SLOVENSKI STANDARD
oSIST prEN 12420:2022

01-oktober-2022

Baker in bakrove zlitine - Izkovki

Copper and copper alloys - Forgings

Kupfer und Kupferlegierungen - Schmiedestücke

Cuivre et alliages de cuivre - Pièces forgées

Ta slovenski standard je istoveten z: **prEN 12420**

ICS:

77.150.30	Bakreni izdelki	Copper products

oSIST prEN 12420:2022 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

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ICS 77.150.30

Will supersede EN 12420:2014

English Version

Copper and copper alloys - Forgings

Cuivre et alliages de cuivre - Pièces forgées

Kupfer und Kupferlegierungen - Schmiedestücke

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 133.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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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

Ref. No. prEN 12420:2022 E

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European foreword

This document (prEN 12420:2022) has been prepared by Technical Committee CEN/TC 133 “Copper and copper alloys”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede 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 defined;

2) CuZn4Si4MnP (CW245E) and CuZn9Si4MnP (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.

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 given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

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 CuZn4Si4MnP (CW245E), CuZn9Si4MnP (CW246E), CuZn33Pb1AlSiAs (CW725R), 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 CuZn4Si4MnP (CW245E) and CuZn9Si4MnP (CW246E) information may be obtained from:

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

— For CuZn33Pb1AlSiAs (CW725R) information may be obtained from:

Diehl Brass Solutions Stiftung & Co. KG
Heinrich-Diehl-Straße 9
D-90552 Röthenbach/Pegnitz
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 1173:2008, *Copper and copper alloys - Material condition designation*

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

EN 1655:1997, *Copper and copper alloys - Declarations of conformity*

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

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

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 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*

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

3 Terms and definitions

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

ISO and IEC maintain terminological 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

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 (smax and smin), measured in the same plane perpendicular to the axis of the forging

Note 1 to entry: Deviation from concentricity (mm) = (smax – smin)/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 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, 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 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 h)].

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);

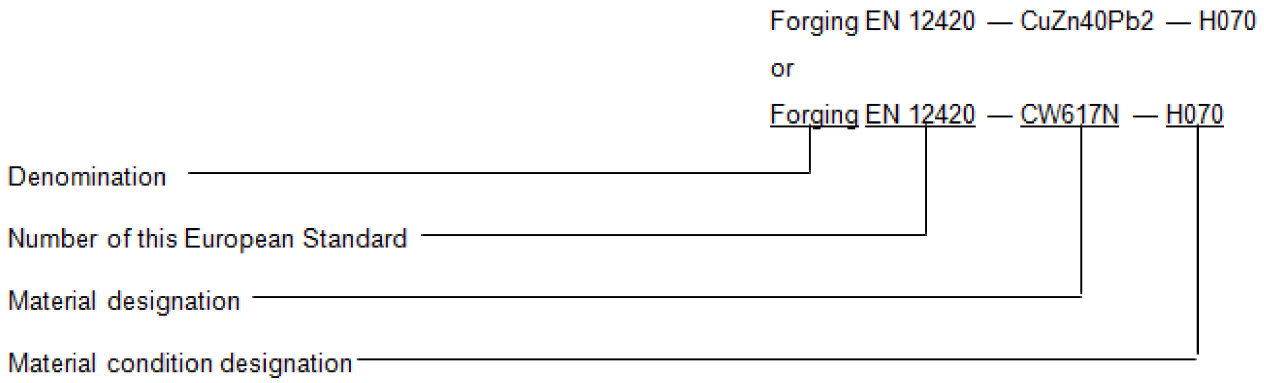
— material designation, either symbol or number (see Tables 1 to 9);

— for the use in contact with drinking water: DW for compliance in the chemical composition according to 4 MS Common Composition List;

