



SLOVENSKI STANDARD
oSIST prEN 12449:2022
01-april-2022

Baker in bakrove zlitine - Nevarjene cevi z okroglim prerezom za splošno uporabo

Copper and copper alloys - Seamless, round tubes for general purposes

Kupfer und Kupferlegierungen - Nahtlose Rundrohre zur allgemeinen Verwendung

Cuivre et alliages de cuivre - Tubes ronds sans soudure pour usages généraux

Ta slovenski standard je istoveten z: prEN 12449

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ICS:

23.040.15 Cevi iz neželeznih kovin **Non-ferrous metal pipes**
77.150.30 Bakreni izdelki **Copper products**

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en,fr,de

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 12449

February 2022

ICS 23.040.15; 77.120.30

Will supersede EN 12449:2016+A1:2019

English Version

Copper and copper alloys - Seamless, round tubes for general purposes

Cuivre et alliages de cuivre - Tubes ronds sans soudure
pour usages généraux

Kupfer und Kupferlegierungen - Nahtlose Rundrohre
zur allgemeinen Verwendung

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

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prEN 12449:2022 (E)**European foreword**

This document (prEN 12449:2022) 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 12449:2016+A1:2019.

In comparison with EN 12449:2016+A1:2019, the following changes were made:

- a) Update of normative references
- b) Addition of the material CuCr1Zr (CW106C) in Table 2 and Table 9;
- c) Modification of the lead content for CuZn39Pb3 (CW614N) and CuZn40Pb2 (CW617N) in Table 7;
- d) Correction of hardness values for CuSi3Zn2P (CW124C) of material conditions R650 and H170 in Table 9;
- e) Modification of 9.1 “Declaration of conformity” and 9.2 “Inspection documentation.”

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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 alloy CuSi₃Zn₂P (CW124C) 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 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 CuSi₃Zn₂P (CW124C) information may be obtained from:

VIEGA GmbH and Co. KG

Ennester Weg 9

57439 Attendorn

GERMANY

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 (<http://www.cenelec.eu/ipr/Patents/PatentDeclaration/Pages/default.aspx>) 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.

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prEN 12449:2022 (E)**1 Scope**

This document specifies the composition, property requirements and tolerances on dimensions and form for seamless round drawn copper and copper alloy tubes for general purposes supplied in the size range from 3 mm up to and including 450 mm outside diameter and from 0,3 mm up to and including 20 mm wall thickness.

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

NOTE Tubes having an outside diameter less than 80 mm and/or a wall thickness greater than 2 mm in certain alloys are most frequently used for free machining purposes which are specified in EN 12168.

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, *Copper and copper alloys - Material condition designation*

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

EN 1971-1, *Copper and copper alloys - Eddy current test for measuring defects on seamless round copper and copper alloy tubes - Part 1: Test with an encircling test coil on the outer surface*

EN 1971-2, *Copper and copper alloys - Eddy current test for measuring defects on seamless round copper and copper alloy tubes - Part 2: Test with an internal probe on the inner surface*

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

EN 16090, *Copper and copper alloys - Estimation of average grain size by ultrasound*

EN ISO 196, *Wrought copper and copper alloys - Detection of residual stress - Mercury(I) nitrate test (ISO 196)*

EN ISO 2624, *Copper and copper alloys - Estimation of average grain size (ISO 2624)*

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

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

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

EN ISO 8493, *Metallic materials - Tube - Drift-expanding test (ISO 8493)*

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

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

ISO 80000-1:2009, *Quantities and units — Part 1: General*

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:

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

3.1

seamless round tube

hollow semi-finished product, circular in cross-section, having a uniform wall thickness, which at all stages of production has a continuous periphery

3.2

mean diameter

arithmetical mean of the maximum and minimum outside diameters through the same cross-section of the tube

[SOURCE: EN 1057:2006+A1:2010, 3.5]

3.3

deviation from circular form

difference between the maximum and minimum outside diameters measured at any one cross-section of the tube

[SOURCE: EN 1057:2006+A1:2010, 3.6]

4 Designations

4.1 Material

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4.1.1 General

The material is designated either by symbol or number (see Table 1 to Table 8)

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 document 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.

prEN 12449:2022 (E)**4.2 Material condition**

For the purposes of this document, 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;
- 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.
- NOTE 1 Products in the H... condition can be specified to Vickers or Brinell hardness. The material condition designation H... is the same for both hardness test methods.
- S material condition for a product which is stress relieved.
- (suffix) NOTE 2 Products in the M, R... or H... condition can 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 (see 6.5.2).

