BRITISH STANDARD

BS EN
13347:2002

Copper and copper alloys — Rod and wire for welding and braze welding

The European Standard EN 13347:2002 has the status of a British Standard

ICS 25.160.20; 25.160.50; 77.150.30

BSI
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National foreword

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The UK participation in its preparation was entrusted by Technical Committee NFE/34, Copper and copper alloys, to Subcommittee NFE/34/1, Wrought and unwrought copper and copper alloys, which has the responsibility to:

— aid enquirers to understand the text;

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EN 13347

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English version

Copper and copper alloys - Rod and wire for welding and braze welding

Cuivre et alliages de cuivre - Barres et fils pour soudage et brasage

Kupfer und Kupferlegierungen - Stangen und Drahte fur SchweiBzusatzwerkstoffe und Fugenlote

This European Standard was approved by CEN on 23 October 2002.

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COMITE EUROPEEN DE NORMALISATION
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Contents

Foreword

This document (EN 13347:2002) has been prepared by Technical Committee CEN/TC 133 "Copper and copper alloys", 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of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by June 2003.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 4 "Rod/bar, wire, profiles" to prepare the following standard:

EN 13347, *Copper and copper alloys — Rod and wire for welding and braze welding.*

This is one of a series of European Standards for copper and copper alloy products in rod, wire and profile form. Other products are specified as follows:

EN 12163, *Copper and copper alloys — Rod for general purposes.*

EN 12164, *Copper and copper alloys — Rod for free machining purposes.*

EN 12165, *Copper and copper alloys — Wrought and unwrought forging stock.*

EN 12166, *Copper and copper alloys — Wire for general purposes.*

EN 12167, *Copper and copper alloys — Profiles and rectangular bar for general purposes.*

EN 12168, *Copper and copper alloys — Hollow rod for free machining purposes.*

prEN 13601, *Copper and copper alloys — Copper rod, bar and wire for general electrical purposes.*

prEN 13602, *Copper and copper alloys — Drawn, round copper wire for the manufacture of electrical conductors.*

According to CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the composition, property requirements and dimensional tolerances for copper and copper alloy rod and wire intended for welding and braze welding purposes.

The sampling procedures, the methods of test for verification of conformity to the requirements of this standard, and the delivery conditions are also specified.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 1044, *Brazing — Filler metals.*

EN 1655, *Copper and copper alloys — Declarations of conformity.*

EN 1976, *Copper and copper alloys — Cast unwrought copper products.*

NOTE Informative references to documents used in the preparation of this standard, and cited at the appropriate places in the text, are listed in the bibliography.

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
wire
solid wrought product of uniform circular cross-section along its whole length supplied in coil form or on spools, reels or in drums

3.2
rod
solid wrought product of uniform circular cross-section along its whole length, supplied in straight lengths

3.3
circularity
difference between the maximum and the minimum diameters measured at any cross-section of a round rod or wire

3.4
knurl
embossed finish applied to the surface of the wire or rod to aid the adhesion of subsequently applied flux coatings

4 Designations

4.1 Material

4.1.1 General

The material is designated either by symbol or number (see Tables 1 to 6).

4.1.2 Symbol

The material symbol designation is based on the designation system given in ISO 1190-1.

NOTE Although material symbol designations used in this standard might be the same as those in other standards using the designation system given in ISO 1190-1, the detailed composition requirements are not necessarily the same.

4.1.3 Number

The material number designation is in accordance with the system given in EN 1412.

4.2 Product

The product designation provides a standardized pattern of designation from which a rapid and unequivocal description of a product is conveyed in communication. It provides mutual comprehension at the international level with regard to products which meet the requirements of the relevant European Standard.

The product designation is no substitute for the full content of the standard.

The product designation for products to this standard shall consist of:

— denomination (Rod or Wire);

— number of this European Standard (EN 13347);

— material designation, either symbol or number (see Tables 1 to 6);

— nominal diameter.

