BRITISH STANDARD

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1981:2003

Copper and copper alloys — Master alloys

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National foreword

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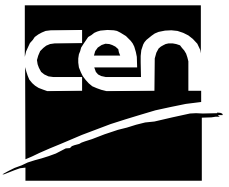

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Contents

Foreword

This document (EN 1981:2003) has been prepared by Technical Committee CEN/TC 133 "Copper and copperalloys", 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of an identical text or by endorsement, at the latest by August 2003, and conflicting national standards shall be withdrawn at the latest by August 2003.

This document supersedes EN 1981:1998.

In comparison with the first edition of EN 1981:1998, the following significant technical changes were made:

a) Subclause 5 h) added;

b) Compositions of the materials in Table 1 partially amended;

c) CuMn20 (CM208E) and CuTi28 (CM235E) deleted;

d) CuCo10 (CM237E), CuLi2 (CM123C), CuMg10 (CM238E), CuNi50 (CM239E), CuSi30(A) (CM240E), CuSi30(B) (CM241E), CuTi30 (CM244E), CuZr50(B) (CM242E), CuZr50(C) (CM243E) added.

Annex A is normative.

According to the 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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard has been prepared at the suggestion of the manufacturers of cast and wrought copper alloys, by representatives of the producers and users of master alloys. There is, at present, no similar international standard for copper-based master alloys.

In several cases more than one grade of a particular master alloy is specified, having differing impurity limits, to satisfy the requirements of various end products.

1 Scope

This European Standard specifies the compositions of copper-based master alloys intended for the manufacture, deoxidation, or desulfurization of cast or wrought alloys, especially those based on copper, supplied in the form of ingots, notched bar, notched slab (waffle plate), granules or broken pieces.

A procedure is included for sampling the master alloys for analysis for verification of conformity to the composition requirements.

A method for the determination of chromium(III)-oxide in chromium-copper master alloy is given in annex A.

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

EN 10204, *Metallic products — Types of inspection documents.*

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 standard, the following terms and definitions apply:

3.1
master alloy
alloy intended to add one or more elements to a melt

3.2
cast
product of one crucible, or one furnace, or one melt

3.3
batch
portion of master alloy taken from one cast

3.4
consignment
collection of products issued or received as one delivery, consisting of one or more batches of one master alloy

4 Designations

4.1 Material

4.1.1 General

The material is designated either by symbol or number (see Table 1).

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 standardised 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 (Copper master alloy);

— number of this European Standard (EN 1981);

— material designation, either symbol, or number (see Table 1);

— material form (the following designations shall be used as appropriate: ING for ingots, NOB for notched bars, NOS for notched slabs, GRN for granules and BPS for broken pieces) (see 6.2).

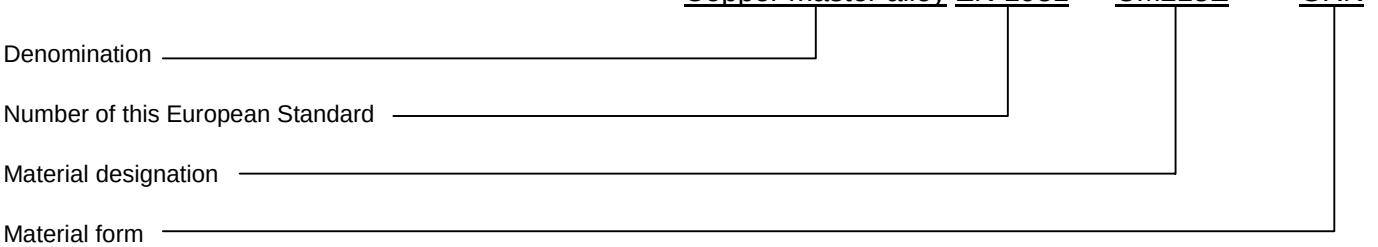
The derivation of a product designation is shown in the following example.

EXAMPLE Copper master alloy conforming to this standard, in material designated either CuP15(B) or CM218E, in the form of granules, shall be designated as follows:

Copper master alloy EN 1981 — CuP15(B) — GRN

or

Copper master alloy EN 1981 — CM218E — GRN



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 (Copper master alloy);

c) number of this European Standard (EN 1981);

d) material designation (see Table 1);

e) material form (see 6.2).

NOTE 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:

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

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

h) whether casts in a consignment shall be kept separate (see 10).

