which indicate compositional modifications from the original. In both approaches, classification is based upon the chemical composition of the product. In many cases a given product can be classified using both approaches, because the composition ranges, although slightly different, overlap to a considerable extent, in the two approaches.

Application of either type of classification designation (or both where suitable) identifies a product as classified according to this International Standard. Many, but not all, commercial products addressed by this International Standard can be classified using both approaches, and suitable products may be so marked. The classification according to system A is mainly based on EN 12072. The classification according to system B is mainly based upon standards used around the Pacific Rim.

For stainless steel welding consumables, there is no unique relationship between the product form (wire electrode, wire or rod) and the welding process used (gas-shielded metal arc welding, gas tungsten arc welding, plasma arc welding or submerged arc welding). For this reason, the wire electrodes, wires or rods 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.

Welding consumables — Wire electrodes, wires and rods for arc welding of stainless and heat resisting steels — Classification

1 Scope

This International Standard specifies requirements for classification of wire electrodes, wires and rods for gas-shielded metal arc welding, gas tungsten arc welding, plasma arc welding, submerged arc welding and laser beam welding of stainless and heat resisting steels. The classification of the wire electrodes, wires and rods is based upon their chemical composition.

This document is a combined standard providing for classification utilizing a system based upon classification according to nominal composition or utilizing a system based upon classification according to alloy type.

a) Paragraphs and table entries which carry the label “classification according to nominal composition”, or which are identified by “ISO 14343-A”, are applicable only to products classified to that system.

b) Paragraphs and table entries which carry the label “classification according to alloy type”, or which are identified by “ISO 14343-B”, are applicable only to products classified to that system.

c) Paragraphs and table entries which carry neither label are applicable to products classified according to either or both systems.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

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

ISO 864, *Arc welding — Solid and tubular cored wires which deposit carbon and carbon manganese steel — Dimensions of wires, spools, rims and coils*

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

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
rod
form of welding filler metal, normally packaged in straight lengths, that does not conduct the welding current, for gas tungsten arc and plasma arc welding

3.2
wire
form of welding filler metal, normally packaged as coils, spools or drums, that does not conduct the welding current, for gas tungsten arc, plasma arc welding and laser beam welding

3.3
wire electrode
form of welding filler metal, normally packaged as coils, spools or drums, that becomes part of the welding circuit through which electrical current is conducted, and that terminates at the arc, for gas-shielded metal arc and submerged arc welding

4 Classification

A wire electrode, wire or rod shall be classified according to its chemical composition as listed in Table 1. The classification is divided into two parts.

a) The first part gives a symbol indicating the product/process to be identified.

b) The second part gives a symbol indicating the chemical composition of the wire electrode, wire or rod.

4.1 Symbol for the product/process

ISO 14343-A — Classification according to nominal composition

The symbol for the wire electrode, wire or rod used in the arc welding process is the letter G (gas-shielded metal arc welding), W (gas tungsten arc welding), P (plasma arc welding), S (submerged arc welding) or L (laser beam welding) placed at the beginning of the designation.

ISO 14343-B — Classification according to alloy type

No symbol is used to indicate the welding process. The symbol for solid stainless and heat resisting steel wires for use in all welding processes shall be the letters “SS”. The initial “S” indicates solid wire as distinguished from covered electrodes or from tubular cored wires. The second “S” indicates that the alloy system is stainless or heat resisting steel.

4.2 Symbol for the chemical composition

The symbol in Table 1 indicates the chemical composition of the wire electrode, wire or rod determined under conditions given in clause 6.

5 Properties of the all-weld metal

Properties of the all-weld metal are not part of the classification.

NOTE 1 The influence of the shielding gas or flux on the chemical composition of the all-weld metal has to be considered. Differences between the chemical composition of the all-weld metal and the wire electrode, wire or rod may occur.

NOTE 2 Proof and tensile strength of the weld metal made by a consumable listed in Table 1 is expected to comply with the minimum requirements in annex A. Elongation and impact properties of the weld metal may deviate from the minimum values specified for the corresponding parent metal as a result of variations in the microstructure.

NOTE 3 Table A.1 lists expected minimum tensile properties of weld metal.

6 Chemical analysis

Chemical analysis shall be performed on specimens of the product. Any analytical technique may be used, but in case of dispute reference shall be made to established published methods.