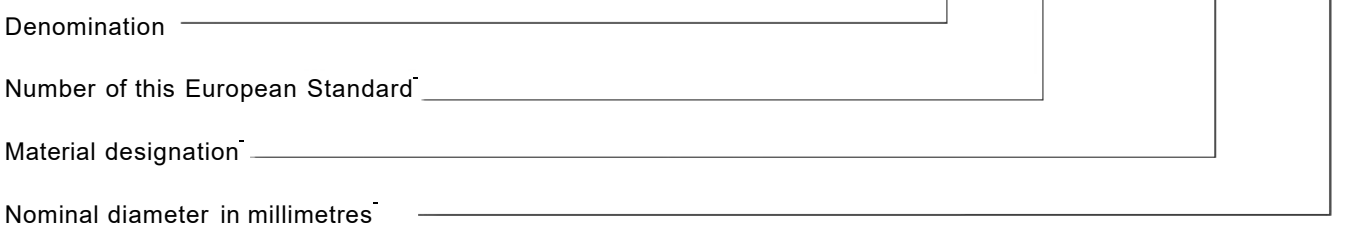
The derivation of a product designation is shown in the following example.

EXAMPLE Rod for welding/braze welding to this standard, in material designated either CuSn6 or CF452K, nominal diameter 2,4 mm, shall be designated as follows:

Rod EN 13347 — CuSn6 — 2,4

or

Rod EN 13347 — CF452K — 2,4



5 Ordering information

In order to facilitate the enquiry, order and confirmation of order procedures between the purchaser and the supplier, the purchaser shall state on his enquiry and order the following information:

a) quantity of product required (mass);

b) denomination (Rod or Wire);

c) number of this European Standard (EN 13347);

d) material designation (see Tables 1 to 6);

e) nominal diameter;

f) for rod, the length required. Normally rod is supplied to "nominal length" tolerances. If "fixed lengths" are required, the length and tolerance shall be stated (see 6.2.3);

NOTE 1 It is recommended that the product designation, as described in 4.2, is used for items b) to e).

In addition, the purchaser shall also state on the enquiry and order any of the following, if required:

g) whether a knurl is to be applied;

NOTE 2 The design of the knurl should be agreed between the supplier and the purchaser.

h) whether a declaration of conformity is required (see 9.1);

i) whether an inspection document is required, and if so, which type (see 9.2);

j) whether there are any special requirements for marking, labelling and packaging, including, if necessary, any limitations on dimensions or mass of coils, spools, reels or drums (see clause 10).

EXAMPLE Ordering details for 100 kg of rod conforming to EN 13347, in material designated either CuSn6 or CF452K, nominal diameter 2,4 mm, nominal length 500 mm, knurled:

100 kg Rod EN 13347 — CuSn6 — 2,4
— nominal length 500 mm
— knurled

or

100 kg Rod EN 13347 — CF452K — 2,4
— nominal length 500 mm
— knurled

6 Requirements

6.1 Composition

The composition shall conform to the requirements for the appropriate material given in Tables 1 to 6.

6.2 Dimensions and tolerances

6.2.1 Diameter

The diameter shall conform to the tolerances given in Table 7.

NOTE The diameter of rod or wire is calculated as the mean of one or more pairs of measurements taken at right angles at the same cross-section of the rod or wire.

6.2.2 Shape tolerances

The deviation from circularity shall not exceed half the range of the tolerance on diameter given in Table 7.

6.2.3 Length of rod

Rod shall be supplied in "nominal lengths" unless "fixed lengths" are specifically ordered by the purchaser (see note).

"Nominal lengths" are supplied in the preferred lengths given in Table 8 and shall conform to the tolerances given in the table.

NOTE The length and the length tolerances of "fixed lengths" rod are subject to agreement between the purchaser and the supplier [see clause 5, f)].

