International Standard

ISO 18275

Welding consumables — Covered electrodes for manual metal arc welding of high-strength steels — Classification

Produits consommables de soudage — Électrodes enrobées pour le soudage manuel à l'arc des aciers à haute résistance — Classification

Fourth edition
2026-05

Reference number
ISO 18275:2026(en)

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Published in Switzerland

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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 18275:2018), which has been technically revised.

The main changes are as follows:

— this document has been reformatted in single column showing System A and System B in tables and separate clauses and subclauses, some which are new;

— this document shows system A and system B in a simplified manner with an explanation of each system in Clause 4 and the scope;

— normative references have been updated;

— all tables have been updated and reorganized;

— N6M4 has been added to Table 6;

— E7618-N6M4 A has been added to Table 11 and Table 12;

— the type of current has been updated in Table 7 has been updated to reflect ISO 2560;

— in 5.6.2, the tolerance for holding time has been relaxed except for E6218-N4M2 P

— in 6.1, clarification regarding when 4,0 mm diameter electrodes are not manufactured;

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.

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Introduction

This document recognizes that there are two somewhat different approaches in the global market to classifying a given electrode, and allows for either or both to be used, to suit a particular market need. Application of either type of classification designation (or of both, where suitable) identifies a product as classified in accordance with this document. The classification in accordance with system A was originally based on EN 757:1997 which has been withdrawn and replaced by this document. The classification in accordance with system B is mainly based on standards used around the Pacific Rim.

This document provides a classification system for covered electrodes for high-strength steels in terms of the tensile properties, impact properties and chemical composition of the all-weld metal, as well as the type of electrode covering. The ratio of yield strength to tensile strength of weld metal is generally higher than that of parent metal. Users should note that matching weld metal yield strength to parent metal yield strength does not necessarily ensure that the weld metal tensile strength matches that of the parent metal. Therefore, where the application requires matching tensile strength, selection of the consumable should be made by reference to column 3 (Tensile strength) of Table 3 or column 2 (Tensile strength) of Table 11.

The mechanical properties of all-weld metal test specimens used to classify covered electrodes can vary from those obtained in production joints because of differences in welding procedure such as electrode size, width of weave, welding position, and parent metal composition.

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Welding consumables — Covered electrodes for manual metal arc welding of high-strength steels — Classification

1 Scope

This document specifies requirements for classification of covered electrodes and deposited metal in the as-welded condition and in the post-weld heat-treated condition for manual metal arc welding of high-strength steels with a minimum yield strength greater than 500 MPa or a minimum tensile strength greater than 570 MPa.

This document is a combined specification providing a classification utilizing a system based on the yield strength and an average impact energy of 47 J of the all-weld metal, or utilizing a system based on the tensile strength and an average impact energy of 27 J of the all-weld metal.

a) Clauses, subclauses and tables which carry the suffix “System A” are applicable only to covered electrodes classified under the system based on the yield strength and an average impact energy of 47 J of the all-weld metal given in this document.

b) Clauses, subclauses and tables which carry the suffix “System B” are applicable only to covered electrodes classified under the system based on the tensile strength and an average impact energy of 27 J of the all-weld metal given in this document.

c) Subclauses and tables which do not have either the suffix “System A” or the suffix “System B” are applicable to all covered electrodes classified under this document.

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 2401:2018, *Welding consumables — Covered electrodes — Determination of the efficiency, metal recovery and deposition coefficient*

ISO 2560:2020, *Welding consumables — Covered electrodes for manual metal arc welding of non-alloy and fine grain steels — Classification*

ISO 3690, *Welding and allied processes — Determination of hydrogen content in arc weld metal*

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

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

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 80000-1:2022, *Quantities and units — Part 1: General*

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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 on two approaches, A and B, to indicate the tensile properties, and the impact properties of the all-weld metal obtained with a given electrode.

System A is applicable to covered electrodes classified under the system based on the yield strength and an average impact energy of 47 J of the all-weld metal given in this document.

System B is applicable to covered electrodes classified under the system based on the tensile strength and an average impact energy of 27 J of the all-weld metal given in this document.

The two designation approaches include additional designators for some other classification requirements, but not all, as will be clear from the following subclauses. In most cases, a given commercial product can be classified in both systems, in such cases, either or both classification designations can be used for the product.

Annex A gives figures that explain how the classification systems are structured.

4.2 Classification systems

Each classification system is split into parts as given in Table 1.

The classifications are based on an electrode diameter of 4,0 mm.

Table 1 — Parts of each classification system

Part of classification designation	Classification system	
	System A	System B
1	symbol indicating the product/process to be identified	
2	symbol indicating the strength and elongation of the all-weld metal (See Table 3)	symbol indicating the strength of the all-weld metal (See Table 3)
3	symbol indicating the impact properties of the all-weld metal (See Table 4)	symbol indicating the type of electrode covering, the type of current, and the welding position (See Table 7)
4	symbol indicating the chemical composition of the all-weld metal (See Table 5)	symbol indicating the chemical composition of the all-weld metal (See Table 6)
5	symbol indicating the type of electrode covering (See 5.5.1)	symbol indicating the condition of the post-weld heat treatment under which the all-weld metal test was conducted (See 5.6.2)
6	symbol indicating post-weld heat treatment if this is applied (See 5.6.1)	symbol indicating that the electrode has satisfied a requirement for 47 J impact energy at the temperature normally used for the 27 J requirement (See 5.3.2)

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