BRITISH STANDARD

BS EN 14640:2005

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

The European Standard EN 14640:2005 has the status of a British Standard

ICS 25.160.20

BSI British Standards

National foreword

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The UK participation in its preparation was entrusted to Technical Committee WEE/39, Welding consumables, which has the responsibility to:

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 10 May 2005

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 11 and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 46036 3

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14640

April 2005

ICS 25.160.20

English version

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

Schweißzusätze - Massivdrähte und -stäbe zum Schmelzschweißen von Kupfer und Kupferlegierungen - Einteilung

This European Standard was approved by CEN on 15 March 2005.

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Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 14640:2005: E

Contents

Foreword

This document (EN 14640:2005) has been prepared by Technical Committee CEN/TC 121 “Welding”, 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of an identical text or by endorsement, at the latest by October 2005, and conflicting national standards shall be withdrawn at the latest by October 2005.

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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 may be classified on the basis of any of the above product forms and can be used as appropriate, for more than one of the above processes.

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 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.

EN ISO 544, *Welding consumables — Technical delivery conditions for welding filler materials — Type of product, dimensions, tolerances and markings (ISO 544:2003).*

EN ISO 14344, *Welding and allied processes — Flux and gas shielded electrical welding processes — Procurement guidelines for consumables (ISO 14344:2002).*

ISO 31-0:1992, *Quantities and units — Part 0: General principles.*

3 Classification

The classification is divided into two parts:

a) the first part indicates the product form being solid wires or rods, see 4.1;

b) the second part gives a numerical symbol indicating the chemical composition of the solid wire or rod, see Table 1.

4 Symbols and requirements

4.1 Symbols 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.

4.2 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 6.

NOTE 1 In addition the chemical symbol may be used.