7 Sampling

When required (e.g. when the purchaser requests inspection documents in accordance with EN 10204 to be supplied with test results based on specific inspection and testing), an inspection lot shall be sampled for analysis in accordance with Table 11 [see clause 5, i)].

A test sample, depending on the analytical technique to be employed, shall be prepared from each sampling unit and shall be used for the determination of the composition.

NOTE 1 When preparing the test sample, care should be taken to avoid contaminating or overheating the test sample. Carbide tipped tools are recommended; steel tools, if used, should be made of magnetic material to assist in the subsequent removal of extraneous iron. If the test samples are in finely divided form (e.g. drillings, millings), they should be treated carefully with a strong magnet to remove any particles of iron introduced during preparation.

NOTE 2 In cases of dispute concerning the results of analysis, the full procedure given in ISO 1811-2 should be followed.

NOTE 3 Results may be used from analyses carried out at an earlier stage of manufacturing the product, e.g. at the casting stage, if the material identity is maintained and if the quality management system of the manufacturer is certified as conforming to EN ISO 9001.

8 Test methods

8.1 Analysis

Analysis shall be carried out on the test samples obtained in accordance with clause 7. Except in cases of dispute, the analytical methods used shall be at the discretion of the supplier. For expression of results, the rounding rules given in 8.2 shall be used.

NOTE In cases of dispute concerning the results of analysis, the method of analysis to be used should be agreed between the disputing parties.

8.2 Rounding of results

For the purpose of determining conformity to the compositional limits specified in this standard, an observed or a calculated value obtained from the analysis shall be rounded in accordance with the following procedure, which is based upon the guidance given in Annex B of ISO 31-0:1992. It shall be rounded in one step to the same number of figures used to express the specified limit in this standard.

The following rules shall be used for rounding:

a) if the figure immediately after the last figure to be retained is less than 5, the last figure to be retained shall be kept unchanged;

b) if the figure immediately after the last figure to be retained is equal to or greater than 5, the last figure to be retained shall be increased by one.

9 Declaration of conformity and inspection documentation

9.1 Declaration of conformity

When requested by the purchaser [see clause 5, h)] and agreed with the supplier, the supplier shall issue for the products the appropriate declaration of conformity in accordance with EN 1655.

9.2 Inspection documentation

When requested by the purchaser [see clause 5, i)] and agreed with the supplier, the supplier shall issue for the products the appropriate inspection document in accordance with EN 10204.

10 Marking, labelling, packaging

10.1 General

Unless otherwise specified by the purchaser and agreed by the supplier [see clause 5, j)], the marking, labelling and packaging shall be in accordance with 10.2 and 10.3.

10.2 Marking and labelling

Each package of rod and each coil, spool, reel or drum of wire and its outer packing shall be clearly marked with the following information:

— number of this standard (EN 13347);

— size and quantity of rod or wire;

— material designation (see Tables 1 to 6),

except that for coils supplied in bundles for subsequent spooling or use, it is sufficient to mark each bundle only.

10.3 Packaging

Rods and coils, spools, reels or drums of wire shall be suitably packed to guard against damage, contamination or deterioration during storage and transportation.

NOTE If special conditions apply (e.g. transportation to a tropical region), the purchaser should state them at the time of ordering [see clause 5, j)].

Table 1 — Composition of copper

Material designation		Composition in % (mass fraction)							
		Element	Cu[a]	Bi	0	P	Pb	Other elements (see note)	
Symbol	Number							total	excluding
Cu-ETP	CF004A	min	99,90	–	–	–	–	–	Ag, O
		max.	–	0,000 5	0,040[b]	–	0,005	0,03	
Cu-OF	CF008A	min.	99,95	–	–	–	–	–	Ag
		max.	–	0,000 5	-[c]	–	0,005	0,03	
Cu-DHP	CF024A	min.	99,90	–	–	0,015	–	–	–
		max.	–	–	–	0,040	–	–	

NOTE The total of other elements (than copper) is defined as the sum of Ag, As, Bi, Cd, Co, Cr, Fe, Mn, Ni, 0, P, Pb, S, Sb, Se, Si, Sn, Te and Zn, subject to the exclusion of any individual elements indicated.