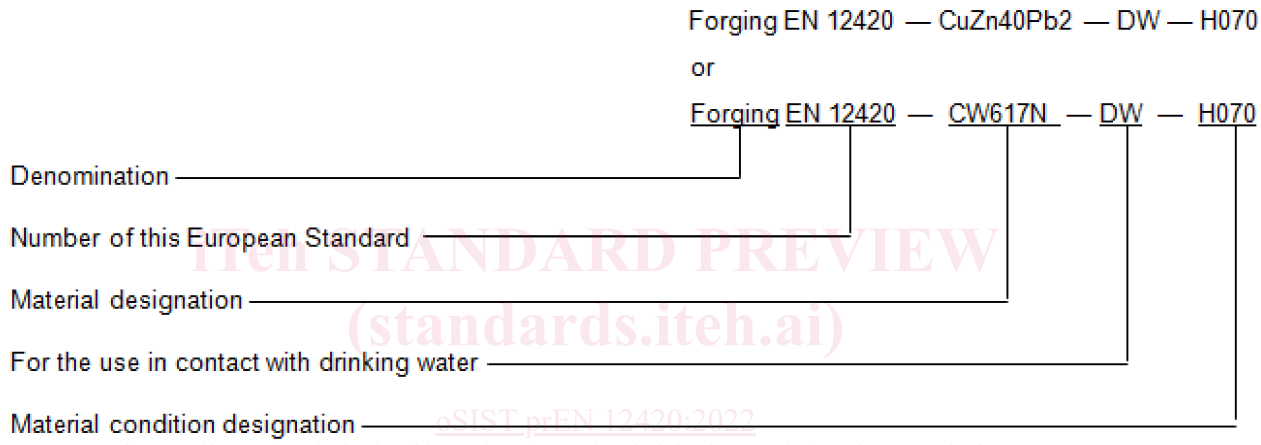
— material condition designation (see Tables 10 and 12).

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:



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

h) 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 the purchaser chooses ISO 6957:1988, the pH value for the test solution is to be selected;

i) whether the products are to be supplied in a thermally stress relieved condition;

j) when requested, tensile properties have to be agreed between purchaser and supplier (see 6.2.2 and Tables B.1 to B.3);

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

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

m) 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 purchaser and supplier.

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 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

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), CuZn35Pb1,5AlAs (CW625N), CuZn33Pb1,5AlAs (CW626N), CuZn32Pb2AsFeSi (CW709R), CuZn21Si3P (CW724R) and CuZn33Pb1AlSiAs (CW725R) products shall be 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.

NOTE The supplied material for forgings may not necessarily meet this requirement unless suitably heat treated. The test is intended to demonstrate that forgings produced are capable of being processed so as to pass the test requirement.

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.

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.

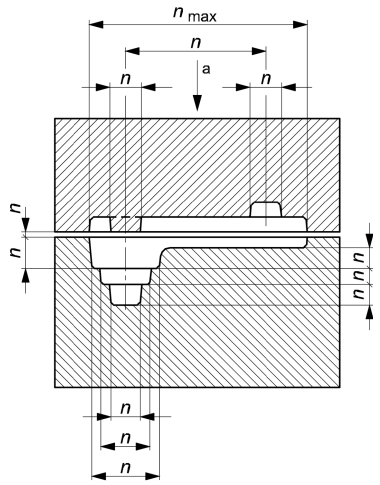
Two different types of dimensions are distinguished for die forgings:

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.

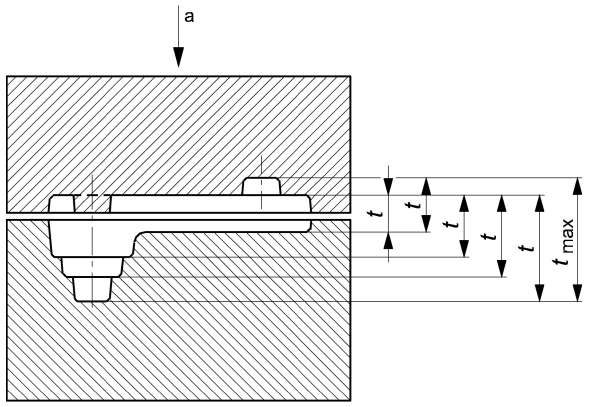
The die forging produced in the dies demonstrated in Figure 1 and Figure 2 is shown in Figure 3.