7 Technical delivery conditions

Technical delivery conditions shall meet the requirements of ISO 544, ISO 864 and ISO 14344.

8 Examples of designation

a) A wire electrode for gas-shielded metal arc welding, also applicable to submerged arc welding, has a chemical composition within the limits for the alloy symbol 20 10 3 and within the limits for the alloy symbol 308Mo of Table 1.

The designation will be:

Classification according to nominal composition	**Classification according to alloy type**
ISO 14343-A - G 20 10 3 and/or S 20 10 3	ISO 14343-B - SS308Mo

b) A rod for gas tungsten arc welding has a chemical composition within the limits for the alloy symbol 20 10 3 and within the limits for the alloy symbol 308Mo of Table 1.

The designation will be:

Classification according to nominal composition	**Classification according to alloy type**
ISO 14343-A - W 20 10 3	ISO 14343-B - SS308Mo

c) A wire electrode for gas-shielded metal arc welding has a chemical composition within the limits for the alloy symbol 19 12 3 L Si and within the limits for alloy symbol 316LSi of Table 1.

The designation will be:

Classification according to nominal composition	**Classification according to alloy type**
ISO 14343-A - G 19 12 3 L Si	ISO 14343-B - SS316LSi

Where, in all three examples,

Classification according to nominal composition	**Classification according to alloy type**
ISO 14343-A = International Standard number, with classification according to the system A	ISO 14343-B = International Standard number, with classification according to the system B
G, S, W = product/process symbol (see 4.1)	SS = product/process symbol (see 4.1)
20 10 3, 19 12 3 L Si = chemical composition of product (see Table 1).	308Mo, 316LSi = chemical composition of product (see Table 1).

Table 1 — Chemical composition requirements

Alloy designation [a] for classification according to		Chemical composition, % (m/m) [b, c]											
Nominal composition [d] ISO 14343-A	Alloy Type ISO 14343-B	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Nb [e]	Other
