



SLOVENSKI STANDARD
SIST EN 12420:2024

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Baker in bakrove zlitine - Izkovki

Copper and copper alloys - Forgings

Kupfer und Kupferlegierungen - Schmiedestücke

Cuivre et alliages de cuivre - Pièces forgées

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Copper and copper alloys - Forgings

Cuivre et alliages de cuivre - Pièces forgées

Kupfer und Kupferlegierungen - Schmiedestücke

This European Standard was approved by CEN on 30 June 2024.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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EN 12420:2024 (E)**European foreword**

This document (EN 12420:2024) 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of an identical text or by endorsement, at the latest by April 2025, and conflicting national standards shall be withdrawn at the latest by April 2025.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 12420:2014.

In comparison with EN 12420:2014, the following significant technical changes were made:

- 1) Introduction in the chemical composition Tables of a footnote to explain the meaning of elements for which no upper and lower limits are specified;
- 2) CuSi4Zn4MnP (CW245E) and CuSi4Zn9MnP (CW246E) added in the new Table 3 and Table 10;
- 3) Chemical composition of CuZn39Pb3 (CW614N), CuZn40Pb2 (CW617N), CuZn35Pb1,5AlAs (CW625N) and CuZn33Pb1,5AlAs (CW626N) modified in Table 8;
- 4) Added a new alloy CuZn40Pb1 (CW627N) in Table 8, Table 10 and Table B.1;
- 5) Chemical composition of CuZn33Pb1AlSiAs (CW725R) modified in Table 9;
- 6) Added a new alloy CuZn36Si1P (CW726R) in Table 9, Table 10 and Table B.1;
- 7) Added new Table 12 for Hardness properties for forgings of material group III.

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This 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:

- 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 bars for general purposes;
- EN 12168, Copper and copper alloys — Hollow rod for free machining 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/she is willing to negotiate licences under reasonable and not-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 (<http://www.cen.eu/cen/WorkArea/IPR/Pages/default.aspx>) and CENELEC (<http://www.cenelec.eu/membersandexperts/toolsandapplications/index.html>) 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.

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.

1 Scope

This document specifies the composition, the property requirements and tolerances on dimensions and form for copper and copper alloy die and hand forgings.

The sampling procedures, the methods of test for verification of conformity to the requirements of this document, and the delivery conditions 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 1173:2008, *Copper and copper alloys - Material condition designation*

EN 1412:2016, *Copper and copper alloys - European numbering system*

EN 1976:2012, *Copper and copper alloys - Cast unwrought copper products*

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

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)*

ISO 1190-1:1982, *Copper and copper alloys — Code of designation — Part 1: Designation of materials*

ISO 2768-1:1989, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

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 <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

forging

wrought product, hot formed by hammering or pressing

3.1.1

die forging

forging produced between closed dies

EN 12420:2024 (E)**3.1.2****hand forging**

forging produced between open dies

3.1.3**cored forging**

forging produced between closed dies including cores

3.2**deviation from concentricity**

half of the difference between the maximum and the minimum wall thickness (s_{\max} and s_{\min}), measured in the same plane perpendicular to the axis of the forging

Note 1 to entry: Deviation from concentricity (mm) = $(s_{\max} - s_{\min})/2$.

3.3**inspection lot**

definite quantity of products of the same cross-sectional dimensions, the same material and material condition, collected together for inspection (testing)

4 Designations**4.1 Material****4.1.1 General**

The material is designated either by symbol or number (see Tables 1 to 9).

4.1.2 Symbol

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

NOTE //std 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 shall be in accordance with the system given in EN 1412:2016.

4.2 Material condition

For the purposes of this document, 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; |
| 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 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 g) and list entry i)].

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 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.

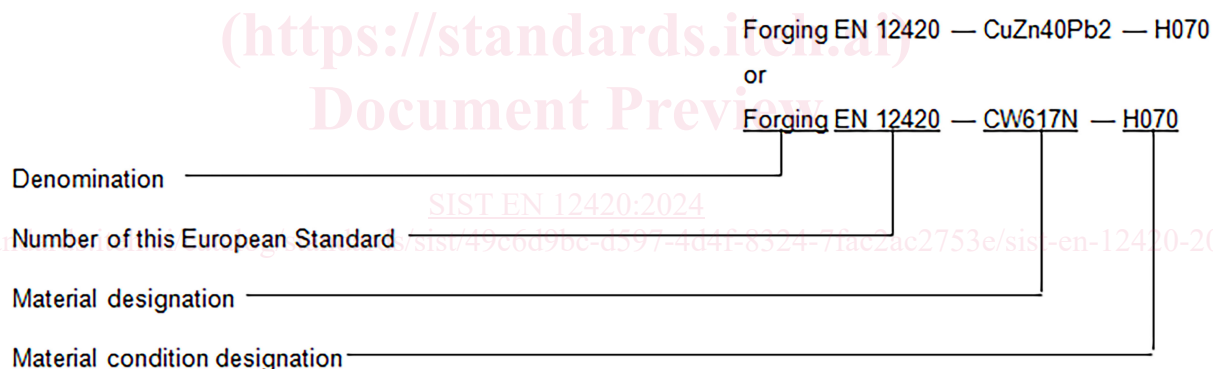
The product designation is no substitute for the full content of the standard.

