



**International
Standard**

ISO 21952

**Welding consumables — Wire
electrodes, wires, rods and
deposits for gas shielded arc
welding of creep-resisting steels —
Classification**

*Produits consommables pour le soudage — Fils-électrodes, fils,
baguettes et dépôts pour le soudage à l'arc sous gaz de protection
des aciers résistant au fluage — Classification*

**Third edition
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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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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*, 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 third edition cancels and replaces the second edition (ISO 21952:2012), which has been technically revised.

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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;
- normative references have been updated;
- [5.4.2](#) additional text was added at the end of the subclause;
- [Table 3](#), new compositions 9C1MV3 and 9C1MV4 were added and footnote b was revised;
- [Table 3](#), the Mn + Ni for 9C1MV was revised;
- [Table 3](#), footnotes f and g were revised;
- [Table 4](#), X62X 9C1MV3 was added to reflect the addition in [Table 3](#);
- [Table 6](#) has been revised;
- [Clause 10](#) was updated to match the rounding procedure used in other current standards;
- [Clause 13](#) examples were revised, and new examples added.

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

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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 was prepared in collaboration with the International Institute of Welding. It recognizes that there are two somewhat different approaches in the global market to classifying a given wire electrode, wire, rod or deposit, 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 mainly based on EN 12070:1999 which has been withdrawn and replaced by this document. The classification in accordance with system B is mainly based upon standards used around the Pacific Rim.

This document proposes a classification system for wire electrodes, wires and rods in terms of their chemical composition and, where required, in terms of the yield strength, tensile strength and elongation of the all-weld metal deposit. The ratio of yield 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 material. Where the application requires matching tensile strength, selection of the consumable should be made by reference to column 4 of [Table 4](#).

It should be noted that the mechanical properties of all-weld metal test pieces used to classify the electrodes, wires and rods vary from those obtained in production joints because of differences in welding procedure such as electrode size, width of weave, welding position and material composition.

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Welding consumables — Wire electrodes, wires, rods and deposits for gas shielded arc welding of creep-resisting steels — Classification

1 Scope

This document specifies requirements for classification of wire electrodes, wires and rods for gas shielded metal arc welding and tungsten inert-gas welding of creep-resisting steels, and for their deposits in the as-welded or post-weld heat-treated condition. One wire electrode can be tested and classified with different shielding gases.

This document is a combined specification providing for classification utilizing a system based upon the chemical composition of wire electrodes, wires and rods with requirements for yield strength and average impact energy of 47 J of all-weld metal, or utilizing a system based upon the tensile strength of the all-weld metal deposits and the chemical composition of wire electrodes, wires and rods.

- a) Clauses, subclauses and tables which carry the suffix “system A” are applicable only to wire electrodes, wires, rods and deposits classified in accordance with the system based upon the chemical composition with requirements for yield strength and the average impact energy of 47 J of all-weld metal deposits under this document.
- b) Clauses, subclauses and tables which carry the suffix “system B” are applicable only to wire electrodes, wires, rods and deposits classified in accordance with the system based upon the tensile strength of all-weld metal deposits and the chemical composition of wire electrodes, wires and rods under this document.
- c) Clauses, subclauses and tables which do not have either the suffix “system A” or the “system B” are applicable to all wire electrodes, wires, rods and deposits classified under this document.

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2 Normative references

The following referenced documents are indispensable for the application 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 13916, *Welding — Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature*

ISO 14175:2008, *Welding consumables — Gases and gas mixtures for fusion welding and allied processes*

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*

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 to indicate:

- the chemical composition of the wire electrode wire or rod;
- tensile properties; and
- impact properties (system A only)

of the all-weld metal deposits obtained with a given wire electrode, wire or rod. The two designation approaches include additional designators for some other classification requirements, but not all, as is clear from the following subclauses. In most cases, a given commercial product can be classified in accordance with both systems. Then, either or both classification designations can be used for the product.

A wire electrode, wire or rod shall be classified in accordance with its chemical composition as given in [Table 3](#).

When the wire electrode, wire, rod or deposit is classified in combination with a shielding gas, the classification shall be prefixed with a symbol in accordance with [Clause 5](#) as appropriate.

4.2 Classification systems

Each classification system, A and B, is split into parts as given in [Table 1](#).

Table 1 — Parts of the classification systems, A and B

Part of classification designation	Classification system	
	System A Classification by chemical composition	System B Classification by tensile strength and chemical composition
1	The first part gives a symbol indicating the product or process to be identified;	
2	The second part gives a symbol indicating the chemical composition of the wire electrode, wire, or rod used (see Table 3).	The second part gives a symbol indicating the strength and elongation of the all-weld-metal deposit in the post weld heat-treated condition (see Table 4);
3	—	The third part gives a symbol indicating the shielding gas used (see 5.4.2);
4	—	The fourth part gives a symbol indicating the chemical composition of the wire electrode, wire or rod used (see Table 3).
NOTE A dash indicates not applicable		

5 Symbols and requirements

5.1 Symbol for the product or process

The symbol for the wire electrode, wire or rod used in the arc welding process shall be the letter G (gas shielded metal arc welding) and/or W (gas shielded arc welding with non-consumable tungsten electrode).

5.2 Symbol for the chemical composition of wire electrodes, wires, and rods

The symbol in [Table 3](#) indicates the chemical composition of the wire electrode, wire, and rod determined under the conditions given in [Clause 9](#).

5.3 Symbol for the mechanical properties of all-weld metal

5.3.1 Classification by chemical composition – System A

No symbol shall be used for the mechanical properties of the all-weld metal. The all-weld metal deposit obtained with the wire electrodes, wires, and rods in [Table 3](#) under conditions given in [Clause 6](#) shall also fulfil the mechanical property requirements specified in [Table 4](#).

5.3.2 Classification by tensile strength and chemical composition – System B

The symbol for tensile strength of the all-weld metal deposit produced by the gas shielded metal arc welding process and the tungsten inert-gas welding process shall be as given in [Table 2](#).

Table 2 — Symbol for tensile strength of all-weld metal deposit – Classification by tensile strength and chemical composition - System B

Symbol	Minimum tensile strength MPa
49	490
52	520
55	550
57	570
62	620
69	690
78	780
The complete mechanical property requirements that shall be fulfilled by the various compositions are specified in Table 4 .	

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5.4 Symbol for shielding gas

5.4.1 Classification by chemical composition – system A

No symbol shall be used for the shielding gas.

5.4.2 Classification by tensile strength and chemical composition – system B

The symbols for shielding gases shall be in accordance with ISO 14175:2008, for example:

- the symbol I1 shall be used when the classification has been performed with shielding gas ISO 14175-I1, 100 % argon;
- the symbol M12, for mixed gases, shall be used when the classification has been performed with shielding gas ISO 14175-M12, but without helium;
- the symbol M13 shall be used when the classification has been performed with shielding gas ISO 14175-M13;
- the symbol M20, for mixed gases, shall be used when the classification has been performed with shielding gas ISO 14175-M20, but without helium.
- the symbol M21, for mixed gases, shall be used when the classification has been performed with shielding gas ISO 14175-M21, but without helium;

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- the symbol C1 shall be used when the classification has been performed with shielding gas ISO 14175-C1, carbon dioxide;
- the symbol Z is used for an unspecified shielding gas.

In all cases, the actual shielding gas used shall be shown on test reports.

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