[a] Including Ag, up to a maximum of 0,015 %.

[b] Oxygen content up to 0,060 % is permitted, subject to agreement between the purchaser and the supplier.

[c] The oxygen content shall be such that the material conforms to the hydrogen embrittlement requirements of EN 1976.

Table 2 — Composition of miscellaneous copper alloys

Material Designation		Composition in % (mass fraction)													
Symbol	Number	Element	Cu	Al	Bi	Cd	Fe	Mn	Ni	P	Pb	Si	Sn	Zn	Others total
CuSi3Mn1	CF116C	min.	Rem.	—	–	–	—	0,7	–	—	—	2,7	—	—	—
		max.	—	0,05	—	—	0,2	1,3	—	0,05	0,05	3,2	—	0,4	0,5
CuMnSi	CF132C	min.	Rem.	—	–	–	—	0,1	—	—	—	0,1	—	—	—
		max.	—	0,03	—	—	0,03	0,4	0,1	0,015	0,01	0,4	0,1	—	0,2
CuSnIMnSi	CF133C	min.	Rem.	—	–	–	—	0,1	—	—	—	0,1	0,5	–	—
		max.	—	0,03	—	—	0,03	0,4	0,1	0,015	0,01	0,4	1,0	—	0,2
CuP8	CF222E	min.	Rem.	—	—	—	–	—	–	7,5	—	–		—	—
		max.	—	0,01	0,030	0,025[a]	—	—	—	8,1	0,025	—	—	0,05[a]	0,25 (all)
CuMn13Al6Fe2Ni2	CF239E	min.	72,0	5,5	–	—	1,5	9,0	1,5	—	—	—	—	—	—
		max.	78,0	6,5	—	—	2,5	14,0	2,5	—	0,02	0,2	—	0,2	0,5 (all)

[a] Cd + Zn : max. 0,05.

Table 3 — Composition of copper-zinc alloys

Material Designation		Composition in % (mass fraction)										
Symbol	Number	Element	Cu	Al	Fe	Mn	Ni	Pb	Si	Sn	Zn	Others total
CuZn40Si[a]	CF724R[a]	min.	58,5	—	—	—	—	—	0,2	—	Rem.	—
		max.	61,5	0,01	0,25	—	—	0,02	0,4	0,2	—	0,2
CuZn40SiSn[a]	CF725R[a]	min.	58,5	—	—	—	—	—	0,2	0,2	Rem.	—
		max.	61,5	0,01	0,25	—	—	0,02	0,4	0,5	—	0,2
CuZn40MnSi[a]	CF726R[a]	min.	58,5	—	—	0,05	—	—	0,15	—	Rem.	—
		max.	61,5	0,01	0,25	0,25	—	0,02	0,4	0,2	—	0,2
CuZn40MnSiSn[a]	CF727R[a]	min.	58,5	—	—	0,05	—	—	0,15	0,2	Rem.	—
		max.	61,5	0,01	0,25	0,25	—	0,02	0,4	0,5	—	0,2
CuZn39Mn1 SiSn	CF728R	min.	59,0	—	—	0,5	—	—	0,15	0,20	Rem.	—
		max.	61,0	0,05	0,05	1,0	—	0,02	0,40	0,50	—	0,2
CuZn37Si	CF729R	min.	62,5	—	—	—	—	—	0,1	—	Rem.	—
		max.	63,5	0,02	0,05	0,02	0,3	0,05	0,2	0,05	—	0,2
CuZn40Sn1	CF730R	min.	57,0	—	—	—	—	—	—	0,25	Rem.	—
		max.	61,0	0,02	0,2	0,01	—	0,05	0,2	1,0	—	0,2
CuZn40Sn1 MnNiSi[a]	CF731 R[a]	min.	56,0	—	—	0,2	0,5[b]	—	0,1	0,5	Rem.	—
		max.	62,0	0,01	0,25	1,0	1,5	0,02	0,5	1,5	—	0,2
CuZn40Fe1 Sn1 MnSi	CF732R	min.	56,0	—	0,25	0,01	—	—	0,04	0,8	Rem.	—
		max.	60,0	0,01	1,2	0,5	—	0,05	0,15	1,1	—	0,2
CuZn39Fe1 Sn1 MnNiSi	CF733R	min.	56,0	—	0,25	0,01	0,2	—	0,04	0,8	Rem.	—
		max.	60,0	0,01	1,2	0,5	0,8	0,05	0,15	1,1	—	0,2
CuZn40FeSiSn	CF734R	min.	58,5	—	0,1	0,05	—	—	0,15	0,2	Rem.	—
		max.	61,5	0,02	0,5	0,25	—	0,03	0,3	0,5	—	0,2