Exact conversion between the 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 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.

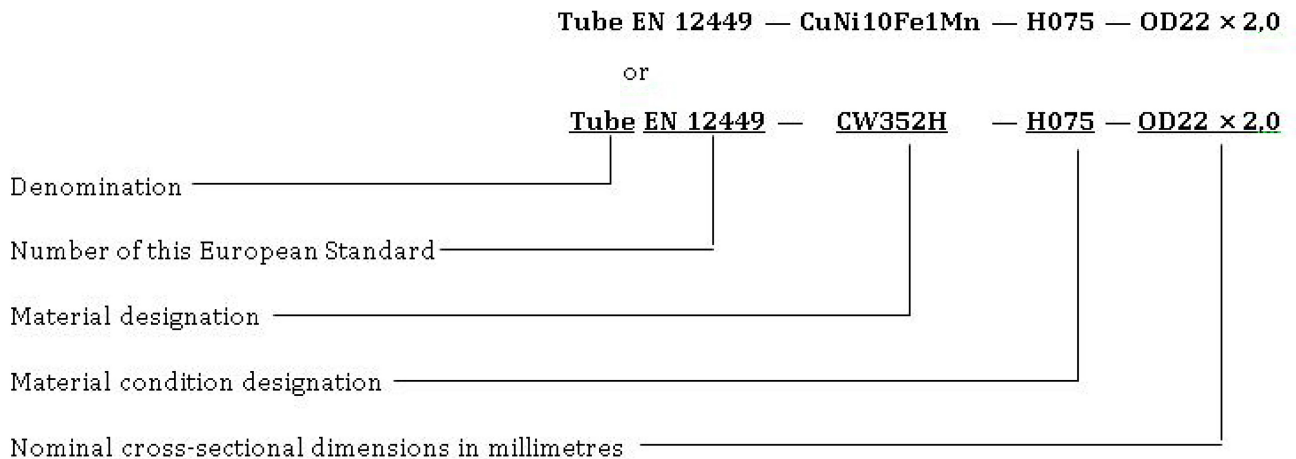
The product designation is no substitute for the full content of the document.

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

- denomination (Tube);
- number of this European Standard (EN 12449);
- material designation, either symbol or number (see Tables 1 to 8);
- material condition designation (see Tables 9 to 15);
- nominal cross-sectional dimensions, either outside diameter (OD) and wall thickness or inside diameter (ID) and wall thickness (see 6.3).

The derivation of a product designation is shown in Example 1.

EXAMPLE 1 Tube conforming to this document, in material designated either CuNi10Fe1Mn or CW352H, in material condition H075, nominal outside diameter 22 mm, nominal wall thickness 2,0 mm, will be designated as follows:



EXAMPLE 2 Tube conforming to this document, in material designated either CuZn37 or CW508L, in material condition M, stress relieved, nominal inside diameter 30 mm, nominal wall thickness 2,5 mm, will be designated as follows:

Tube EN 12449 — CuZn37 — MS — ID30 × 2,5

or
Tube EN 12449 — CW508L — MS — ID30 × 2,5

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 (number of pieces, length or mass);
- b) denomination (Tube);
- c) number of this European Standard (EN 12449);
- d) material designation (see Table 1 to Table 8);
- e) material condition designation (see 4.2 and Table 9 to Table 15) if it is other than M;
- f) nominal cross-sectional dimensions [either outside diameter (OD) and wall thickness or inside diameter (ID) and wall thickness] (see 6.3);
- g) length, either nominal together with tolerance required, or fixed length (see 6.3.4).

