SLOVENSKI STANDARD
SIST EN 12449:2016+A1:2019

01-december-2019

Nadomešča:
SIST EN 12449:2016

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: **EN 12449:2016+A1:2019**

ICS:

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

SIST EN 12449:2016+A1:2019 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12449:2016+A1

October 2019

ICS 23.040.15; 77.120.30

Supersedes EN 12449:2016

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 European Standard was approved by CEN on 28 February 2016 and includes Amendment 1 approved by CEN on 7 August 2019.

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

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Contents

Page

Figures

Tables

European foreword

This document (EN 12449:2016+A1:2019) 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of an identical text or by endorsement, at the latest by April 2020 and conflicting national standards shall be withdrawn at the latest by April 2020.

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 includes Amendment 1 approved by CEN on 7 August 2019.

This document supersedes A1 EN 12449:2016 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

In comparison with EN 12449:2012, the following significant technical changes were made:

a) Addition of the new material CuFe0,1Sn0,1P (CW125C);

b) Modification of the elongation values for Cu-DHP (CW024A) in material condition R250 including new Table 16;

c) Modification of iron and tin content for CuZn37Pb1 (CW605N) from 0,2 % to 0,3 % in Table 7;

d) Replacement of the material number CW121C by CW124C for CuSi3Zn2P.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 3 "Copper tubes (installation and industrial)" to revise the following standard:

— EN 12449:2012, *Copper and copper alloys — Seamless, round copper tubes for general purposes*.

This is one of a series of European Standards for copper and copper alloy tubes. Other products are specified as follows:

— EN 1057, *Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating applications*;

— EN 12450, *Copper and copper alloys — Seamless, round copper capillary tubes*;

— EN 12451, *Copper and copper alloys — Seamless, round tubes for heat exchangers*;

— EN 12452, *Copper and copper alloys — Rolled, finned, seamless tubes for heat exchangers*;

— EN 12735-1, *Copper and copper alloys — Seamless, round tubes for air conditioning and refrigeration — Part 1: Tubes for piping systems*;

— EN 12735-2, *Copper and copper alloys — Seamless, round tubes for air conditioning and refrigeration — Part 2: Tubes for equipment*;

— EN 13348, *Copper and copper alloys — Seamless, round copper tubes for medical gases or vacuum*;

— EN 13349, *Copper and copper alloys — Pre-insulated copper tubes with solid covering*;

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

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, Turkey and the United Kingdom.

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) and CuZn21Si3P (CW724R) 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 assured 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 & Co. KG

  Ennester Weg 9

  57439 Attendorn

  GERMANY

— For CuZn21Si3P (CW724R) information may be obtained from:

  Wieland-Werke AG

  Graf-Arco-Straße 36

  89079 Ulm

  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.cencenelec.eu/ipr/Patents/PatentDeclaration/Pages/default.aspx) maintain on-line lists of patents relevant to their standards. Users are encouraged to consult the lists for the most up to date information concerning patents.

1 Scope

This European Standard 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 European Standard 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, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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 10204, *Metallic products - Types of inspection documents*

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 6957, *Copper alloys - Ammonia test for stress corrosion resistance*

3 Terms and definitions

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

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

4.1.1 General

The material is designated either by symbol or number (see Tables 1 to 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 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;

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 (suffix) material condition for a product which is stress relieved.

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 standard.

The product designation for products to this standard 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 standard, 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:

Tube **EN 12449** — CuNi10Fe1Mn — H075 — OD22 × 2,0

or

Tube **EN 12449** — CW352H — H075 — OD22 × 2,0

Denomination

Number of this European Standard

Material designation

Material condition designation

Nominal cross-sectional dimensions in millimetres

EXAMPLE 2 Tube conforming to this standard, 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 Tables 1 to 8);

e) material condition designation (see 4.2 and Tables 9 to 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);

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 Tables 1 to 8.

6.2 Mechanical properties

The properties shall conform to the appropriate requirements given in Tables 9 to 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 Tables 9 to 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)].

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.

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.