EXAMPLE Ordering details for 500 kg of copper master alloy conforming to EN 1981, 15 % phosphorus designated either CuP15(B) or CM218E, in granular form, with declaration of conformity:

500 kg Copper master alloy EN 1981 — CuP15(B) — GRN
— with declaration of conformity

or

500 kg Copper master alloy EN 1981 — CM218E — GRN
— with declaration of conformity

6 Requirements

6.1 Composition

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

6.2 Product form

The master alloy shall be in one of the following forms, as requested by the purchaser [see 5 e)]:

— ingot;

— notched bar;

— notched slab (waffle plate);

— granules; or

— broken pieces.

The design of the ingot, notched bar, or notched slab shall be at the discretion of the supplier, unless a specific design is requested by the purchaser.

6.3 Physical condition

The products shall be supplied free from dirt or dross and shall contain no extraneous material detrimental to their metallurgical quality.

Broken pieces shall be reasonably free from fine metallic particles.

7 Sampling

7.1 General

When required (e.g., if necessary in accordance with specified procedures of a supplier's quality system, or when the purchaser requests inspection documents with test results, or for use in cases of dispute), an inspection lot shall be sampled in accordance with 7.2 or 7.3.

7.2 Cast analysis

For routine control purposes a sample representative of each cast shall be taken from the furnace, or crucible, during the process of casting, and poured into a clean permanent mould of dimensions appropriate to the chosen method of analysis.

7.3 Cases of dispute

In cases of dispute concerning the composition of a master alloy in a consignment, the method of sampling shall be agreed between the disputing parties.

8 Methods of analysis

8.1 Routine cast analysis

The routine methods of analysis carried out on the sample obtained in accordance with 7.2, to verify conformity of the cast of master alloy to this standard, shall be at the discretion of the supplier.

8.2 Determination of chromium(III)-oxide in alloy CuCr10 (CM202E)

For alloy CuCr10 (CM202E), the method recommended for the determination of Cr_2O_3 is given in annex A.

NOTE A qualitative assessment can be made by examining a polished microsection, under polarized light, at $\times$ 250 magnification.

8.3 Cases of dispute

In cases of dispute concerning the results of analysis of a master alloy, the procedure shall be agreed between the disputing parties.

8.4 Rounding of results

For the purpose of determining conformity to the compositional limits specified in this standard, the result obtained from 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 Table 1.

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 5 f)] 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 5 g)] 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

Each consignment of a master alloy supplied shall be assembled into bundles or containers and shall be labelled with the manufacturer's mark, the material symbol (or material number), and the number(s) of the cast(s) from which the material has been supplied, together with any requirements for the safe handling and storage of the material.

When requested by the purchaser [see 5 h)] and agreed with the supplier, casts shall be kept separate.

Table 1 — Composition of master alloys

Material designation		Composition in % (mass fraction)																		
		Major elements	Maximum impurities																	
																		Further elements	Other elements	
Symbol	Number		Al	As	Bi	C	Fe	Mn	Ni	P	Pb	Sb	Se	Si	Sn	Te	Zn		Each	Total
CuAl50(A)	CM344G	Cu Rem. Al 48,5 to 51,5	[a]	—	—	—	0,25	0,1	0,1	0,05	0,05	—	—	0,15	0,05	—	0,1	Ti 0,01	0,05	0,3
CuAl50(B)	CM345G	Cu Rem. Al 48 to 52	[a]	—	—	—	0,5	0,2	0,1	0,05	0,1	—	—	0,25	0,1	—	0,2	—	0,1	0,5
CuAs30	CM200E	Cu Rem. As 28,5 to 31,5	0,05	[a]	0,05	—	0,2	0,2	0,2	0,05	0,10	0,20	0,03	0,10	0,1	0,03	0,3	Cr 0,10	0,1	0,5
CuB2	CM121C	Cu Rem. B 1,6 to 2,0	0,10	—	—	—	0,10	—	—	—	0,02	—	—	0,15	0,02	—	—	—	0,05	0,3
CuBe4	CM122C	Cu Rem. Be 3,5 to 4,5	0,17	—	—	—	0,17	—	0,1	—	0,02	—	—	0,17	0,03	—	—	Co 0,1 Cr 0,05	0,05	0,3
CuCo10	CM237E	Cu Rem. Co 9,0 to 11,0	—	—	—	—	0,10	—	0,20	0,05	0,05	—	—	—	0,05	—	—	—	0,05	0,3
CuCo15	CM201E	Cu Rem. Co 14,0 to 16,0	—	0,01	0,005	—	0,10	—	0,20	0,10	0,05	0,01	0,005	0,05	0,05	0,005	0,20	—	0,05	0,3
CuCr10	CM202E	Cu Rem. Cr 9,0 to 11,0 [b]	0,02	0,01	0,005	—	0,08	0,03	0,02	0,005	0,02	0,01	0,005	0,02	0,02	0,005	0,10	—	0,05	0,3
CuFe10(A)	CM203E	Cu Rem. Fe 9,0 to 11,0	0,02	0,01	0,005	0,05	[a]	0,1	0,15	0,05	0,03	0,01	0,005	0,05	0,10	0,005	0,1	—	0,05	0,3
CuFe10(B)	CM204E	Cu Rem. Fe 9,0 to 11,0	—	—	—	—	[a]	0,2	0,2	—	0,1	—	—	0,1	0,1	—	0,1	—	0,1	0,5
CuFe15	CM213E	Cu Rem. Fe 14,0 to 16,0	—	—	—	—	[a]	0,15	0,15	—	0,05	—	—	0,10	0,10	—	0,1	—	0,05	0,3
CuFe20(A)	CM205E	Cu Rem. Fe 19,0 to 21,0	0,02	0,01	0,005	0,05	[a]	0,1	0,15	0,05	0,05	0,01	0,005	0,05	0,10	0,005	0,1	—	0,05	0,3
CuFe20(B)	CM206E	Cu Rem. Fe 19,0 to 21,0	—	—	—	—	[a]	0,2	0,2	—	0,1	—	—	0,1	0,1	—	0,1	—	0,1	0,5