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

Alloy symbols		Chemical composition in % (m/m) [a] [b]														
Numerical	Chemical	Cu	Al	Fe	Mn	Ni incl. Co	P	Pb	Si	Sn	Zn	As	C	Ti + Nb	S	Others total
COPPER-LOW ALLOYED																
Cu 1897	CuAg1	min. 99,5 incl. Ag	0,01	0,05	0,2	0,3	0,01-0,05[c]	0,01	0,1	-	-	0,05	-	-	-	Ag:0,8-1,2
Cu 1898	CuSn1	bal.	0,01	0,05	0,1-0,5	0,3	0,02	0,02	0,5	0,5-1,0	-	0,05	-	-	-	0,1
COPPER-SILICON (SILICON BRONZE)																
Cu 6511	CuSi2Mn1	bal.	-	-	0,9-1,1	-	0,008-0,012	-	1,7-1,9	0,17-0,25	-	-	-	-	-	0,5
Cu 6560	CuSi3Mn1	bal.	0,01	0,5	0,5-1,5	-	0,02	0,02	2,8-4,0	0,2	0,2	-	-	-	-	0,4
Cu 6561	CuSi2Mn1Sn	bal.	-	0,5	1,5	-	-	0,02	2,0-2,8	1,5	1,5	-	-	-	-	0,5
COPPER-TIN (INCL. PHOSPHOR BRONZE)																
Cu 5180	CuSn6P	bal.	0,01	0,1	-	-	0,1-0,4	0,02	-	4,0-7,0	0,1	-	-	-	-	0,4
Cu 5210	CuSn9P	bal.	-	0,1	-	-	0,1-0,4	0,02	-	7,0-9,0	0,2	-	-	-	-	0,5
Cu 5211	CuSn10	bal.	-	-	0,2-0,35	-	-	-	0,2-0,3	9,0-10,0	-	-	-	-	-	0,5
Cu 5410	CuSn12P	bal.	0,01	0,1	-	-	0,4	0,02	-	11,0-13,0	0,1	-	-	-	-	0,4
COPPER-ZINC (BRASS)																
Cu 4700	CuZn40	57,0-61,0	0,01[d]	[d]	[d]	-	-	0,05[d]	-	0,25-1,0	bal.	-	-	-	-	0,5
Cu 4701	CuZn40SnSiMn	58,5-61,5	0,01	0,25	0,05-0,25	-	-	0,02	0,15-0,4	0,2-0,5	bal.	-	-	-	-	0,2
Cu 6800	CuZn40Ni	56,0-60,0	0,01	0,2-1,2	0,5	0,2-0,8	-	0,03	0,2	0,8-1,1	bal.	-	-	-	-	0,2
Cu 6810	CuZn40SnSi	58,0-62,0	0,01	0,2	0,3	-	-	0,03	0,1-0,5	1,0	bal.	-	-	-	-	0,2
Cu 7730	CuZn40Ni10	46,0-50,0	-	-	-	9,0-11,0	-	0,03	0,2	0,8-1,1	bal.	-	-	-	-	0,5
COPPER-ALUMINIUM (ALUMINIUM BRONZE)																
Cu 6061	CuAl5Mn1Ni1	bal.	4,5-5,0		0,5-1,0	0,5-1,0	-	-	-	-		-	-	-	-	0,5
Cu 6100	CuAl8	bal.	6,0-9,5	0,5	0,5	0,8	-	0,02	0,2	-	0,2	-	-	-	-	0,4
Cu 6180	CuAl10	bal.	8,5-11,0	0,5-1,5	1,0	1,0	-	0,02	0,1	-	0,02	-	-	-	-	0,4
Cu 6240	CuAl11Fe	bal.	10,0-11,5	2,0-4,5	-	-	-	0,02	-	-	0,1	-	-	-	-	0,5
Cu 6325	CuAl8Fe4Ni2	bal.	7,0-9,0	2,0-5,0	0,5-3,0	0,5-3,0	-	0,02	0,1	-	0,1	-	-	-	-	0,4
Cu 6327	CuAl8Ni2	bal.	7,0-9,5	0,5-2,5	0,5-2,5	0,5-3,0	-	0,02	0,2	-	0,2	-	-	-	-	0,4
Cu 6328	CuAl9Ni5	bal.	8,5-9,5	3,0-5,0	0,6-3,5	4,0-6,0	-	0.02	0.2	-	0.1	-	-	-	-	0,4
Cu 6329	CuAl11Ni6	bal.	10,0-11,5	2,8-3,3	1,0-1,5	5,5-6,5	-	0,02	0,2	-	0,2	-	-	-	-	0,4
COPPER-MANGANESE																
Cu 6338	CuMn13Al7	bal.	6,5-8,5	1,5-4,0	11,0-14,0	1,5-3,0	-	0,02	0,1	-	0,15	-	-	-	-	0,5
COPPER-NICKEL																
Cu 7061	CuNi10	bal.	-	0,5-2,0	0,5-1,5	9,0-11,0	0,02	0,02	0,2	-	-	-	0,05	0,1-0,5	0,02	0,4
Cu 7158	CuNi30	bal.	-	0,4-1,0	0,5-1,5	29,0-32,0	0,02	0,02	0,25	-	-	-	0,05	0,2-0,5	0,02	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 analysis shall be made to determine that the total of these other elements does not exceed given maximum level.

[b] Single values shown are maximum, unless otherwise noted.

[c] For gas welding: min. P = 0,02%, for shield gas welding max. P = 0,05%

[d] Sum Al+Fe+Mn+Pb max. 0,5%

NOTE Consumables not listed in the table can be symbolised by Cu Z. Chemical symbol established by the manufacturer may be added in brackets.

NOTE 2 Corresponding national classifications are shown in Annex A.

5 Mechanical properties of the weld metal

Mechanical properties of the weld metal are not part of the classification.

6 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.

7 Rounding off procedure

For purposes of determining compliance with the requirements of this document, the actual test values obtained shall be subjected to the rounding-off rules of Annex B, Rule A of ISO 31-0:1992. 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 off. If an average value is to be compared to the requirements of this document, rounding off shall be done only after calculating the average. In the case where the testing standard cited in the normative references of this document contains instructions for rounding off that conflict with the instructions of this document, the rounding off requirements of the testing standard shall apply. The rounded-off results shall fulfil the requirements of the appropriate table for the classification under test.

