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## **Welding consumables — Solid wires and rods for fusion welding of copper and copper alloys — Classification**

*Produits consommables pour le soudage — Fils pleins et baguettes  
pleines pour le soudage par fusion du cuivre et des alliages de cuivre  
— Classification*

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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 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](http://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](http://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](http://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*.

Any feedback, question or request for official interpretation related to 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/members.html](http://www.iso.org/members.html). Official interpretations, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>

This second edition cancels and replaces the first edition (ISO 24373:2008), which has been technically revised. The main changes compared to the previous edition are as follows:

- a new alloy, CuSn6MnSi, has been added to [Table 1](#);
- chemistries in [Table 1](#) have been updated for a number of alloys;
- wording regarding Z options has been revised in footnote to [Table 1](#);
- an example showing a Z option has been added;
- [Clauses 7, 8 and 9](#) have been updated to reflect agreed text for all ISO/TC 44/SC 3 standards.

## Introduction

For copper-welding consumables, there is no unique relationship between the product form (solid wire or rod) and the welding process used (e.g. gas-shielded metal arc welding, gas tungsten arc welding, plasma arc or other welding processes). For this reason, the solid wires or rods can be classified on the basis of any of the product forms and can be used, as appropriate, for more than one of the above welding processes.

This document was originally based on EN 14640:2005<sup>[1]</sup>.

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# Welding consumables — Solid wires and rods for fusion welding of copper and copper alloys — Classification

## 1 Scope

This document specifies requirements for classification of solid wires and rods for fusion welding of copper and copper alloys. The classification of the solid wires and rods is based on their chemical composition.

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

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

## 3 Terms and definitions

No terms and definitions are listed in this document.

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 <http://www.electropedia.org/>

## 4 Classification

The classification is divided into two parts:

- a) the first part indicates the product form, solid wires or rods (see 5.1);
- b) the second part gives a numerical symbol indicating the chemical composition of the solid wire or rod (see Table 1).

## 5 Symbols

### 5.1 Symbol for the product form

The symbol for the solid wire and rod shall be S.

NOTE One product form may be used for more than one welding process.

## 5.2 Symbol for the chemical composition

The numerical symbol in [Table 1](#) indicates the chemical composition of a solid wire or rod, determined under conditions given in [Clause 7](#).

NOTE 1 In addition the chemical symbol may be used.

NOTE 2 Corresponding national classifications are shown in [Annex A, Table A.1](#).

NOTE 3 [Annex B](#) gives recommendations for select alloys for use with oxyfuel gas welding and gas-shielded metal arc welding.

## 6 Mechanical properties of the weld metal

The mechanical properties of the weld metal are not part of the classification.

## 7 Chemical analysis

Chemical analysis shall be performed on specimens of the product or the stock from which it is made. Any analytical technique can be used; but, in case of dispute, reference shall be made to established published methods, agreed between the contracting parties.

## 8 Rounding procedure

For purposes of determining compliance with the requirements of this document, the actual test values obtained shall be subject to ISO 80000-1:2009, B.3, Rule A. If the measured values are obtained by equipment calibrated in units other than those of this document, the measured values shall be converted to the units of this document before rounding. If an arithmetic average value is to be compared with the requirements of this document, rounding shall be done only after calculating the arithmetic average. The rounded results shall fulfil the requirements of the appropriate table for the classification under test.

## 9 Retest

If any test fails to meet a requirement, that test shall be repeated twice. The results of both retests shall meet the requirement. Specimens for the retest may be taken from the original test sample or from a new test sample. For chemical analysis, retests need only be for those specific elements that failed to meet their test requirement. If the results of one or both retests fail to meet the requirement, the material under test shall be considered as not meeting the requirements of this document for that classification.

In the event that, during preparation or after completion of any test, it is clearly determined that prescribed or proper procedures were not followed in preparing the sample or test specimen(s), or in conducting the tests, the test shall be considered invalid, without regard to whether the test was actually completed, or whether the test results met, or failed to meet, the requirement. That test shall be repeated, following proper prescribed procedures. In this case, the requirement for doubling the number of test specimens does not apply.

## 10 Technical delivery conditions

Technical delivery conditions shall meet the requirements given in ISO 544 and ISO 14344.



Table 1 — Symbol for the chemical composition of solid wires and rods

Alloy symbols		Chemical composition, % (by mass) <sup>a,b</sup>														Others total
Numerical	Chemical	Cu	Al	Fe	Mn	Ni incl. Co	P	Pb	Si	Sn	Zn	As	C	Ti	S	
COPPER-LOW ALLOYED																
Cu 1897	CuAg1	min. 99,5 incl. Ag	0,01	0,05	0,2	0,3	0,01 to 0,05	0,01	0,1	—	—	0,05	—	—	—	0,2 Ag:0,8 to 1,2
Cu 1898	CuSn1	min. 98,0	0,01	—	0,50	—	0,15	0,02	0,50	1,0	—	—	—	—	—	0,50
Cu 1898A	CuSn1MnSi	bal.	0,01	0,03	0,1 to 0,4	0,1	0,015	0,01	0,1 to 0,4	0,5 to 1,0	—	—	—	—	—	0,2
COPPER-SILICON (SILICON BRONZE)																
Cu 6511	CuSi2Mn1	bal.	0,01	0,1	0,5 to 1,5	—	0,02	0,02	1,5 to 2,0	0,1 to 0,3	0,2	—	—	—	—	0,5
Cu 6560	CuSi3Mn1	bal.	0,01	0,50	1,5	—	—	0,02	2,8 to 4,0	1,0	1,0	—	—	—	—	0,50
Cu 6561	CuSi2Mn1Sn1Zn1	bal.	—	0,5	1,5	—	—	0,02	2,0 to 2,8	1,5	1,5	—	—	—	—	0,5
COPPER-TIN (INCLUDING PHOSPHOR BRONZE)																
Cu 5180	CuSn5P	bal.	0,01	—	—	—	0,10 to 0,35	0,02	—	4,0 to 6,0	—	—	—	—	—	0,50
Cu 5180A	CuSn6P	bal.	0,01	0,1	—	—	0,01 to 0,45	0,02	—	4,0 to 7,0	0,1	—	—	—	—	0,2
Cu 5285	CuSn6MnSi	bal.	0,01	—	0,1 to 0,5	—	—	—	0,1 to 0,5	5,0 to 6,0	—	—	—	—	—	0,5
Cu 5210	CuSn8P	bal.	0,01	0,10	—	—	0,10 to 0,35	0,02	—	7,0 to 9,0	0,20	—	—	—	—	0,50
Cu 5211	CuSn10MnSi	bal.	0,01	0,1	0,1 to 0,5	—	0,1	0,02	0,1 to 0,5	9,0 to 10,0	0,1	—	—	—	—	0,5
Cu 5410	CuSn12P	bal.	0,005	—	—	—	0,01 to 0,4	0,02	—	11,0 to 13,0	0,05	—	—	—	—	0,4
<sup>a</sup> Analysis shall be made for the elements for which specific values are shown in this table. If, however, the presence of other elements is indicated in the course of routine analysis, further analyses shall be carried out to determine that the total of these other elements does not exceed the given maximum level.																
<sup>b</sup> Single values shown are maxima, unless otherwise noted.																
<sup>c</sup> (and *) The total of all other elements, including those for which the maximum value or an asterisk (*) is shown, shall not exceed the value specified in "Others total".																
<sup>d</sup> Consumables for which the chemical composition is not listed in this table shall be symbolized similarly and prefixed by the letter Z. The chemical composition ranges are not specified. Therefore, it is possible that two electrodes with the same Z classification are not interchangeable.																