Table 1 *(continued)*

Material designation		Composition in % (mass fraction)																		
		Major elements	Maximum impurities																Other elements	
Symbol	Number		Al	As	Bi	C	Fe	Mn	Ni	P	Pb	Sb	Se	Si	Sn	Te	Zn	Further elements	Each	Total
CuLi2	CM123C	Cu Rem. Li 1,6 to 2,2	—	—	—	—	—	—	—	—	—	—	—	0,10	—	—	—	—	0,03	0,2
CuMg10	CM238E	Cu Rem. Mg 9,0 to 11,0	0,05	0,01	0,005	0,05	0,10	—	0,20	0,02	0,03	0,01	0,005	0,05	0,05	0,005	0,10	—	0,05	0,3
CuMg20	CM207E	Cu Rem. Mg 18,0 to 22,0	0,05	0,01	0,005	0,05	0,10	—	0,20	0,02	0,05	0,01	0,005	0,10	0,05	0,005	0,10	—	0,05	0,3
CuMn30(A)	CM209E	Cu Rem. Mn 29,0 to 31,0	0,05	0,02	0,005	0,05	0,20	[a]	0,20	0,02	0,05	0,02	0,005	0,05	0,05	0,005	0,20	Mg 0,05	0,05	0,3
CuMn30(B)	CM210E	Cu Rem. Mn 29 to 31	—	—	—	—	0,5	[a]	0,2	0,05	0,2	—	—	0,2	0,2	—	0,2	—	0,1	0,5
CuMn50	CM211E	Cu Rem. Mn 48,0 to 52,0	—	—	—	—	0,5	[a]	0,2	0,05	0,2	—	—	0,2	0,2	—	0,2	—	0,1	0,5
CuNi30	CM390H	Cu Rem. Ni 29,0 to 31,0	0,05	—	—	0,03	0,8	0,2	[a]	0,02	0,05	—	—	0,05	0,05	—	0,1	—	0,05	0,3
CuNi50	CM239E	Cu Rem. Ni 48,5 to 51,5	0,05	—	—	0,05	0,3	0,2	[a]	0,03	0,05	—	—	0,05	0,05	—	0,1	—	0,05	0,3
CuP10(A)	CM215E	Cu Rem. P 9,5 to 11,0	0,02	0,01	0,005	—	0,10	0,10	0,10	[a]	0,03	0,01	0,005	0,05	0,05	0,005	0,05	—	0,05	0,3
CuP10(B)	CM216E	Cu Rem. P 9,5 to 11,0	—	—	—	—	0,20	—	0,20	[a]	0,20	—	—	—	0,2	—	0,2	—	0,1	0,5
CuP15(A)	CM217E	Cu Rem. P 13,5 to 15,0	0,02	0,01	0,005	—	0,10	0,10	0,10	[a]	0,03	0,01	0,005	0,05	0,05	0,005	0,05	—	0,05	0,3
CuP15(B)	CM 218E	Cu Rem. P 13,5 to 15,0	—	—	—	—	0,10	—	0,10	[a]	0,10	—	—	—	0,1	—	0,1	—	0,10	0,4
CuP15(C)	CM 219E	Cu Rem. P 13,5 to 15,0	—	—	—	—	0,20	—	0,20	[a]	0,20	—	—	—	0,2	—	0,2	—	0,1	0,5