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

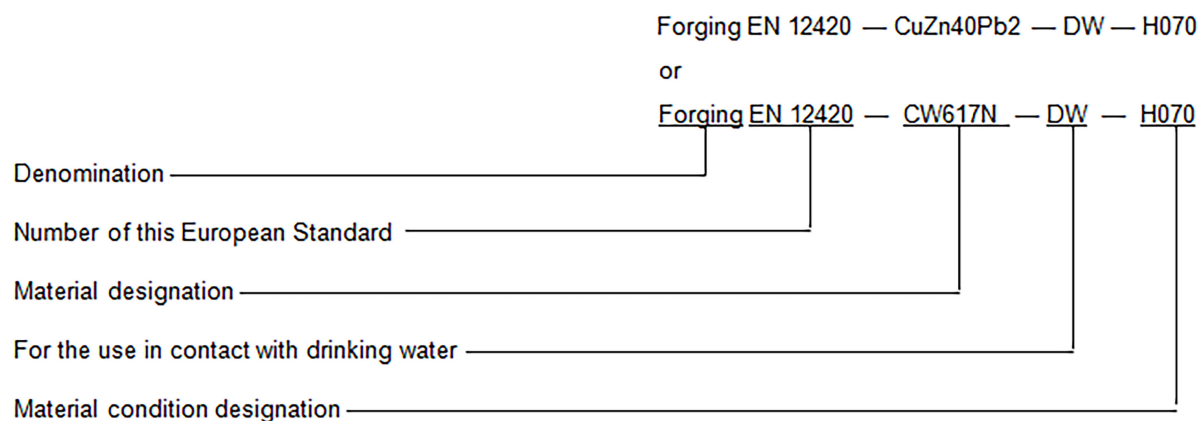
- denomination (Forging);
- number of this document (EN 12420);
- material designation, either symbol or number (see Tables 1 to 9);
- for the use in contact with drinking water: DW for compliance in the chemical composition according to 4 MS Common Composition List (see Bibliography [5]);
- material condition designation (see Tables 10 and 12).

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

EXAMPLE 1 Forging conforming to this standard, in material designated either CuZn40Pb2 or CW617N, for standard applications, in material condition H070, will be designated as follows:



EXAMPLE 2 Forging conforming to this standard, in material designed either CuZn40Pb2 or CW617N, for the use in contact with drinking water DW, in material condition H070, will be designated as follows:



EN 12420:2024 (E)**5 Ordering information**

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

- a) quantity of product required (mass or number of pieces);
- b) denomination (Forging);
- c) number of this document (EN 12420);
- d) material designation (see Tables 1 to 9);
- e) material condition designation (see 4.2 and Tables 10 to 12) if it is other than M;
- f) for the use in contact with drinking water: DW for compliance in the chemical composition according to 4 MS Common Composition List;
- g) nominal dimensions and/or tolerance drawing of the forging or finished part including the number of the drawing (see 6.6).

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

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

- h) whether the products according to 6.3, are required to pass a dezincification resistance test (see 8.4)
- i) whether the products are required to pass a stress corrosion resistance test. If so, which test method is to be used (see 8.5) if the choice is not to be left to the discretion of the supplier. If it is chosen ISO 6957:1988, the pH value for the test solution is to be selected;
- j) whether the products are to be supplied in a thermally stress relieved condition;
- k) when requested, tensile properties have to be agreed between the involved parties (see 6.2.2 and Tables B.1 to B.3);
- l) whether a certificate of compliance is required (see 9.1);
- m) whether an inspection document is required, and if so, which type (see 9.2);
- n) whether there are any special requirements for marking, labelling or packaging (see Clause 10).

EXAMPLE Ordering details for 200 forgings conforming to EN 12420, in material designated either CuZn40Pb2 or CW617N, for the use in contact with drinking water DW, in material condition H070, according to drawing number XY000:

200 pieces Forging EN 12420 — CuZn40Pb2 — DW — H070 — drawing number XY000

or

200 pieces Forging EN 12420 — CW617N — DW — H070 — drawing number XY000

6 Requirements

6.1 Composition

The composition shall conform to the requirements for the appropriate material given in Tables 1 to 9. In the same tables the hot working attitude is also reported.

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

NOTE As the materials specified in this standard vary considerably e.g. in their resistance to forming, forging temperature and pressure, die wear and stresses, they have been classified into three groups of similar hot working attitudes (I, II or III in descending order of hot working attitude).

A direct proportionality exists between the group and preheating temperature.

6.2 Mechanical properties

6.2.1 Hardness properties

The hardness properties shall conform to the appropriate requirements given in Tables 10 to 12. For the alloys not mentioned in these tables the hardness values shall be agreed between the involved parties.

6.2.2 Tensile properties

This standard does not specify mandatory tensile properties. The values for the tensile properties given in Tables B.1 to B.3 of Annex B are for information only.

