SLOVENSKI STANDARD
oSIST prEN ISO 3581:2022

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Welding consumables - Covered electrodes for manual metal arc welding of stainless and heat-resisting steels - Classification (ISO/DIS 3581:2022)

Schweißzusätze – Umhüllte Stabelektroden zum Lichtbogenhandschweißen von nichtrostenden und hitzebeständigen Stählen – Einteilung (ISO/DIS 3581:2022)

Produits consommables pour le soudage - Électrodes enrobées pour le soudage manuel à l'arc des aciers inoxydables et résistant aux températures élevées - Classification (ISO/DIS 3581:2022)

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Welding consumables — Covered electrodes for manual metal arc welding of stainless and heat-resisting steels — 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.

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*.

This fourth edition cancels and replaces the third edition (ISO 3581:2016), which has been technically revised.

The main changes compared to the previous edition are as follows:

— xxx xxxxxxx xxx xxxx

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, where they exist, are available from this page: https://committee.iso.org/sites/tc44/home/interpretation.html.

Introduction

This document provides a classification system for stainless steel, covered welding electrodes in terms of chemical composition of deposited weld metal and type of electrode covering. Other properties of the electrodes are specified by reference to tables.

This document recognizes that there are two somewhat different approaches in the global market for classifying a given stainless steel, covered electrode, and allows for either or both to be used to suit a particular need. Application of either (or both) type(s) of classification designation identifies a product as classified according to this document. It is important to note that the two systems are not exactly equivalent; therefore, each system must be used independent of the other, without combining designators in any way.

The classification according to nominal composition, system A, is mainly based upon EN 1600 while the classification according to alloy type, system B, is mainly based upon standards used around the Pacific Rim.

Welding consumables — Covered electrodes for manual metal arc welding of stainless and heat-resisting steels — Classification

1 Scope

This document specifies requirements for classification of covered electrodes, based on the all-weld metal chemical composition, the type of electrode covering and other electrode properties, and the all-weld metal mechanical properties, in the as-welded or heat-treated conditions, for manual metal arc welding of stainless and heat-resisting steels.

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 tables which carry the label "classification according to nominal composition-A" or "ISO 3581-A" are applicable only to products classified to that system.

b) Paragraphs and tables which carry the label "classification according to alloy type-B" or "ISO 3581-B" are applicable only to products classified to that system.

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

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 2401, *Welding consumables — Covered electrodes — Determination of the efficiency, metal recovery and deposition coefficient*

ISO 6847, *Welding consumables — Deposition of a weld metal pad for chemical analysis*

ISO 6947:2011, *Welding and allied processes — Welding positions*

ISO 13916, *Welding — Measurement of preheating temperature, interpass temperature and preheat maintenance temperature*

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

ISO 15792-1:2020, *Welding consumables — Test methods — Part 1: Preparation of all-weld metal test pieces and specimens in steel, nickel and nickel alloys*

ISO 15792-3, *Welding consumables — Test methods — Part 3: Classification testing of positional capacity and root penetration of welding consumables in a fillet weld*

ISO 80000-1:2009, *Quantities and units — Part 1: General*

3 Terms and definitions

ISO and IEC maintain terminological 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/

No terms and definitions are listed in this document.

4 Classification

Classification designations are based upon two approaches for indicating the chemical composition of the all-weld metal deposit obtained with a given electrode.

The "nominal composition-A" approach uses designation components directly indicating the nominal levels of certain alloying elements, given in a particular order, and some symbols for low but significant levels of other elements, whose levels are not conveniently expressed as integers.

The "alloy type-B" approach uses tradition-based three-digit or four-digit designations for alloy families, and occasionally an additional character or characters for compositional modifications of each original alloy within the family.

Both designation approaches include additional designators for some other classification requirements, but not entirely the same classification requirements, as will be clear from the following clauses.

Table 1 lists the tests required for classification of an electrode under each approach.

In many cases, a given commercial product can be classified using both approaches. Then either or both classification designations can be used for the product.