Martensitic/ferritic types													
	409	0,08	0,8	0,8	0,03	0,03	10,5 to 13,5	0,6	0,50	—	0,75	—	Ti 10 × C to 1,5
	409Nb	0,12	0,5	0,6	0,03	0,03	10,5 to 13,5	0,6	0,75		0,75	8 × C to 1,0	
13	(410)	0,15	1,0	1,0	0,03	0,02	12,0 to 15,0	0,3	0,3	—	0,3	—	—
(13)	410	0,12	0,5	0,6	0,03	0,03	11,5 to 13,5	0,6	0,75	—	0,75	—	—
13 L		0,05	1,0	1,0	0,03	0,02	12,0 to 15,0	0,3	0,3	—	0,3	—	—
13 4	(410NiMo)	0,05	1,0	1,0	0,03	0,02	11,0 to 14,0	3,0 to 5,0	0,4 to 1,0	—	0,3	—	—
(13 4)	410NiMo	0,06	0,5	0,6	0,03	0,03	11,0 to 12,5	4,0 to 5,0	0,4 to 0,7	—	0,75	—	—
	420	0,25 to 0,40	0,5	0,6	0,03	0,03	12,0 to 14,0	0,75	0,75	—	0,75	—	—
17	(430)	0,12	1,0	1,0	0,03	0,02	16,0 to 19,0	0,3	0,3	—	0,3	—	—
(17)	430	0,10	0,5	0,6	0,03	0,03	15,5 to 17,0	0,6	0,75	—	0,75	—	—
	430Nb	0,10	0,5	0,6	0,03	0,03	15,5 to 17,0	0,6	0,75	—	0,75	8 × C to 1,2	—
18LNb	430LNb	0,02	0,5	0,8	0,03	0,02	17,8 to 18,8	0,3	0,3	0,02	0,3	0,05 + 7(C+N) up to 0,5	—
Austenitic types													
	308	0,08	0,65	1,0 to 2,5	0,03	0,03	19,5 to 22,0	9,0 to 11,0	0,75	—	0,75	—	—
	308Si	0,08	0,65 to 1,00	1,0 to 2,5	0,03	0,03	19,5 to 22,0	9,0 to 11,0	0,75	—	0,75	—	—
19 9 L	(308L)	0,03	0,65	1,0 to 2,5	0,03	0,02	19,0 to 21,0	9,0 to 11,0	0,3	—	0,3	—	—
(19 9 L)	308L	0,03	0,65	1,0 to 2,5	0,03	0,03	19,5 to 22,0	9,0 to 11,0	0,75	—	0,75	—	—
19 9 L Si	(308LSi)	0,03	0,65 to 1,2	1,0 to 2,5	0,03	0,02	19,0 to 21,0	9,0 to 11,0	0,3	—	0,3	—	—
(19 9 L Si)	308LSi	0,03	0,65 to 1,00	1,0 to 2,5	0,03	0,03	19,5 to 22,0	9,0 to 11,0	0,75	—	0,75	—	—
19 9 Nb	(347)	0,08	0,65	1,0 to 2,5	0,03	0,02	19,0 to 21,0	9,0 to 11,0	0,3	—	0,3	10 × C to 1,0	—
(19 9 Nb)	347	0,08	0,65	1,0 to 2,5	0,03	0,03	19,0 to 21,5	9,0 to 11,0	0,75	—	0,75	10 × C to 1,0	—
19 9 Nb Si	(347Si)	0,08	0,65 to 1,2	1,0 to 2,5	0,03	0,02	19,0 to 21,0	9,0 to 11,0	0,3	—	0,3	10 × C to 1,0	—
(19 9 Nb Si)	347Si	0,08	0,65 to 1,00	1,0 to 2,5	0,03	0,03	19,0 to 21,5	9,0 to 11,0	0,75	—	0,75	10 × C to 1,0	—
	347L	0,03	0,65	1,0 to 2,5	0,03	0,03	19,0 to 21,5	9,0 to 11,0	0,75	—	0,75	10 × C to 1,0	—
	316	0,08	0,65	1,0 to 2,5	0,03	0,03	18,0 to 20,0	11,0 to 14,0	2,0 to 3,0	—	0,75	—	—