8 Retest

If any test fails to meet the 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 specification 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.

9 Technical delivery conditions

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

10 Designation

The designation of solid wires and rods shall follow the principle given in the example below.

EXAMPLE A solid wire (S) for fusion welding has a chemical composition within the limits for the alloy symbol Cu 6560 (CuSi3Mn1) of Table 1, is designated:

Solid wire EN 14640 – S Cu 6560

or alternatively

Solid wire EN 14640 – S Cu 6560 (CuSi3Mn1)

where:

EN = standard number;

S = product form (see 4.1);

Cu 6560 = chemical composition of welding consumable (see Table 1);

CuSi3Mn1 = optional chemical composition of welding consumable (see Table 1).

Annex A
(informative)

Corresponding national classifications

Table A.1 — Corresponding national classification

Numerical symbol	Chemical symbol	USA		Japan JIS Z3341	Europe EN 13347
		AWS A5.7/A5.7M AWS A5.8/A5.8M	UNS		
COPPER-LOW ALLOYED					
Cu 1897	CuAg1	–	–	–	CuAg1
Cu 1898	CuSn1	ERCu	C18980	YCu	CuSn1MnSi
COPPER-SILICON (SILICON BRONZE)					
Cu 6511	CuSi2Mn1	–	–	–	–
Cu 6560	CuSi3Mn1	ERCuSi-A	C65600	YCuSi B	CuSi3Mn1
Cu 6561	CuSi2Mn1Sn	–	C65610	YCuSi A	–
COPPER-TIN (INCL. PHOSPHOR BRONZE)					
Cu 5180	CuSn6P	ERCuSn-A	C51800	YCuSn A	CuSn5, CuSn6
Cu 5210	CuSn9P	ERCuSn-C	C52100	YCuSn B	CuSn8
Cu 5211	CuSn10	–	–	–	–
Cu 5410	CuSn12P	–	–	–	CuSn12
COPPER-ZINC (BRASS)					
Cu 4700	CuZn40	RBCuZn-A	C47000	–	–
Cu 4701	CuZn40SnSiMn	–	C47010	–	CuZn40MnSiSn
Cu 6800	CuZn40Ni	RBCuZn-B	–	–	CuZn39Fe1Sn1MnNiSi
Cu 6810	CuZn40SnSi	RBCuZn-C	–	–	CuZn40FeSiSn
Cu 7730	CuZn40Ni10	RBCuZn-D	–	–	–
COPPER-ALUMINIUM (ALUMINIUM BRONZE)					
Cu 6061	CuAl5Mn1Ni1	–	–	–	–
Cu 6100	CuAl8	ERCuAl-A1	C61000	–	CuAl8
Cu 6180	CuAl10	ERCuAl-A2	C61800	YCuAl	CuAl10Fe1
Cu 6240	CuAl11Fe	ERCuAl-A3	C62400	–	–
Cu 6325	CuAl8Ni4	–	C63250	YCuAlNi B	–
Cu 6327	CuAl8Ni2	–	–	YCuAlNi A	–
Cu 6328	CuAl9Ni5	ERCuAlNi	C63280	YCuAlNi C	CuAl9Ni4Fe3Mn2

Table A.1 *(concluded)*

Numerical symbol	Chemical symbol	USA		Japan JIS Z3341	Europe EN 13347
		AWS A5.7/A5.7M AWS A5.8/A5.8M	UNS		
Cu 6329	CuAl11Ni6	–	–	–	–
COPPER-MANGANESE					
Cu 6338	CuMn13Al7	ERCuMnNiAl	C63380	–	–
COPPER-NICKEL					
Cu 7061	CuNi10	–	–	YCuNi-1	–
Cu 7158	CuNi30	ERCuNi	C71580	YCuNi-3	–

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