Key

a direction of forging

Figure 1 — Dimensions n within the die cavity



a direction of forging

Figure 2 — Dimensions t across the die parting line

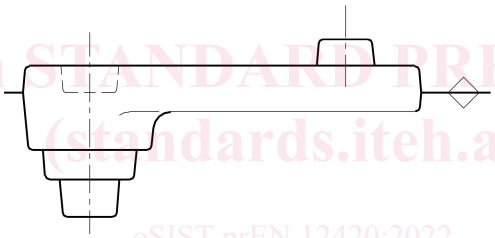


Figure 3 — Die forging

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

6.6.2 Tolerances for dimensions within the die cavity and for dimensions across the die parting line

The dimensions n and t shall conform to the tolerances given in Table 14 for material group I, Table 15 for material group II and Table 16 for material group III.

The polygonal shapes shall conform to the tolerances given in Table 17 for material group I.

The largest dimension t_{max} in the direction of forging is the basic dimension for applying tolerances for dimensions t across the die parting line. The tolerance for t_{max} depends on the area A of the part viewed in the direction of blow. The area A in the case of round parts is equal to the area of the circle and in the case of irregularly shaped parts is equal to the area of the circumscribing rectangle (see Figure 4). All smaller dimensions t have the same tolerance as t_{max}.

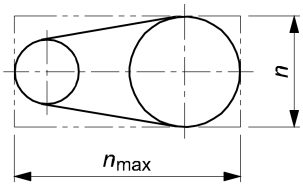


Figure 4 — Area A (in mm2) = nmax × n

The tolerances given in Tables 14 to 16 are also applicable for die forgings which are produced with a die cavity in one die half only facing a plane opposite die half.

The tolerance need not necessarily be applied symmetrically about the nominal dimension; it may be all plus or all minus.

6.6.3 Mismatch

Mismatch is not associated with a particular direction (see Figure 5).

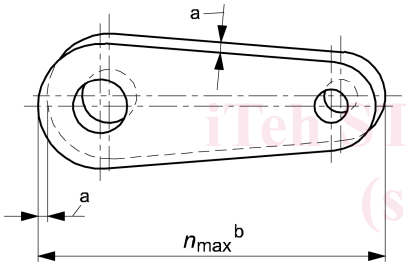
The mismatch shall be determined by reference to the largest nominal dimension n_{max} as viewed in the direction of forging (see Figure 5).

The permissible mismatch is given in Tables 14 to 16.

The maximum permitted mismatch shall be indicated above the title block or in the title block of the drawing of the forging, e.g.: mismatch max. 0,5 mm.

Mismatch is not included in the tolerances for dimensions within the die cavity: the tolerances for dimensions within the die cavity and for mismatch are in this case independently applied (see Figure 6 and Figure 7).

Dimensions in millimetres



Key

a mismatch

b reference dimension for

Figure 5 — Mismatch

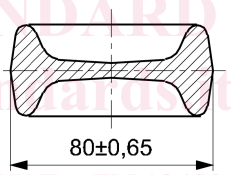
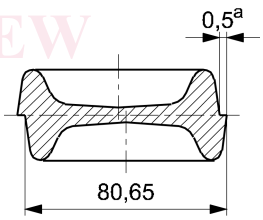


Figure 6 — Intended construction



Key

a mismatch

Figure 7 — Permanent actual dimensions

6.6.4 Flash projection

The flash projection is determined by reference to the largest nominal dimension n_{max} perpendicular to the direction of forging (see Figure 8).

The permissible flash projection is given in Tables 14 to 16.

The flash originating from the die parting line shall be trimmed by the manufacturer.

Flash caused by deburring, punching or piercing or through-die inserts (see G1, G2, G3 and G4 in Figure 9) is permissible, provided that it is either removed during machining or is not objectionable if left on the finished part. This flash shall be indicated in the drawing and shall not exceed 1,5 mm.