BS EN 12164:2024

BSI Standards Publication

Copper and copper alloys — Rod for free machining purposes

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National foreword

This British Standard is the UK implementation of EN 12164:2024. It supersedes BS EN 12164:2016, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee NFE/34, Copper and copper alloys.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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UK Government is responsible for legislation. For information on legislation and policies relating to that legislation, consult the relevant pages of www.gov.uk.

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Date	Text affected

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12164

October 2024

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Supersedes EN 12164:2016

English Version

Copper and copper alloys - Rod for free machining purposes

Cuivre et alliages de cuivre - Barres pour décolletage

Kupfer und Kupferlegierungen - Stangen für die spanende Bearbeitung

This European Standard was approved by CEN on 19 August 2024.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 12164:2024) 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of an identical text or by endorsement, at the latest by April 2025, and conflicting national standards shall be withdrawn at the latest by April 2025.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12164:2016.

In comparison with EN 12164:2016, the following significant technical changes were made:

a) Introduction of eddy current test parameters in 6.6;

b) Introduction of 6.7 Internal inclusion;

c) Modification of shape and size of test pieces for Tensile test;

d) Modification of the definition of diameter or width across-flats in 6.5.1;

e) Addition of a new Figure for straightness at 6.5.3 and modification of description of straightness measurement in Table 18;

f) Introduction in the chemical composition Tables of a footnote to explain the meaning of elements for which no upper and lower limits are specified;

g) Deletion of alloys groups in Table 7;

h) Addition of CuSi4Zn4MnP (CW245E) and CuSi4Zn9MnP (CW246E) in the new Table 3 and new Table 10;

i) Modification of the chemical composition of CuZn39Pb3 (CW614N), CuZn40Pb2 (CW617N), CuZn35Pb1,5AlAs (CW625N) and CuZn33Pb1,5AlAs (CW626N) in Table 7;

j) Addition of a new alloy CuZn40Pb1 (CW627N) in Table 7 and Table 14;

k) Modification of the chemical composition of CuZn33Pb1AlSiAs (CW725R) in Table 8;

l) Addition of CuNi12Zn38Mn5Pb2 (CW407J) in Table 4 and Table 11;

m) Addition of a new alloy CuZn36Si1P (CW726R) in Table 8 and Table 15;

n) Modification of the range of width across-flats for CuZn21Si3P (CW724R) in Table 15;

o) Addition of Table 23 and Table 24;

p) Addition of Annex ZA.

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

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

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

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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Introduction

The European Committee for Standardization (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning the alloys CuSi4Zn4MnP (CW245E), CuSi4Zn9MnP (CW246E) and CuZn36Si1P (CW726R) given in 6.1.

CEN takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has ensured the CEN that he is willing to negotiate licenses either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with CEN.

— For CuSi4Zn4MnP (CW245E) and CuSi4Zn9MnP (CW246E) information may be obtained from:

  Viega Technology GmbH & Co. KG
  Viega Platz 1
  57439 Attendorn
  GERMANY

— For CuZn36Si1P (CW726R) information may be obtained from:

  Luvata Oy
  Kuparitie 5
  28330 Pori
  FINLAND

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. CEN shall not be held responsible for identifying any or all such patent rights.

CEN and CENELEC maintain online lists of patents relevant to their standards. Users are encouraged to consult the lists for the most up to date information concerning patents (https://www.cencenelec.eu/european-standardization/ipr-and-patents/patents/).

Due to developing legislation, the composition of a material may be restricted to the composition specified in this European Standard with respect to individual uses (e.g. for the use in contact with drinking water in some Member States of the European Union). These individual restrictions are not part of this European Standard. Nevertheless, for materials for which traditional and major uses are affected, these restrictions are indicated. The absence of an indication, however, does not imply that the material can be used in any application without any legal restriction.

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1 Scope

This document specifies the composition, property requirements and dimensional tolerances for copper alloy rod, in the shape of circles, squares, hexagons or octagons, finally produced by drawing or extruding, especially intended for free machining purposes.

The sampling procedures and the methods of test for verification of conformity to the requirements of this document are also specified.

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.