Table 1 (*continued*)

Alloy designation [a] for classification according to		Chemical composition, % (m/m) [b, c]											
Nominal composition [d] ISO 14343-A	Alloy Type ISO 14343-B	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Nb [e]	Other
	316Si	0,08	0,65 to 1,00	1,0 to 2,5	0,03	0,03	18,0 to 20,0	11,0 to 14,0	2,0 to 3,0	—	0,75	—	—
19 12 3 L	(316L)	0,03	0,65	1,0 to 2,5	0,03	0,02	18,0 to 20,0	11,0 to 14,0	2,5 to 3,0	—	0,3	—	—
(19 12 3 L)	316L	0,03	0,65	1,0 to 2,5	0,03	0,03	18,0 to 20,0	11,0 to 14,0	2,0 to 3,0	—	0,75	—	—
19 12 3 L Si	(316LSi)	0,03	0,65 to 1,2	1,0 to 2,5	0,03	0,02	18,0 to 20,0	11,0 to 14,0	2,5 to 3,0	—	0,3	—	—
(19 12 3 L Si)	316LSi	0,03	0,65 to 1,00	1,0 to 2,5	0,03	0,03	18,0 to 20,0	11,0 to 14,0	2,0 to 3,0	—	0,75	—	—
	316LCu	0,03	0,65	1,0 to 2,5	0,03	0,03	18,0 to 20,0	11,0 to 14,0	2,0 to 3,0	—	1,0 to 2,5	—	—
19 12 3 Nb	(318)	0,08	0,65	1,0 to 2,5	0,03	0,02	18,0 to 20,0	11,0 to 14,0	2,5 to 3,0	—	0,3	10 × C to 1,0	—
(19 12 3 Nb)	318	0,08	0,65	1,0 to 2,5	0,03	0,03	18,0 to 20,0	11,0 to 14,0	2,0 to 3,0	—	0,75	8 × C to 1,0	—
	318L	0,03	0,65	1,0 to 2,5	0,03	0,03	18,0 to 20,0	11,0 to 14,0	2,0 to 3,0	—	0,75	8 × C to 1,0	—
19 12 3 Nb Si		0,08	0,65 to 1,2	1,0 to 2,5	0,03	0,02	18,0 to 20,0	11,0 to 14,0	2,5 to 3,0	—	0,3	10 × C to 1,0	—
	317	0,08	0,65	1,0 to 2,5	0,03	0,03	18,5 to 20,5	13,0 to 15,0	3,0 to 4,0	—	0,75	—	—
(18 15 3 L)	317L	0,03	0,65	1,0 to 2,5	0,03	0,03	18,5 to 20,5	13,0 to 15,0	3,0 to 4,0	—	0,75	—	—
	321	0,08	0,65	1,0 to 2,5	0,03	0,03	18,5 to 20,5	9,0 to 10,5	0,75	—	0,75	—	Ti 9 × C to 1,0
Ferritic-austenitic types, sometimes referred to as austenitic-ferritic types													
22 9 3 N L	(2209)	0,03	1,0	2,5	0,03	0,02	21,0 to 24,0	7,0 to 10,0	2,5 to 4,0	0,10 to 0,20	0,3	—	—
(22 9 3 N L)	2209	0,03	0,90	0,5 to 2,0	0,03	0,03	21,5 to 23,5	7,5 to 9,5	2,5 to 3,5	0,08 to 0,20	0,75	—	—
25 7 2 L		0,03	1,0	2,5	0,03	0,02	24,0 to 27,0	6,0 to 8,0	1,5 to 2,5	—	0,3	—	—
25 9 3 Cu N L		0,03	1,0	2,5	0,03	0,02	24,0 to 27,0	8,0 to 11,0	2,5 to 4,0	0,10 to 0,20	1,5 to 2,5	—	—
25 9 4 N L		0,03	1,0	2,5	0,03	0,02	24,0 to 27,0	8,0 to 10,5	2,5 to 4,5	0,20 to 0,30	1,5	—	W 1,0
Fully austenitic types [f]													
18 15 3 L [f]	(317L) [f]	0,03	1,0	1,0 to 4,0	0,03	0,02	17,0 to 20,0	13,0 to 16,0	2,5 to 4,0	—	0,3	—	—
18 16 5 N L [f]		0,03	1,0	1,0 to 4,0	0,03	0,02	17,0 to 20,0	16,0 to 19,0	3,5 to 5,0	0,10 to 0,20	0,3	—	—
19 13 4 L [f]	(317L) [f]	0,03	1,0	1,0 to 5,0	0,03	0,02	17,0 to 20,0	12,0 to 15,0	3,0 to 4,5	—	0,3	—	—
19 13 4 N L [f]		0,03	1,0	1,0 to 5,0	0,03	0,02	17,0 to 20,0	12,0 to 15,0	3,0 to 4,5	0,10 to 0,20	0,3	—	—
20 25 5 Cu L [f]	(385) [f]	0,03	1,0	1,0 to 4,0	0,03	0,02	19,0 to 22,0	24,0 to 27,0	4,0 to 6,0	—	1,0 to 2,0	—	—
(20 25 5 Cu L) [f]	385 [f]	0,025	0,50	1,0 to 2,5	0,02	0,03	19,5 to 21,5	24,0 to 26,0	4,2 to 5,2	—	1,2 to 2,0	—	—
20 25 5 Cu N L [f]		0,03	1,0	1,0 to 4,0	0,03	0,02	19,0 to 22,0	24,0 to 27,0	4,0 to 6,0	0,10 to 0,20	1,0 to 2,0	—	—

Table 1 (*continued*)