Table 1 — Summary of test requirements

Electrode designation		Size[a] mm	Position of welding[b]					
			Chemical analysis test		All-weld metal tension test		Fillet weld test	
ISO 3581-A	ISO 3581-B		ISO 3581-A	ISO 3581-B	ISO 3581-A	ISO 3581-B	ISO 3581-A	ISO 3581-B
Coating type symbol B and position symbols 1 and 2	Position and coating type symbol - 15	2,5 (or 2,4 or 2,6)	Not required	PA	Not required	Not required	Not required	Not required
		3,2 or 3,0	PA	PA	Not required	Not required	Not required	Not required
		4,0	PA	PA	PA	PA	Not required	PB, PF, PD
		5,0 or 4,8	Not required	PA	Not required	Not required	Not required	PB
		6,0 (or 5,6 or 6,4)	Not required	PA	Not required	Not required	Not required	PB

[a] If the size is not manufactured, the next nearest size may be substituted (provided that the substituted size is different from those specified in this table).

[b] The abbreviation PA, PB, PD, PF and PG indicate welding positions in accordance with ISO 6947, as follows:

PA = flat;

PB = horizontal vertical;

PD = horizontal overhead;

PF = vertical up;

PG = vertical down.

Table 1 *(continued)*

Electrode designation		Size [a] mm	Position of welding[b]					
			Chemical analysis test		All-weld metal tension test		Fillet weld test	
ISO 3581-A	ISO 3581-B		ISO 3581-A	ISO 3581-B	ISO 3581-A	ISO 3581-B	ISO 3581-A	ISO 3581-B
All coating types and position symbol 3	Not applicable	3,2 or 3,0	PA	Not applicable	Not required	Not applicable	Not required	Not applicable
		4,0	PA		PA		Not required	
		5,0 or 4,8	Not required		Not required		Not required	
All coating types and position symbol 4	Position symbol - 4 and all coating types	2,5 (or 2,4 or 2,6)	Not required	PA	Not required	Not required	Not required	PG
		3,2 or 3,0	PA	PA	Not required	Not required	Not required	PG
		4,0	PA	PA	PA	PA	Not required	PG
		5,0 or 4,8	Not required	PA	Not required	Not required	Not required	PG
All coating types and position symbol 5	Not applicable	3,2 (or 3,0)	PA	Not applicable	Not required	Not applicable	Not required	Not applicable
		4,0	PA		PA		Not required	
		5,0 (or 4,8)	Not required		Not required		Not required	
Coating type symbol R and position symbols 1 and 2	Position and coating type symbols - 16 and - 17	2,5 (or 2,4 or 2,6)	Not required	PA	Not required	Not required	Not required	Not required
		3,2 (or 3,0)	PA	PA	Not required	Not required	Not required	Not required
		4,0	PA	PA	PA	PA	Not required	PB, PF, PD
		5,0 (or 4,8)	Not required	PA	Not required	Not required	Not required	PB
		6,0 (or 5,6 or 6,4)	Not required	PA	Not required	Not required	Not required	PB

[a] If the size is not manufactured, the next nearest size may be substituted (provided that the substituted size is different from those specified in this table).

[b] The abbreviation PA, PB, PD, PF and PG indicate welding positions in accordance with ISO 6947, as follows:

PA = flat;

PB = horizontal vertical;

PD = horizontal overhead;

PF = vertical up;

PG = vertical down.

Table 1 *(continued)*

Electrode designation		Size [a] mm	Position of welding[b]					
			Chemical analysis test		All-weld metal tension test		Fillet weld test	
ISO 3581-A	ISO 3581-B		ISO 3581-A	ISO 3581-B	ISO 3581-A	ISO 3581-B	ISO 3581-A	ISO 3581-B
Not applicable	Position and coating type symbols - 26 and - 27	2,5 (or 2,4 or 2,6)	Not applicable	PA	Not applicable	Not required	Not applicable	Not required
		3,2 (or 3,0)		PA		Not required		Not required
		4,0		PA		PA		PB
		5,0 (or 4,8)		PA		Not required		PB
		6,0 (or 5,6 or 6,4)		PA		Not required		PB

[a] If the size is not manufactured, the next nearest size may be substituted (provided that the substituted size is different from those specified in this table).