[a] When ordered as filler metal to meet the requirements of EN 1044; As max. 0,01, Bi max. 0,01, Cd max. 0,025, Sb max. 0,01, total impurities excluding Fe max. 0,2.

[b] When ordered as filler metal to meet the requirements of EN 1044; Ni min. 0,2.

Table 4 — Composition of cooper-tin alloys

Material designation		Composition in % (mass fraction)											
Symbol	Number	Element	Cu	Al	Cd	Fe	Ni	P	Pb	S	Sn	Zn	Others total
CuSn5	CF451K	min.	Rem.	—	—	—	—	0,01	—	—	4,5	—	—
		max.	—	—	—	0,1	0,2	0,4	0,02	—	5,5	0,2	0,2
CuSn6	CF452K	min.	Rem.	—	—	—	—	0,01	—	—	5,5	—	—
		max.	—	—	—	0,1	0,2	0,4	0,02	—	7,0	0,2	0,2
CuSn8	CF453K	min.	Rem.	—	—	—	—	0,01	—	—	7,5	—	—
		max.	—	—	—	0,1	0,2	0,4	0,02	—	8,5	0,2	0,2
CuSn12[a]	CF461 K[a]	min.	Rem.	—	—	—	—	0,01	—	—	11,0	—	—
		max.	—	0,005	0,025	—	—	0,40	0,02	—	13,0	0,05	0,4

[a] When ordered as filler metal to meet the requirements of EN 1044; others individually: max. 0,1.

Table 5 — Composition of copper-aluminium alloys

Material designation		Composition in % (mass fraction)										
Symbol	Number	Element	Cu	Al	Fe	Mn	Ni	Pb	Si	Sn	Zn	Others total
CuAl6Si2Fe	CF301G	min.	Rem.	6,0	0,5	—	—	—	2,0	—	—	—
		max.	—	6,4	0,7	0,1	0,1	0,05	2,4	0,1	0,4	0,2
CuAl 10Fe1	CF305G	min.	Rem.	9,0	0,5	—	—	—	—	—	—	—
		max.	—	10,0	1,5	0,5	1,0	0,02	0,2	—	0,5	0,2
CuAl8	CF309G	min.	Rem.	7,0	—	—	—	—	—	—	—	—
		max.	—	9,0	0,5	0,5	0,5	0,02	0,2	0,1	0,2	0,2
CuAl9Ni4Fe3Mn2	CF310G	min.	Rem.	8,5	2,5	1,0	3,5	—	—	—	—	—
		max.	—	9,5	4,0	2,0	5,5	0,02	0,1	—	0,2	0,2

Table 6 — Composition of copper-nickel-zinc alloys

Material designation		Composition in % (mass fraction)										
Symbol	Number	Element	Cu	Al	Fe	Mn	Ni	Pb	Si	Sn	Zn	Others total
CuNi10Zn42[a]	CF411 J[a]	min.	46,0	—	—	—	8,0	—	0,15	—	Rem.	—
		max.	50,0	0,01	0,25	0,2	11,0	0,02	0,4	0,2	—	0,2

[a] When ordered as filler metal to meet the requirements of EN 1044; As max. 0,01, Bi max. 0,01, Cd max. 0,025, Sb max. 0,01, total impurities excluding Fe max. 0,2.