EN 764-5:2014, *Pressure equipment - Part 5: Inspection documentation of metallic materials and compliance with the material specification*

EN 10204:2004, *Metallic products - Types of inspection documents*

EN 14977:2006, *Copper and copper alloys - Detection of tensile stress - 5 % ammonia test*

EN 17263:2019, *Copper and copper alloys - Eddy current testing on the outer surface of rods, bars, hollow rods and wires for the detection of defects by encircling test coil*

EN ISO 6506-1:2014, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1:2014)*

EN ISO 6509-1:2014, *Corrosion of metals and alloys - Determination of dezincification resistance of copper alloys with zinc - Part 1: Test method (ISO 6509-1:2014)*

EN ISO 6892-1:2019, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1:2019)*

ISO 6957:1988, *Copper alloys — Ammonia test for stress corrosion resistance*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
rod
straight product of uniform cross-section along its whole length

[SOURCE: EN 12163:2016, 3.1]

3.2
deviation from circular form
difference between the maximum and the minimum diameters measured at any one cross-section of a round product

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4 Designations

4.1 Material

4.1.1 General

The material is designated either by symbol or by number (see Tables 2 to 8).

4.1.2 Symbol

The material symbol designation is based on the designation system given in ISO 1190-1:1982.

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 1190-1:1982, 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 1412:2016.

4.2 Material condition

For the purposes of this standard, the following designations, which are in accordance with the system given in EN 1173:2008, apply for the material condition:

M	material condition for the product as manufactured, without specified mechanical properties;
R...	material condition designated by the minimum value of tensile strength requirement for the product with mandatory tensile property requirements;
H...	material condition designated by the minimum value of hardness requirement for the product with mandatory hardness requirements;
S (suffix)	material condition for a product which is stress relieved.

Products in the M, R… or H… condition may be specially processed (i.e. mechanically or thermally stress relieved) in order to lower the residual stress level to improve the resistance to stress corrosion and the dimensional stability on machining [see Clause 5, list entry m), list entry n) and 8.5].

Exact conversion between material conditions designated R... and H... is not possible.

Except when the suffix S is used, 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 can be 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.

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

— denomination (Rod);

— number of this European Standard (EN 12164);

— material designation, either symbol or number (see Tables 2 to 8);

— DW for compliance in the chemical composition according to the 4 MS Common Composition List. This information is mandatory in the case in which the product is used for drinking water applications according to the 4 MS Common Composition List and not to be given in other cases (see Bibliography [5]);

— material condition designation (see Tables 9 to 15);

— cross-sectional shape (the following designations shall be used, as appropriate: RND for round, SQR for square, HEX for hexagonal, OCT for octagonal);

— nominal cross-sectional dimension (diameter or width across-flats);

— for round rod, the tolerance class (see Table 16);

— for square, hexagonal or octagonal rod, the corner shape (the following designations shall be used as appropriate: SH for sharp, RD for rounded) (see Table 20).

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

EXAMPLE 1 Rod for free machining purposes conforming to this standard, in material designated either CuZn40Pb2 or CW617N, for standard applications, in material condition R430, round cross-section, nominal diameter 30 mm, tolerance Class A, will be designated as follows:

Rod EN 12164 — CuZn40Pb2 — R430 — RND30A

or

Rod EN 12164 — CW617N — R430 — RND30A

Denomination

Number of this European Standard

Material designation

Material condition designation

Cross-sectional shape, nominal cross-sectional dimension in millimetres, tolerance class

EXAMPLE 2 Rod for free machining purposes conforming to this standard, in material designated either CuZn40Pb2 or CW617N, for drinking water applications according to the 4 MS Common Composition List, in material condition R430, round cross-section, nominal diameter 30 mm, tolerance Class A, will be designated as follows:

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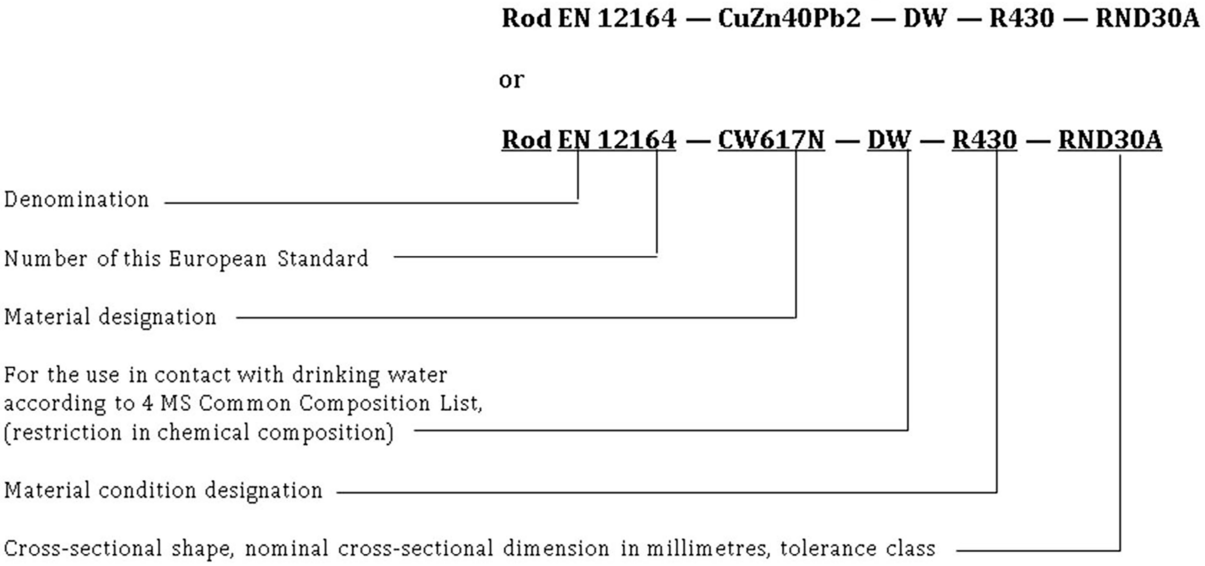