NOTE 1 It is advised that the product designation, as described in 4.3, is used for items b) to f).

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

- h) whether the tubes are for sea water application (see Table 3). If so, the composition limits required;
- i) test method to be used for the measurement of hardness, i.e. Vickers or Brinell (see 8.3);
- j) where dimensional tolerances are to be applied, if not on the outside diameter and wall thickness (see 6.3.1);

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- k) whether the tubes are required to pass a drift expanding test (see 6.5.1);
- l) whether the tubes are required to pass a stress corrosion resistance test (see 6.5.2);
- m) whether the tubes are required to meet a grain size requirement (see 6.5.3); if so, the grain size limits required;

NOTE 2 It is advised to agree the grain size limits between the purchaser and the supplier.

- n) whether the tubes are required to pass freedom from defects tests (see 6.5.4); 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, and the acceptance criteria if they are not to be left to the discretion of the supplier;
- o) whether deburring is required (see 6.4);
- p) whether special surface quality is required (see 6.4);
- q) whether a declaration of conformity is required (see 9.1);
- r) whether an inspection document is required, and if so, which type (see 9.2);
- s) whether there are any special requirements for marking, packaging or labelling (see Clause 10).

EXAMPLE Ordering details for 1 000 m tube conforming to EN 12449, in material designated either CuNi10Fe1Mn or CW352H, in material condition H075, nominal outside diameter 22 mm, nominal wall thickness 2,0 mm, in 3 000 mm fixed lengths:

1 000 m Tube EN 12449 — CuNi10Fe1Mn — H075 — OD22 × 2,0
— fixed length 3 000 mm
 or
1 000 m Tube EN 12449 — CW352H — H075 — OD22 × 2,0
— fixed length 3 000 mm

6 Requirements

6.1 Composition

The composition shall conform to the requirements for the appropriate material given in Table 1 to Table 8.

6.2 Mechanical properties

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

Products in stress relieved condition shall conform to the same mechanical property requirements as for non stress relieved material.

6.3 Dimensions and tolerances

6.3.1 General

The geometrical properties of the tubes are defined by outside diameter or inside diameter, wall thickness and length.

Normally, tolerances for cross-sectional dimensions are applied on the outside diameter (see 6.3.2) and wall thickness (see 6.3.3) but other possibilities may be agreed between the purchaser and the supplier at the time of the enquiry and order [see Clause 5, list entry j)].

Normally, tubes are supplied in lengths with tolerances agreed between the purchaser and the supplier at the time of the enquiry and order [see Clause 5, list entry g)] but tubes may be ordered as “fixed lengths” (see 6.3.4).

6.3.2 Outside or inside diameter

The diameter of the tubes shall conform to the tolerances given in Table 17.

6.3.3 Wall thickness

The wall thickness, measured at any point, shall conform to the tolerances given in Table 18.

6.3.4 Fixed lengths

Tubes in straight lengths ordered as “fixed lengths” shall conform to the tolerances given in Table 19. Tubes in coiled form ordered as “fixed lengths” shall conform to the tolerances given in Table 20.

6.3.5 Tolerances on form

6.3.5.1 Deviation from circular form

For tubes in straight lengths the deviation from circular form is included in the tolerances on diameter given in Table 17.

For coiled tubes with wall thicknesses up to and including 2 mm, except for tubes with ratios of outside diameter to wall thickness greater than 20, the deviation from circular form is included in the tolerances on diameter given in Table 21.

6.3.5.2 Straightness

Tubes in straight lengths, except for those in the annealed condition (see Table 9 to Table 15) or with outside diameter equal to or less than 10 mm, shall conform to the tolerances given in Table 22.

6.4 Surface quality

The external and internal surfaces shall be clean and smooth.

The tubes may have a superficial film of drawing lubricant or, if annealed or thermally stress relieved, a superficial, dull, iridescent oxide film, securely adherent on both the internal and external surfaces.

Discontinuous irregularities on the external and internal surfaces of the tubes are permitted if they are within the dimensional tolerances.

