



BSI Standards Publication

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

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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) ^{a,b}														
Numerical	Chemical	Cu	Al	Fe	Mn	Ni incl. Co	P	Pb	Si	Sn	Zn	As	C	Ti	S	Others total
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

^a 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.

^b Single values shown are maxima, unless otherwise noted.

^c (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".

^d 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.

Table 1 (continued)

Alloy symbols		Chemical composition, % (by mass) ^{a,b}														
Numerical	Chemical	Cu	Al	Fe	Mn	Ni incl. Co	P	Pb	Si	Sn	Zn	As	C	Ti	S	Others total
COPPER-ZINC (BRASS)																
Cu 4641	CuZn40SnSi	58,0 to 62,0	0,01	0,2	0,3	—	—	0,03	0,1 to 0,5	1,0	bal.	—	—	—	—	0,2
Cu 4700	CuZn40Sn	57,0 to 61,0	0,01*	*	*	—	—	0,05*	*	0,25 to 1,00	bal.	—	—	—	—	0,50 ^c
Cu 4701	CuZn40SnSiMn	58,5 to 61,5	0,01	0,25	0,05 to 0,25	—	—	0,02	0,15 to 0,45	0,2 to 0,5	bal.	—	—	—	—	0,2
Cu 6800	CuZn40Ni	56,0 to 60,0	0,01*	0,25 to 1,20	0,01 to 0,50	0,20 to 0,80	—	0,05*	0,04 to 0,20	0,80 to 1,10	bal.	—	—	—	—	0,50 ^c
Cu 6810	CuZn40Fe1Sn1	56,0 to 60,0	0,01*	0,25 to 1,20	0,01 to 0,50	—	—	0,05*	0,04 to 0,15	0,80 to 1,10	bal.	—	—	—	—	0,50 ^c
Cu 7730	CuZn40Ni10	46,0 to 50,0	0,01*	—	—	9,0 to 11,0	0,25	0,05*	0,04 to 0,25	—	bal.	—	—	—	—	0,50 ^c
COPPER-ALUMINIUM (ALUMINIUM-BRONZE)																
Cu 6061	CuAl5Ni2Mn	bal.	4,5 to 5,5	0,5	0,1 to 1,0	1,0 to 2,5	—	0,02	0,1	—	0,2	—	—	—	—	0,5
Cu 6100	CuAl7	bal.	6,0 to 8,5	*	0,50	*	—	0,02	0,10	*	0,20	—	—	—	—	0,50 ^c
Cu 6180	CuAl10Fe	bal.	8,5 to 11,0	0,5 to 1,5	—	—	—	0,02	0,10	—	0,02	—	—	—	—	0,50
Cu 6240	CuAl11Fe3	bal.	10,0 to 11,5	2,0 to 4,5	—	—	—	0,02	0,10	—	0,10	—	—	—	—	0,50
Cu 6325	CuAl8Fe4Mn2Ni2	bal.	7,0 to 9,0	1,8 to 5,0	0,5 to 3,0	0,5 to 3,0	—	0,02	0,1	—	0,1	—	—	—	—	0,4
Cu 6327	CuAl8Ni2Fe2Mn2	bal.	7,0 to 9,5	0,5 to 2,5	0,5 to 2,5	0,5 to 3,0	—	0,02	0,2	—	0,2	—	—	—	—	0,4
Cu 6328	CuAl9Ni5Fe3Mn2	bal.	8,50 to 9,50	3,0 to 5,0	0,60 to 3,50	4,0 to 5,5	—	0,02	0,10	—	0,10	—	—	—	—	0,50
^a 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. ^b Single values shown are maxima, unless otherwise noted. ^c (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". ^d 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.																

Table 1 (continued)

Alloy symbols		Chemical composition, % (by mass) ^{a,b}														
Numerical	Chemical	Cu	Al	Fe	Mn	Ni incl. Co	P	Pb	Si	Sn	Zn	As	C	Ti	S	Others total
COPPER-MANGANESE																
Cu 6338	CuMn13Al8Fe3Ni2	bal.	7,0 to 8,5	2,0 to 4,0	11,0 to 14,0	1,5 to 3,0	—	0,02	0,10	—	0,15	—	—	—	—	0,50
COPPER-NICKEL																
Cu 7061	CuNi10	bal.	—	0,5 to 2,0	0,5 to 1,5	9,0 to 11,0	0,02	0,02	0,2	—	—	—	0,05	0,1 to 0,5	0,02	0,4
Cu 7158	CuNi30Mn1FeTi	bal.	—	0,40 to 0,70	1,0	29,0 to 32,0	0,02	0,02	0,25	—	—	—	—	0,20 to 0,50	0,01	0,50
Cu Z		Any other chemical composition ^d .														
<p>^a 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.</p> <p>^b Single values shown are maxima, unless otherwise noted.</p> <p>^c (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".</p> <p>^d 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.</p>																