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

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

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Foreword

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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).

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This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 3, *Welding consumables*.

This third edition cancels and replaces the second edition (ISO 14343:2009), which has been technically revised and contains the following changes:

— a number of new alloy designations have been added to Table 1 and Table A.1;

— the chemistries of some alloy designations have been revised in Table 1;

— the mechanical properties of some alloy designations have been revised in Table A.1;

— Clause 7 has been updated to new text for all new and revised standards;

— examples for Z designations have been added to Clause 10.

Requests for official interpretations of any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 3 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Introduction

This document provides a classification system for wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat resisting steels. It recognizes that there are two somewhat different approaches in the global market to classifying a given welding consumable, and allows for either or both to be used, to suit a particular market need. Many, but not all, commercial products addressed by this document can be classified using both approaches, and suitable products can also be marked.

System A uses the *nominal composition* approach with designators to indicate the principal alloying elements at their nominal levels, in a particular sequence, and which is sometimes followed by chemical element symbols to indicate compositional modifications to the original grade. System B uses the *alloy type* approach with three- or four-digit designations for certain grades, sometimes followed by one or more chemical element symbols indicating compositional modifications of the grade. 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 between the two.

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

Classification according to system A, by nominal composition, is based mainly on EN 12072[1], while that of system B, by alloy type, is mainly based upon standards used around the Pacific Rim.

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

1 Scope

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

This document is a combined specification providing for classification utilizing a system based upon nominal composition (system A), or utilizing a system based upon alloy type (system B).

a) Paragraphs which carry the label "classification according to nominal composition" and the suffix letter "A", or "ISO 14343-A", are applicable only to products classified according to system A;

b) Paragraphs which carry the label "classification according to alloy type" and the suffix letter "B", or "ISO 14343-B", are applicable only to products classified according to system B.

c) Paragraphs which carry neither label nor suffix letter are applicable to products that can be classified according to either system A or B or both.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 80000-1:2009, *Quantities and units — Part 1: General.* Corrected by ISO 80000-1:2009/Cor 1:2011

3 Terms and definitions

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

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

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

3.2
strip electrode
form of welding filler metal, normally packaged as coils, having a rectangular cross-section of width much greater than thickness, that becomes part of the welding circuit through which current is conducted, and that terminates at the arc for submerged arc welding, or at the slag bath for electroslag welding

3.3
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

3.4
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, used in gas-shielded metal arc and submerged arc welding

4 Classification

4.1 General

A wire electrode, strip electrode, wire or rod shall be classified according to its chemical composition as given in Table 1.

The classification is divided into two parts:

a) the first gives a symbol indicating the product/process to be identified;

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

4.2 Symbols for products/processes

4.2A Classification according to nominal composition

The symbol for the wire electrode, strip electrode, wire or rod used in the arc welding process shall be the letter

— "G" for gas metal arc welding,

— "W" for gas tungsten arc welding,

— "P" for plasma arc welding,

— "S" for submerged arc welding,

— "B" for submerged arc welding or electroslag welding with strip electrode, or

— "L" for laser beam welding, placed at the beginning of the designation.

See Clause 10 for designation examples.

4.2B Classification according to alloy type

No symbol is used to indicate the welding process.

The symbol for solid stainless and heat-resisting steel wire electrodes, wires and rods 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 or tubular cored rods.

The symbol for strip electrodes for use in submerged arc welding or electroslag welding shall be the letters "BS". The "B" indicates a strip electrode, while the second "S" in "SS" and the "S" in "BS" indicates that the alloy system is stainless or heat-resisting steel.

See Clause 10 for designation examples.

4.3 Symbols for chemical composition

The symbols presented in Table 1 indicate the chemical composition of the wire electrode, strip electrode, wire or rod determined using the analysis specified in Clause 6.