Special requirements (e.g. pickling, degreasing, etc.) relating to the surface quality shall be agreed between the purchaser and the supplier [see Clause 5, list entry p)].

If deburring of the cut ends of the tubes is required it shall be agreed between the purchaser and the supplier [see Clause 5, list entry o)].

prEN 12449:2022 (E)**6.5 Technological requirements****6.5.1 Drift expanding**

No crack shall be visible to the unaided eye, corrected for normal vision if necessary, when tubes in the annealed condition and outside diameter up to and including 100 mm and when agreed between the purchaser and the supplier [see Clause 5, list entry k)] are tested in accordance with 8.4.1.

6.5.2 Residual stress level

No crack shall be visible to the unaided eye, corrected for normal vision if necessary, when tubes in the stress relieved condition and when requested by the purchaser [see Clause 5, list entry l)] are tested in accordance with 8.4.2.

6.5.3 Grain size

The average grain size of tubes in the annealed condition, when requested by the purchaser, [see Clause 5, list entry m)] shall conform to the limits agreed between the purchaser and the supplier. The test shall be carried out in accordance with 8.4.3.

6.5.4 Freedom from defects

When requested by the purchaser [see Clause 5, list entry n)] tubes shall be tested in accordance with 8.5 and the acceptance criteria, unless otherwise agreed between the purchaser and the supplier, shall be at the discretion of the supplier.

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 and 7.3.

7.2 Analysis

The sampling rate shall be in accordance with Table 23. A test sample, depending on the analytical technique to be employed, shall be prepared from each sampling unit and used for the determination of the composition.

When preparing the test sample, care should be taken to avoid contaminating or overheating the test sample. Carbide tipped tools are recommended; steel tools, if used, should be made of magnetic material to assist in the subsequent removal of extraneous iron. If the test samples are in finely divided form (e.g. drillings, millings), they should be treated carefully with a strong magnet to remove any particles of iron introduced during preparation.

In cases of dispute concerning the results of analysis, the full procedure given in ISO 1811-2 should be followed.

Results may be used from analyses carried out at an earlier stage of manufacturing the product, e.g. at the casting stage, if the material identity is maintained and if the quality management system of the manufacturer is certified, e.g. as conforming to EN ISO 9001.

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Documents with test results
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7.3 Mechanical tests and stress corrosion resistance test

The sampling rate shall be in accordance with Table 23. Sampling units shall be selected from the finished products. The test samples shall be cut from the sampling units. Test samples, and test pieces prepared from them, shall not be subjected to any further treatment, other than any machining operations necessary in the preparation of the test pieces.

8 Test methods

8.1 Analysis

Analysis shall be carried out on the test pieces, or test portions, prepared from the test samples obtained in accordance with 7.2. Except in cases of dispute, the analytical methods used shall be chemical or spectrographic according to EN or ISO standards in force. For expression of results, the rounding rules given in 8.7 shall be used.

In cases of dispute concerning the results of analysis, the method of analysis to be used should be chemical.

8.2 Tensile test

The tensile properties shall be determined in accordance with EN ISO 6892-1 on the test pieces obtained in accordance with 7.3.

8.3 Hardness test

Hardness shall be determined on test pieces prepared from the test samples obtained in accordance with 7.3. The test shall be carried out in accordance with either EN ISO 6506-1 or EN ISO 6507-1 and the impression/indentation made on the outside surface, unless otherwise agreed. For the Brinell test according to EN ISO 6506-1, a $0,102 F/D^2$ ratio of 10 shall be used.

8.4 Technological tests

8.4.1 Drift expanding test

When required, the drift expanding test shall be carried out in accordance with EN ISO 8493. The outside diameter of the tube end shall be expanded by 30 % using a conical mandrel with an angle of 45°.

8.4.2 Stress corrosion resistance test

When required, the test method given in either EN ISO 196 or ISO 6957 shall be used on the test pieces prepared from the test samples obtained in accordance with 7.3. The choice of which of these tests is used shall be at the discretion of the supplier.

8.4.3 Average grain size determination

When required, the estimation of average grain size shall be carried out in accordance with EN ISO 2624 or EN 16090.

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