5 Ordering information

In order to facilitate the enquiry, order and confirmation of order procedures the following information shall be specified:

a) mass of product required;

b) denomination (Rod);

c) number of this European Standard (EN 12164);

d) material designation (see Tables 2 to 8);

e) material condition designation (see 4.2 and Tables 9 to 15) if it is other than M;

f) DW for compliance in the chemical composition according to the 4 MS Common Composition List. This information is mandatory in the case in which the product is used for drinking water applications according to the 4 MS Common Composition List and not to be given in other cases;

g) cross-sectional shape;

h) nominal cross-sectional dimension (diameter or width across-flats);

i) for round rod up to and including 30 mm diameter, whether Class A or Class B tolerances are required, unless the tolerance class shall be left to the discretion of the supplier (see Table 16);

j) for rod with square, hexagonal and octagonal cross-section, whether “sharp” or “rounded” corners are required unless the corner radii of the rod shall be left to the discretion of the supplier (see 6.5.5 and Table 20);

k) length of product required. Normally rod is supplied to “nominal length” tolerances (see Table 19). If “fixed lengths” are required, the length and tolerance shall be stated (see 6.5.4).

It is recommended that the product designation, as described in 4.3, is used for items b) to k).

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

l) whether the products according to 6.3, are required to pass a dezincification resistance test (see 8.4)

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m) whether the products are required to pass a stress corrosion resistance test. If so which test method shall be used (see 8.5), if the choice is not to be left to the discretion of the supplier;

n) whether the products shall be supplied in a thermally stress relieved material condition;

o) whether the products shall be supplied with shaped ends which are different from those specified in 6.5.7;

p) whether special surface quality is required (see 6.6);

q) whether surface quality test is required (see 6.6) and the class;

r) whether a certificate of compliance is required (see 9.1);

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

t) whether there are any special requirements for marking, packaging or labelling (see Clause 10).

EXAMPLE Ordering details for 500 kg rod for free machining purposes conforming to EN 12164, in material designated either CuZn40Pb2 or CW617N, for drinking water application according to the 4 MS Common Composition List, in material condition R430, round cross-section, nominal diameter 30 mm, tolerance Class A, nominal length 3 000 mm:

500 kg **Rod** **— CuZn40Pb2 — DW — R430 — RND30A**
EN 12164

— nominal length 3 000 mm

or

500 kg **Rod** **— CW617N — DW — R430 — RND30A**
EN 12164

— nominal length 3 000 mm

6 Requirements

6.1 Composition

The composition shall conform to the requirements for the appropriate material given in Tables 2 to 8.

Due to developing legislation, specific applications (see 4.3) may require restrictions in the chemical composition. In this case the limitations shall be specified in the ordering information (see Clause 5 list entry f)).

6.2 Mechanical properties

The tensile or the hardness properties shall conform to the appropriate requirements given in Tables 9 to 15. The tests shall be carried out in accordance with 8.2 or 8.3.

6.3 Resistance to dezincification

This requirement only applies to materials that are declared resistant to dezincification.

The maximum depth of dezincification, in any direction, of CuZn38As (CW511L), CuZn36Pb2As (CW602N), CuZn32Pb2AsFeSi (CW709R), CuZn21Si3P (CW724R) and CuZn33Pb1AlSiAs (CW725R) products shall not exceed 100 µm. For the alloys CuZn35Pb1,5AlAs (CW625N), CuZn33Pb1,5AlAs (CW626N) the maximum depth of dezincification, in any direction, shall not exceed 200 µm.

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