6.3 Electrical properties

Forgings materials listed in Table 13 shall conform to the electrical properties specified in the same table.

6.4 Resistance to dezincification

<https://standards.iteh.ai/> This requirement only applies to materials that are declared resistant to dezincification. <https://standards.iteh.ai/standards/en-12420-2024>

The maximum depth of dezincification, in any direction, of CuZn38As (CW511L), CuZn36Pb2As (CW602N), CuZn35Pb1,5AlAs (CW625N), CuZn33Pb1,5AlAs (CW626N), CuZn32Pb2AsFeSi (CW709R), CuZn21Si3P (CW724R) and CuZn33Pb1AlSiAs (CW725R) products shall not exceed 150 μm .

The amount of β phase for CuZn38As (CW511L), CuZn36Pb2As (CW602N), CuZn35Pb1,5AlAs (CW625N), CuZn33Pb1,5AlAs (CW626N), CuZn32Pb2AsFeSi (CW709R) and CuZn33Pb1AlSiAs (CW725R) shall be less than 3 %.

The test shall be carried out in accordance with 8.4.

Products in alloys other than CuZn21Si3P (CW724R) shall be subjected to heat treatment approximately in the range 500 °C to 550 °C after hot stamping. Should the user need to heat the material above 530 °C (i.e. soldering, brazing or welding operations) then advice should be sought from the supplier.

6.5 Residual stress level

Forgings ordered in the stress relieved condition (see 4.2, 2nd paragraph) shall show no evidence of cracking when tested. The tests shall be carried out in accordance with 8.5.

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6.6 Tolerances for die forgings

6.6.1 General

Tolerances on dimensions and on form indicated in the drawings of a forging shall conform to the tolerances specified in this standard. If no tolerances are indicated in the drawings, the tolerances according to ISO 2768-1:1989, Tolerance Class c, shall apply. When more than one general tolerance is applicable, the larger of the possible general tolerances shall be used.

It is recommended that reference to this standard is made on the drawings.

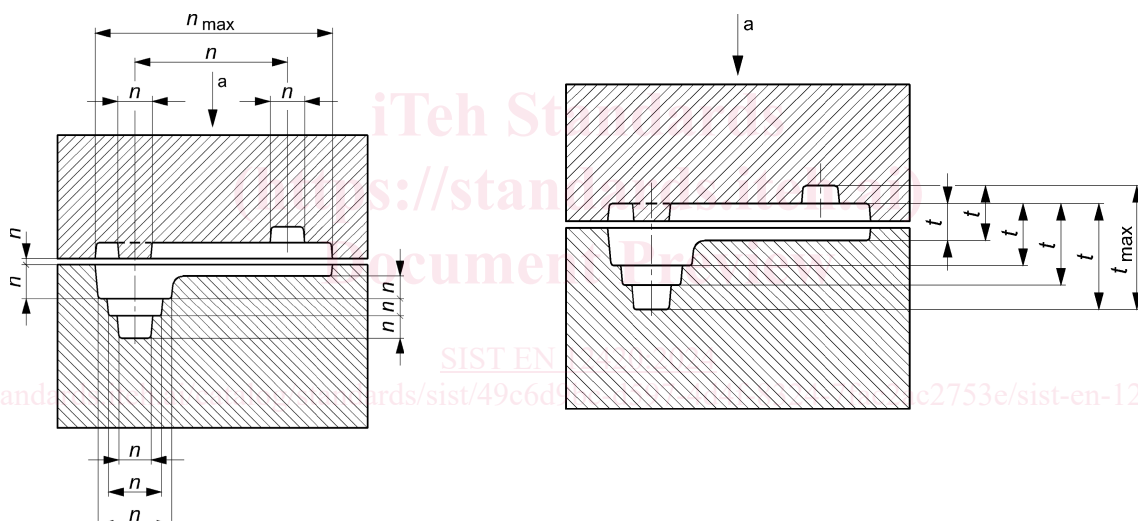
Two different types of dimensions are distinguished for die forgings:

- a) dimensions within the die cavity which originate from the forging shape in one separate die part and which does not have components moving towards one another, see dimensions n in Figure 1.

These die parts may consist of one single piece or of several components immovable towards one another.

- b) dimensions across the die parting line which originate from two or more die parts moving towards one another, see dimensions t in Figure 2.

The die forging produced in the dies demonstrated in Figure 1 and Figure 2 is shown in Figure 3.



Key

a direction of forging

a direction of forging

Figure 1 — Dimensions n within the die cavity

Figure 2 — Dimensions t across the die parting line

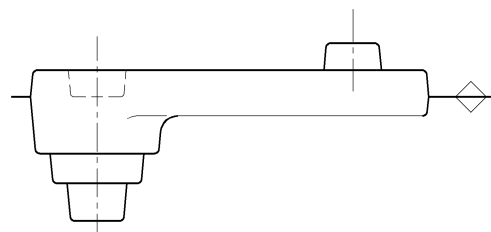


Figure 3 — Die forging

For recommended machining allowances and total allowances see A.3.10 and Table A.6.