Table 1 — Chemical composition requirements

Alloy designation[a] according to		Chemical composition, % by mass[b]											
Nominal composition[c] ISO 14343-A	Alloy type ISO 14343-B[c]	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Nb[d]	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	0,08	1,0	0,8	0,04	0,03	10,5 to 13,5	0,6	0,50	—	0,75	10 × C to 0,75	—
13	(410)	0,15	1,0	1,0	0,03	0,02	12,0 to 15,0	0,5	0,5	—	0,5	—	—
(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	0,5	0,5	—	0,5	—	—
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	—	0,5	—	—
(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	0,6	0,75	—	0,75	—	—
16 5 1	—	0,04	0,2 to 0,7	1,2 to 3,5	0,02	0,01	15,0 to 17,0	4,5 to 6,5	0,9 to 1,5	—	0,5	—	—
17	(430)	0,12	1,0	1,0	0,03	0,02	16,0 to 19,0	0,5	0,5	—	0,5	—	—
(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	—
(18 L Nb)	430LNb	0,03	0,5	0,6	0,03	0,03	15,5 to 17,0	0,6	0,75	—	0,75	8 × C to 1,2	—
18 L Nb	(430LNb)	0,03	0,5	0,8	0,03	0,02	17,8 to 18,8	0,5	0,5	0,02	0,5	0,05 + 7(C+N) to 0,6	—
18 L Nb Si	—	0,03	0,5 to 1,5	1,0	0,03	0,03	17,5 to 19,5	0,5	0,5	0,02	0,5	0,05 + 7(C+N) to 0,6	—
18 L Nb Ti	—	0,03	1,5	1,0	0,03	0,03	17,5 to 19,5	0,5	0,5	0,02	0,5	8 × C to 0,8	Ti 10 × C to 0,5

Table 1 *(continued)*

Alloy designation[a] according to		Chemical composition, % by mass[b]											
Nominal composition[c] ISO 14343-A	Alloy type ISO 14343-B[c]	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Nb[d]	Other
—	439	0,04	0,8	0,8	0,03	0,03	17,0 to 19,0	0,6	0,5	—	0,75	—	Ti 10 × C to 1,1
—	446LMo	0,015	0,4	0,4	**0,02**	0,02	25,0 to 27,5	g	0,75 to 1,00	0,015	g	—	—
Austenitic types													
—	209	0,05	0,90	4,0 to 7,0	0,03	0,03	20,5 to 24,0	9,5 to 12,0	1,5 to 3,0	0,10 to 0,30	0,75	—	V 0,10 to 0,30
—	218	0,10	3,5 to 4,5	7,0 to 9,0	0,03	0,03	16,0 to 18,0	8,0 to 9,0	0,75	0,08 to 0,18	0,75	—	—
—	219	0,05	1,00	8,0 to 10,0	0,03	0,03	19,0 to 21,5	5,5 to 7,0	0,75	0,10 to 0,30	0,75	—	—
—	240	0,05	1,00	10,5 to 13,5	0,03	0,03	17,0 to 19,0	4,0 to 6,0	0,75	0,10 to 0,30	0,75	—	—
—	308	0,08	0,30 to 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	0,5	—	0,5	—	—
(19 9 L)	308L	0,03	0,30 to 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	0,5	—	0,5	—	—
(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	—	—
—	308N2	0,10	0,90	1,0 to 4,0	0,03	0,03	20,0 to 25,0	7,0 to 11,0	0,75	0,12 to 0,30	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	0,5	—	0,5	10 × C to 1,0	—

Table 1 *(continued)*

Alloy designation[a] according to		Chemical composition, % by mass[b]											
Nominal composition[c] ISO 14343-A	Alloy type ISO 14343-B[c]	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Nb[d]	Other
(19 9 Nb)	347	0,08	0,30 to 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	0,5	—	0,5	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	—
—	347H	0,04 to 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	—
—	316	0,08	0,30 to 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	—	—
—	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	—	0,5	—	—
(19 12 3 L)	316L	0,03	0,30 to 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	—	0,5	—	—
(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	—	0,5	10 × C to 1,0	—
(19 12 3 Nb)	318	0,08	0,30 to 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; 0,2 min.	—
—	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; 0,2 min.	—