Table 7 — Available diameters and tolerances on diameter (including circularity)

Values in millimetres

Product form	Diameter	Limit deviations
Wire	0,5	+ 0,01 -0,03
	0,6	
	0,8	
	0,9	
	1,0	
	1,2	
	1,5	
	1,6	
Wire or rod	2,0	+ 0,01 -0,06
	2,4	
	2,5	
	3,0	
	3,2	
Rod	4,0	+ 0,1 -0,1
	5,0	
	6,0	
	8,0	

Table 8 — Tolerances on length of "nominal length" rod

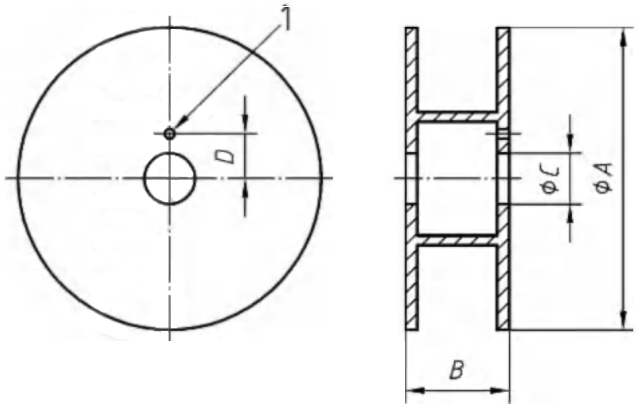
Values in millimetres

Diameter		Preferred (available) lengths	Limit deviations on length
over	up to		
1,2	2,5	500,1 000	±5
2,5	8,0	1 000	±5

Table 9 — Dimensions of preferred spool sizes

Values in millimetres

A		*B*		*C*		*D*		*E*	
Diameter	Limit deviations	Width	Limit deviations	Diameter	Limit deviations	Distance between axes	Limit deviations	Diameter	Limit deviations
100	±2	45	$^{0}_{-2}$	16,0	$^{+1}_{0}$	—	—	—	—
300	±5	103	$^{0}_{-3}$	50,5	$^{+2,5}_{0}$	44,5	±0,5	10	$^{+1}_{0}$
NOTE The dimensions specified in this table are in accordance with ISO 864:1988.									



Key
1 Driving hole diameter *E*

Figure 1 — Spool

Table 10 — Maximum masses for wire on spools

Wire diameters	Maximum masses for wire on spools having flange diameters of	
	100 mm	300 mm
All	1,1 kg	15 kg

Table 11 — Sampling rate

Diameter of rod/wire mm		Size of inspection lot for one test sample kg
over	up to	up to
—	**0,8**	100
0,8	2,0	250
2,0	—	500

NOTE 1 Larger quantities require sampling in proportion, up to a maximum of three test samples for analysis.

NOTE 2 If piece weights are greater than the test frequency indicated, the sampling rate may be reduced to one per piece weight.

Bibliography

In the preparation of this European Standard, use was made of a number of documents for reference purposes. These informative references are cited at the appropriate places in the text and the publications are listed hereafter.

EN 1412, *Copper and copper alloys — European numbering system.*

EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000).*

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

ISO 864:1988, *Arc welding — Solid and tubular cored wires which deposit carbon and carbon manganese steel — Dimensions of wires, spools, rims and coils.*

ISO 1190-1, *Copper and copper alloys — Code of designation — Part 1: Designation of materials.*

ISO 1811-2, *Copper and copper alloys — Selection and preparation of samples for chemical analysis — Part 2: Sampling of wrought products and castings.*

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