INTERNATIONAL STANDARD

ISO 14343

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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

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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	—	—