Alloy designation [a] for classification according to		Chemical composition, % (m/m) [b, c]											
Nominal composition [d] ISO 14343-A	Alloy Type ISO 14343-B	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Nb [e]	Other
20 16 3 Mn L [f]		0,03	1,0	5,0 to 9,0	0,03	0,02	19,0 to 22,0	15,0 to 18,0	2,5 to 4,5	—	0,3	—	—
20 16 3 Mn N L [f]		0,03	1,0	5,0 to 9,0	0,03	0,02	19,0 to 22,0	15,0 to 18,0	2,5 to 4,5	0,10 to 0,20	0,3	—	—
25 22 2 N L [f]		0,03	1,0	3,5 to 6,5	0,03	0,02	24,0 to 27,0	21,0 to 24,0	1,5 to 3,0	0,10 to 0,20	0,3	—	—
27 31 4 Cu L [f]	(383) [f]	0,03	1,0	1,0 to 3,0	0,03	0,02	26,0 to 29,0	30,0 to 33,0	3,0 to 4,5	—	0,7 to 1,5	—	—
(27 31 4 Cu L) [f]	383 [f]	0,025	0,50	1,0 to 2,5	0,02	0,03	26,5 to 28,5	30,0 to 33,0	3,2 to 4,2	—	0,7 to 1,5	—	—
	320 [f]	0,07	0,60	2,5	0,03	0,03	19,0 to 21,0	32,0 to 36,0	2,0 to 3,0	—	3,0 to 4,0	8 × C to 1,0	—
	320LR [f]	0,025	0,15	1,5 to 2,0	0,015	0,02	19,0 to 21,0	32,0 to 36,0	2,0 to 3,0	—	3,0 to 4,0	8 × C to 0,40	
Special types — Often used for dissimilar metal joining													
	307 [f]	0,04 to 0,14	0,65	3,3 to 4,8	0,03	0,03	19,5 to 22,0	8,0 to 10,7	0,5 to 1,5	—	0,75	—	—
18 8 Mn [f]		0,20	1,2	5,0 to 8,0	0,03	0,03	17,0 to 20,0	7,0 to 10,0	0,3	—	0,3	—	—
20 10 3	(308Mo)	0,12	1,0	1,0 to 2,5	0,03	0,02	18,0 to 21,0	8,0 to 12,0	1,5 to 3,5	—	0,3	—	—
(20 10 3)	308Mo	0,08	0,65	1,0 to 2,5	0,03	0,03	18,0 to 21,0	9,0 to 12,0	2,0 to 3,0	—	0,75	—	—
	308LMo	0,03	0,65	1,0 to 2,5	0,03	0,03	18,0 to 21,0	9,0 to 12,0	2,0 to 3,0	—	0,75	—	—
23 12 L	(309L)	0,03	0,65	1,0 to 2,5	0,03	0,02	22,0 to 25,0	11,0 to 14,0	0,3	—	0,3	—	—
(23 12 L)	309L	0,03	0,65	1,0 to 2,5	0,03	0,03	23,0 to 25,0	12,0 to 14,0	0,75	—	0,75	—	—
23 12 L Si	(309LSi)	0,03	0,65 to 1,2	1,0 to 2,5	0,03	0,02	22,0 to 25,0	11,0 to 14,0	0,3	—	0,3	—	—
(23 12 L Si)	309LSi	0,03	0,65 to 1,00	1,0 to 2,5	0,03	0,03	23,0 to 25,0	12,0 to 14,0	0,75	—	0,75	—	—
23 12 Nb		0,08	1,0	1,0 to 2,5	0,03	0,02	22,0 to 25,0	11,0 to 14,0	0,3	—	0,3	10 × C to 1,0	—
	309LNb	0,03	0,65	1,0 to 2,5	0,03	0,03	23,0 to 25,0	12,0 to 14,0	0,75	—	0,75	10 × C to 1,0	—
	309Mo	0,12	0,65	1,0 to 2,5	0,03	0,03	23,0 to 25,0	12,0 to 14,0	2,0 to 3,0	—	0,75	—	—
23 12 2 L	(309LMo)	0,03	1,0	1,0 to 2,5	0,03	0,02	21,0 to 25,0	11,0 to 15,5	2,0 to 3,5	—	0,3	—	—
(23 12 2 L)	309LMo	0,03	0,65	1,0 to 2,5	0,03	0,03	23,0 to 25,0	12,0 to 14,0	2,0 to 3,0	—	0,75	—	—
29 9	(312)	0,15	1,0	1,0 to 2,5	0,03	0,02	28,0 to 32,0	8,0 to 12,0	0,3	—	0,3	—	—
(29 9)	312	0,15	0,65	1,0 to 2,5	0,03	0,03	28,0 to 32,0	8,0 to 10,5	0,75	—	0,75	—	—
Heat resisting types													
16 8 2	(16-8-2)	0,10	1,0	1,0 to 2,5	0,03	0,02	14,5 to 16,5	7,5 to 9,5	1,0 to 2,5	—	0,3	—	—
(16 8 2)	16-8-2	0,10	0,65	1,0 to 2,5	0,03	0,03	14,5 to 16,5	7,5 to 9,5	1,0 to 2,0	—	0,75	—	—
19 9 H	(19-10H)	0,04 to 0,08	1,0	1,0 to 2,5	0,03	0,02	18,0 to 21,0	9,0 to 11,0	0,3	—	0,3	—	—

Table 1 (*continued*)

