



BSI Standards Publication

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

National foreword

This British Standard is the UK implementation of EN ISO 3581:2023. It is identical to ISO 3581:2023. It supersedes BS EN ISO 3581:2016, which is withdrawn.

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

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

**Welding consumables - Covered electrodes for manual
metal arc welding of stainless and heat-resisting steels -
Classification (ISO 3581:2023)**

Produits consommables pour le soudage - Électrodes
enrobées pour le soudage manuel à l'arc des aciers
inoxydables et résistant aux températures élevées -
Classification (ISO 3581:2023)

Schweißzusätze - Umhüllte Stabelektroden zum
Lichtbogenhandschweißen von nichtrostenden und
hitzebeständigen Stählen - Einteilung (ISO 3581:2023)

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document (EN ISO 3581:2023) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding and allied processes" 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of an identical text or by endorsement, at the latest by February 2024, and conflicting national standards shall be withdrawn at the latest by February 2024.

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Endorsement notice

The text of ISO 3581:2023 has been approved by CEN as EN ISO 3581:2023 without any modification.

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

The main changes are as follows:

- the document has been updated in accordance with the drafting guidelines laid out in the ISO House Style;
- the dates of normative references have been updated to show their latest editions;
- a new [Clause 3](#) (Terms and definitions) has been added in accordance with the standard structure of ISO documents;
- “weld metal recovery” now reads “nominal electrode efficiency” throughout, in accordance with ISO 2401;
- a new [Table 2](#) has been added listing classification systems;
- new alloys have been added to [Table 3](#) (formerly Table 2) and associated clauses of the document;
- the chemical compositions of several alloys have been updated in [Table 3](#) (formerly Table 2);
- certain alloys have been reclassified in [Table 3](#) (formerly Table 2);
- a new footnote was added to [Table 3](#) (formerly Table 2) regarding Co content;

— the wording of [Clause 9](#) (formerly Clause 8) has been updated.

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

This document provides a classification system for covered electrodes for manual metal arc welding of stainless and heat-resisting steels 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 covered electrode for arc welding of stainless steel. It 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 is to be used independently of the other, without combining designators in any way.

The classification according to nominal composition (system A) is mainly based on EN 1600. The classification according to alloy type (system B) is mainly based on 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.

[Annex B](#) gives information on considerations on weld metal ferrite content.

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

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 80000-1:2022, *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

4.1 General

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 ISO 3581-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 ISO 3581-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 explained in 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 that specified in this table).								
^b The abbreviations PA, PB, PD, PF and PG indicate welding positions in accordance with ISO 6947:2019:								
PA flat								
PB horizontal vertical								
PD horizontal overhead								
PF vertical up								
PG vertical down								

Table 1 (continued)

Electrode designation		Size ^a mm	Chemical analysis test		Position of welding ^b		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 that specified in this table).								
^b The abbreviations PA, PB, PD, PF and PG indicate welding positions in accordance with ISO 6947:2019:								
PA flat								
PB horizontal vertical								
PD horizontal overhead								
PF vertical up								
PG vertical down								

Table 1 (continued)

Electrode designation		Size ^a mm	Chemical analysis test		Position of welding ^b		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 that specified in this table).								
^b The abbreviations PA, PB, PD, PF and PG indicate welding positions in accordance with ISO 6947:2019:								
PA flat								
PB horizontal vertical								
PD horizontal overhead								
PF vertical up								
PG vertical down								

4.2 Classification systems

4.2.1 General

[Table 2](#) gives the requirements for classification according to:

- nominal composition — ISO 3581-A; and
- alloy type — ISO 3581-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 — ISO 3581-A	Alloy type — ISO 3581-B
The classification is divided into five parts:	The classification is divided into four parts:
1) a symbol indicating the product or process to be identified (see 5.1)	1) a symbol indicating the product or 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 6)
4) a symbol indicating the nominal electrode efficiency, R_N , and type of current (see Table 5)	4) a symbol indicating the type of electrode covering. This also serves to specify the type of current which can be used with the electrode classified (see 5.2.3)
5) a symbol indicating the welding position (see Table 6)	