

Copper and copper alloys — Products of high conductivity copper for electronic tubes, semiconductor devices and vacuum applications

The European Standard EN 13604:2002 has the status of a British Standard

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National foreword

This British Standard is the official English language version of EN 13604:2002.

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;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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English version

**Copper and copper alloys - Products of high conductivity copper
for electronic tubes, semiconductor devices and vacuum
applications**

Cuivre et alliages de cuivre - Produits en cuivre de haute
conductivité pour application dans les tubes électroniques,
semi-conducteurs et vide

Kupfer und Kupferlegierungen - Produkte aus
hochleitfähigem Kupfer für Elektronenröhren,
Halbleiterbauelemente und für die Anwendung in der
Vakuumtechnik

This European Standard was approved by CEN on 14 March 2002.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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Foreword

This document EN 13604:2002 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of an identical text or by endorsement, at the latest by January 2003, and conflicting national standards shall be withdrawn at the latest by January 2003.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 5 "Copper for electrical purposes" to prepare the following standard:

EN 13604, *Copper and copper alloys — Products of high conductivity copper for electronic tubes, semiconductor devices and vacuum applications.*

The two copper grades Cu-OFE (CW009A) and Cu-PHCE (CW022A) specified in this European Standard are those which are especially suitable for electronic, semiconductor and vacuum applications.

Annex A (normative) is the reference for microscopic examination.

Annex B (informative) gives guidance on the characteristics of coppers for electrical purposes.

This is one of a series of European Standards for copper products for electrical purposes. Other copper products are specified as follows:

EN 13599, *Copper and copper alloys — Copper plate, sheet and strip for electrical purposes.*

EN 13600, *Copper and copper alloys — Seamless copper tubes for electrical purposes.*

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

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

EN 13605, *Copper and copper alloys — Copper profiles and profiled wire for electrical purposes.*

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, 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 including electrical properties and tolerances on dimensions and form of two copper grades Cu-OFE (CW009A) and Cu-PHCE (CW022A), for electronic and semiconductor devices as well as for vacuum applications, in the form of wrought products, e.g. plate, sheet, strip, seamless tube, rod, bar, wire, profiles.

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

This European Standard applies to the wrought copper products as delivered to the device manufacturer, i.e. for further fabrication.

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

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test (at ambient temperature).*

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

EN 13599, *Copper and copper alloys — Copper plate, sheet and strip for electrical purposes.*

EN 13600, *Copper and copper alloys — Seamless copper tubes for electrical purposes.*

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

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

EN 13605, *Copper and copper alloys — Copper profiles and profiled wire for electrical purposes.*

EN ISO 2624, *Copper and copper alloys — Estimation of average grain size (ISO 2624:1990).*

EN ISO 2626, *Copper — Hydrogen embrittlement test (ISO 2626:1973).*

EN ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method (ISO 6506-1:1999).*

EN ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method (ISO 6507-1:1997).*

EN ISO 7438, *Metallic materials — Bend test (ISO 7438:1985).*

IEC 60468, *Method of measurement of resistivity of metallic materials.*

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

ISO 4746, *Oxygen-free copper — Scale adhesion test.*

ISO 7801, *Metallic materials — Wire — Reverse bend test.*

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 terms and definitions given in EN 13599, EN 13600, EN 13601, EN 13602 and EN 13605 apply.

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 Material condition

For the purposes of this standard, the following designations, which are in accordance with the system given in EN 1173, apply for the material condition:

M Material condition for the product as manufactured without specified mechanical properties;

D Material condition for the product as drawn without specified mechanical properties;

H...Material condition designated by the minimum value of hardness requirement for the product with mandatory hardness requirements;

R...Material condition designated by the minimum value of tensile strength requirement for the product with mandatory tensile strength requirement (and other tensile property requirements, dependent on product);

A...Material condition designated by the minimum value of elongation requirement for the product with mandatory elongation requirements.

NOTE Products in the H... condition may be specified to Vickers or Brinell hardness, dependent on the product. The material condition designation H... is the same for both hardness test methods.

Exact conversion between the material conditions designated H... and R..., or R... and A..., dependent on the product, is not possible.

Material condition is designated by only one of the above designations.

4.3 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.