Alloy designation [a] for classification according to		Chemical composition, % (m/m) [b, c]											
Nominal composition [d] ISO 14343-A	Alloy Type ISO 14343-B	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Nb [e]	Other
(19 9 H)	19-10H	0,04 to 0,08	0,65	1,0 to 2,0	0,03	0,03	18,5 to 20,0	9,0 to 11,0	0,25	—	0,75	0,05	Ti 0,05
(19 9 H)	308H	0,04 to 0,08	0,65	1,0 to 2,5	0,03	0,03	19,5 to 22,0	9,0 to 11,0	0,50	—	0,75	—	—
19 12 3 H	(316H)	0,04 to 0,08	1,0	1,0 to 2,5	0,03	0,02	18,0 to 20,0	11,0 to 14,0	2,0 to 3,0	—	0,3	—	—
(19 12 3 H)	316H	0,04 to 0,08	0,65	1,0 to 2,5	0,03	0,03	18,0 to 20,0	11,0 to 14,0	2,0 to 3,0	—	0,75	—	—
22 12 H	(309)	0,04 to 0,15	2,0	1,0 to 2,5	0,03	0,02	21,0 to 24,0	11,0 to 14,0	0,3	—	0,3	—	—
(22 12 H)	309	0,12	0,65	1,0 to 2,5	0,03	0,03	23,0 to 25,0	12,0 to 14,0	0,75	—	0,75	—	—
	309Si	0,12	0,65 to 1,00	1,0 to 2,5	0,03	0,03	23,0 to 25,0	12,0 to 14,0	0,75	—	0,75	—	—
25 4		0,15	2,0	1,0 to 2,5	0,03	0,02	24,0 to 27,0	4,0 to 6,0	0,3	—	0,3	—	—
25 20 [f]	(310) [f]	0,08 to 0,15	2,0	1,0 to 2,5	0,03	0,02	24,0 to 27,0	18,0 to 22,0	0,3	—	0,3	—	—
(25 20) [f]	310 [f]	0,08 to 0,15	0,65	1,0 to 2,5	0,03	0,03	25,0 to 28,0	20,0 to 22,5	0,75	—	0,75	—	—
	310S [f]	0,08	0,65	1,0 to 2,5	0,03	0,03	25,0 to 28,0	20,0 to 22,5	0,75	—	0,75	—	—
	310L [f]	0,03	0,65	1,0 to 2,5	0,03	0,03	25,0 to 28,0	20,0 to 22,5	0,75	—	0,75	—	—
25 20 H [f]		0,35 to 0,45	2,0	1,0 to 2,5	0,03	0,02	24,0 to 27,0	18,0 to 22,0	0,3	—	0,3	—	—
25 20 Mn [f]		0,08 to 0,15	2,0	2,5 to 5,0	0,03	0,02	24,0 to 27,0	18,0 to 22,0	0,3	—	0,3	—	—
18 36 H [f]	(330)	0,18 to 0,25	0,4 to 2,0	1,0 to 2,5	0,03	0,02	15,0 to 19,0	33,0 to 37,0	0,3	—	0,3	—	—
(18 36 H) [f]	330	0,18 to 0,25	0,65	1,0 to 2,5	0,03	0,03	15,0 to 17,0	34,0 to 37,0	0,75	—	0,75	—	—
Precipitation hardening type													
	630	0,05	0,75	0,25 to 0,75	0,03	0,03	16,00 to 16,75	4,5 to 5,0	0,75	—	3,25 to 4,00	0,15 to 0,30	—

a A designation in parentheses, e.g., (308L) or (19 9 L) indicates a near match in the other designation system, but not an exact match. The correct designation for a given composition range is the one not in parentheses. A given product may, by having a more restricted chemical composition which fulfills both sets of designation requirements, be assigned both designations independently.

b Single values shown in the table are maximum values. Two values shown indicate minimum and maximum limits for a range.

c The results shall be rounded to the same number of significant figures as in the specified value using the rules in according with annex B, Rule A of ISO 31-0:1992.

d Wire electrodes not listed in the table shall be symbolized similarly and prefixed by the letter Z.

e Up to 20% of the amount of Nb can be replaced by Ta.

f The all-weld metal is in most cases fully austenitic and therefore can be susceptible to microfissuring or hot cracking. The occurrence of fissuring/cracking is reduced by increasing the weld metal manganese level and in recognition of this the manganese range is extended for a number of grades.