[b] The abbreviation PA, PB, PD, PF and PG indicate welding positions in accordance with ISO 6947, as follows:

PA = flat;

PB = horizontal vertical;

PD = horizontal overhead;

PF = vertical up;

PG = vertical down.

4.1 Classification systems

Table 2 gives the requirements for classification according to nominal composition-A and according to alloy type-B.

NOTE The composition of the core wire, which can be substantially different from the weld metal composition, is not considered a classification criterion.

Table 2 — Classification systems

Classification according to	
Nominal composition – A	**Alloy type – B**
The classification is divided into five parts:	The classification is divided into four parts:
1) a symbol indicating the product/process to be identified (see 5.1);	1) a symbol indicating the product/process to be identified (see 5.1);
2) a symbol indicating the chemical composition of all-weld metal (see Table 3);	2) a symbol indicating the chemical composition of all-weld metal (see Table 3);
3) a symbol indicating the type of electrode covering (see 5.3);	3) a symbol indicating the welding position (see Table 5);
4) a symbol indicating the electrode efficiency and type of current (see Table 5);	4) a symbol indicating the type of electrode covering. This also serves to define the type of current which can be used with the electrode classified (see 5.3).
5) a symbol indicating the welding position (see Table 5).	

4.1.1 Classification – nominal composition – A

This classification includes all-weld metal properties obtained with a covered electrode as given below. The classification is based on an electrode diameter of 4 mm with the exception of testing for welding position. When 4 mm diameter electrodes are not manufactured, the next closest diameter shall be tested.

Classification according to nominal composition is split into two sections:

— Compulsory section: includes the symbols for the type of product, the chemical composition and the type of covering, i.e., symbols defined in 4.1, 4.2 and 4.3.

— Optional section: includes the symbols for the weld metal recovery, the type of current and the welding positions for which the electrode is suitable, i.e., the symbols defined in 4.4 and Table 5.

The full designation (compulsory and optional sections) shall be used on packages and in the manufacturer's literature and data sheets.

4.1.2 Classification – alloy type – B

This classification includes all-weld metal properties obtained with a covered electrode as given below. The classification is based on an electrode diameter of 4 mm for mechanical properties, with the exception of testing for welding position and for chemical analysis of the weld metal. When 4 mm diameter electrodes are not manufactured, the next closest diameter shall be tested. In classifying welding electrodes according to alloy type, the symbols for all four parts (product/process, alloy type, welding position and type of electrode covering) as defined in 4.1, 4.2, 4.3 and Table 5, are compulsory.

The full designation shall be used on packages and in the manufacturer's literature and data sheets.

5 Symbols and requirements

5.1 Symbol for the product/process

5.1.1 Classification according to nominal composition – A

The symbol for a covered electrode using the manual metal arc welding process for stainless and heat-resisting steels in accordance with ISO 3581-A shall be the letter E.

5.1.2 Classification according to alloy type – B

The symbol for a covered electrode using the manual metal arc welding process for stainless and heat-resisting steels in accordance with ISO 3581-B shall be the letters ES. The initial letter “E” indicates a covered electrode while the letter “S” indicates stainless and heat-resisting steels.

5.1.3 Symbol for the chemical composition of all-weld metal

The symbols in Table 3 indicate the chemical composition of all-weld metal determined in accordance with Clause 6. The all-weld metal obtained with the covered electrodes in Table 3, in accordance with Clause 7, shall also fulfil the mechanical property requirements for that electrode as specified in Table 4.

5.2 Symbol for type of electrode covering

The type of electrode covering determines, to a large extent, usability characteristics of the electrode and properties of the weld metal. See Annex A for information on coating types.

5.2.1 Classification according to nominal composition – A

The following two symbols are used to describe the type of covering:

— B, denotes a basic covering;

— R, denotes a rutile based covering.