Table 1 *(continued)*

Material designation		Composition in % (mass fraction)																		
		Major elements	Maximum impurities																Other elements	
Symbol	Number		Al	As	Bi	C	Fe	Mn	Ni	P	Pb	Sb	Se	Si	Sn	Te	Zn	Further elements	Each	Total
CuS20	CM230E	Cu Rem. [c] S 18 to 22	—	—	—	—	0,02	—	—	—	0,02	—	—	—	0,20	—	0,02	—	0,05	0,3
CuSi10(A)	CM231E	Cu Rem. Si 9,0 to 11,0	0,03	0,01	0,005	—	0,20	0,10	0,1	0,05	0,05	0,01	0,005	[a]	0,05	0,005	0,10	—	0,05	0,3
CuSi10(B)	CM232E	Cu Rem. Si 9 to 11	0,05	—	—	—	0,5	0,2	0,2	—	0,20	—	—	[a]	0,2	—	0,1	—	0,1	0,5
CuSi20(A)	CM233E	Cu Rem. Si 19,0 to 21,0	0,05	0,02	0,01	—	0,4	0,2	0,2	0,05	0,1	0,02	0,01	[a]	0,1	0,01	0,1	—	0,05	0,3
CuSi20(B)	CM234E	Cu Rem. Si 19 to 21	0,05	—	—	—	0,6	0,2	0,2	—	0,2	—	—	[a]	0,2	—	0,1	—	0,1	0,5
CuSi30(A)	CM240E	Cu Rem. Si 28,5 to 31,5	0,05	0,03	0,015	—	0,60	0,2	0,2	0,05	0,1	0,02	0,01	[a]	0,1	0,01	0,1	—	0,05	0,3
CuSi30(B)	CM241E	Cu Rem. Si 28,0 to 32,0	0,10	—	—	—	0,7	0,2	0,2	—	0,2	—	—	[a]	0,2	—	0,2	—	0,1	0,5
CuTi30	CM244E	Cu Rem. Ti 28,5 to 31,5	0,10	—	0,005	—	0,1	—	—	—	0,05	—	—	0,05	0,05	0,005	0,05	—	0,05	0,3
CuZr50(A)	CM236E	Cu Rem. Zr 49,0 to 53,0	0,05	—	0,005	—	0,1	—	—	—	0,05	—	—	0,05	0,20	0,005	—	Hf 2,5	0,1	0,5
CuZr50(B)	CM242E	Cu Rem. Zr 49,0 to 53,0	0,05	—	0,005	—	0,1	—	—	—	0,05	—	—	0,05	0,20	0,005	—	Nb 2,0	0,1	0,5
CuZr50(C)	CM243E	Cu Rem. Zr 49,0 to 53,0	0,05	—	0,005	—	0,20	—	—	—	0,05	—	—	0,05	0,8	0,005	—	—	0,1	0,5

NOTE A dash (—) indicates "not specified" but is included in other elements. Only specified elements should be determined unless otherwise agreed between the supplier and the customer.

[a] See major elements column.
[b] Cr_2O_3 max. 0,5
[c] Free copper max. 5,0

Annex A
(normative)

Method for determination of chromium(III)-oxide in alloy CuCr10 (CM202E)

A.1 General

This annex specifies a method suitable for the determination of chromium(III)-oxide in master alloy CuCr10 (CM202E).

A.2 Principle

A representative sample of the master alloy is dissolved in a nitric/sulfuric acid mixture, in which Cr_2O_3 is insoluble. Any Cr_2O_3 present is filtered and determined gravimetrically.

A.3 Procedure

Dissolve 2,0 g of turnings or millings in a mixture of 75 ml nitric acid (ρ = 1,2 g/cm^3) and 150 ml sulfuric acid (ρ = 1,4 g/cm^3). Heat until the sample has dissolved and fumes have ceased to be evolved. Cool and dilute to about 400 ml with demineralised water. Filter through a fine grade filter paper and wash thoroughly. Ignite the filter paper in a platinium dish and weigh the residue as Cr_2O_3.

A.4 Expression of the result

Express the result, as Cr_2O_3, in percent (mass fraction).

Bibliography

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

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

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

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