Annex A
(informative)

Expected minimum tensile properties of all-weld metal

Table A.1 — Expected minimum tensile properties of all-weld metal

Alloy symbol		Mechanical property			Postweld heat treatment
Classification according to nominal composition ISO 14343-A	Classification according to alloy type ISO 14343-B	Proof strength $R_{p0,2}$ N/mm^2	Tensile strength R_m N/mm^2	Elongation [a] %	
	409	180	380	14	none
	409Nb	250	450	15	b
13 [c]	410 [b]	250	450	15	c or b
13 L		250	450	15	c
13 4	410NiMo	500	750	15	d
	420	250	450	15	c
17	430	300	450	15	e
	430Nb	250	450	15	e
18LNb	430LNb	220	410	15	none
	308	350	550	30	none
	308Si	350	550	30	none
19 9 L	308L	320	510	30	none
19 9 L Si	308LSi	320	510	30	none
19 9 Nb	347	350	550	25	none
19 9 Nb Si	347Si	350	550	25	none
	347L	320	510	25	none
	316	320	510	25	none
	316Si	320	510	25	none
19 12 3 L	316L	320	510	25	none
19 12 3 L Si	316LSi	320	510	25	none
	316LCu	320	510	25	none
19 12 3 Nb	318	350	550	25	none
	318L	320	510	25	none
19 12 3 Nb Si		350	550	25	none
	317	350	550	25	none
18 15 3 L	317L	300	480	25	none
	321	350	550	25	none
22 9 3 N L	2209	450	550	20	none
25 7 2 L		500	700	15	none
25 9 3 Cu N L		550	620	18	none
25 9 4 N L		550	620	18	none

Table A.1 (*continued*)

Alloy symbol		Mechanical property			Postweld heat treatment
Classification according to nominal composition ISO 14343-A	Classification according to alloy type ISO 14343-B	Proof strength $R_{p0,2}$ N/mm^2	Tensile strength R_m N/mm^2	Elongation [a] %	
18 15 3 L		300	480	25	none
18 16 5 N L		300	480	25	none
19 13 4 L		350	550	25	none
19 13 4 N L		350	550	25	none
20 25 5 Cu L	385	320	510	25	none
20 25 5 Cu N L		320	510	25	none
20 16 3 Mn L		320	510	25	none
20 16 3 Mn N L		320	510	25	none
25 22 2 N L		320	510	25	none
27 31 4 Cu L	383	240	500	25	none
	320	320	550	25	none
	320LR	300	520	25	none
	307	350	590	25	none
18 8 Mn		350	500	25	none
20 10 3	308Mo	400	620	20	none
	308LMo	320	510	30	none
23 12 L	309L	320	510	25	none
23 12 L Si	309LSi	320	510	25	none
23 12 Nb		350	550	25	none
	309LNb	320	510	25	none
	309Mo	350	550	25	none
23 12 2 L	309LMo	350	550	25	none
29 9	312	450	650	15	none
16 8 2	16-8-2	320	510	25	none
19 9 H	19-10H	350	550	30	none
	308H	350	550	30	none
19 12 3 H	316H	350	550	25	none
22 12 H	309	350	550	25	none
	309Si	350	550	25	none
25 4		450	650	15	none
25 20	310	350	550	20	none
	310S	350	550	20	none
	310L	320	510	20	none
25 20 Mn		350	550	20	none
25 20 H		350	550	10 [f]	none
18 36 H	330	350	550	10 [f]	none
	630	725	930	5	g

[a] Gauge length is equal to five times the specimen diameter.

[b] 730 °C /760 °C for 1 h, furnace cooling down to 600 °C, then air cooling.

[c] 840 °C /870 °C for 2 h, furnace cooling down to 600 °C, then air cooling.

[d] 580 °C /620 °C for 2 h, air cooling.

[e] 760 °C /790 °C for 2 h, furnace cooling down to 600 °C, then air cooling.

[f] These wire electrodes deposit high carbon weld metal for service at high temperatures. Room temperature elongation has little relevance to such applications.

NOTE Weld metal may have elongation lower than that of the parent metal.

[g] 1 025 °C /1 050 °C for 1 h, air cool to ambient, then 610 °C /630 °C for 4 h, air cool.

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