SLOVENSKI STANDARD
SIST EN 13600:2013

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Nadomešča:
SIST EN 13600:2004

Baker in bakrove zlitine - Nevarjene bakrene cevi za uporabo v elektrotehniki

Copper and copper alloys - Seamless copper tubes for electrical purposes

Ta slovenski standard je istoveten z: EN 13600:2013

ICS:

77.150.30	Bakreni izdelki	Copper products

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13600

June 2013

ICS 77.150.30

Supersedes EN 13600:2002

English Version

Copper and copper alloys - Seamless copper tubes for electrical purposes

Cuivre et alliages de cuivre - Tubes sans soudure en cuivre pour usages électriques

Kupfer und Kupferlegierungen - Nahtlose Rohre aus Kupfer für die Anwendung in der Elektrotechnik

This European Standard was approved by CEN on 25 April 2013.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Foreword

This document (EN 13600:2013) 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of an identical text or by endorsement, at the latest by December 2013, and conflicting national standards shall be withdrawn at the latest by December 2013.

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

This document supersedes EN 13600:2002.

In comparison with EN 13600:2002, the following significant technical changes have been made:

— The Scope has been expanded.

— The outside diameters have been expanded.

— The wall thickness has been expanded.

— Cu-OFE (CW009A) and Cu-PHCE (CW022A) have been added.

— Tolerance on the outside diameter of round tubes and on wall thicknesses has been completely revised.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 4 "Extruded and drawn products, forgings and scrap" to prepare the following revision of the standard:

EN 13600:2002, *Copper and copper alloys — Seamless copper tubes for electrical purposes.*

The products specified in this European Standard are those which are especially suitable for electrical purposes, i.e. with specified electrical properties. Copper tubes for general purposes are specified in EN 12449.

Annex A (informative) gives guidance on the characteristics of coppers for electrical purposes.

This is one of a series of European Standards for copper products for electrical purposes. Other copper products are specified as follows:

— EN 13599, *Copper and copper alloys — Copper plate, sheet and strip for electrical 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 13604, *Copper and copper alloys — Semiconductor devices, electronic and vacuum products made from high conductivity copper*

— EN 13605, *Copper and copper alloys — Copper profiles and profiled wire 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece,

Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the composition, property requirements including electrical properties, and tolerances on dimensions and form for seamless drawn copper tubes for electrical purposes, delivered in straight lengths or alternatively in level wound coils with the cross-sections and size ranges below:

— for round tubes in straight lengths with outside diameters from 3 mm up to and including 450 mm and wall thicknesses from 0,3 mm;

— for round tubes in level wound coils with outside diameters from 3 mm up to and including 30 mm and wall thicknesses from 0,3 mm;

— for square and rectangular tubes with major outside dimension from 5 mm up to and including 150 mm and wall thicknesses from 0,5 mm up to and including 10 mm.

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

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 1976, *Copper and copper alloys — Cast unwrought copper products*

EN 10204, *Metallic products — Types of inspection documents*

EN ISO 2626, *Copper — Hydrogen embrittlement test (ISO 2626)*

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 7438, *Metallic materials — Bend test (ISO 7438)*

EN ISO 8491, *Metallic materials — Tube (in full section) — Bend test (ISO 8491)*

3 Terms and definitions

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

3.1
seamless tube
hollow semi-finished product, circular, square or rectangular in cross-section, having a uniform wall thickness, which at all stages of production has a continuous periphery

Note 1 to entry: Tubes with a square or rectangular cross-section may have corners rounded along their whole length.

3.2
mean diameter
arithmetical mean of any two diameters normal to each other at the same cross-section of the tube

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 by number (see Table 1 and Table 2).

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 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:

D Material condition for the product as cold worked without specified mechanical properties;

H... Material condition designated by the minimum value of hardness requirement for the product with mandatory hardness requirements;

R... Material condition designated by the minimum value of tensile strength requirement for the product with mandatory tensile strength, 0,2 % proof strength and elongation requirements.

Products in the H... condition may be specified to Vickers or Brinell hardness. The material condition designation H... is the same for both hardness test methods.

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

Material condition is designated by only one of the above designations.

4.3 Product

The product designation provides a standardised 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.

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

a) denomination (tube);

b) number of this European Standard (EN 13600);

c) material designation, either symbol or number (see Table 1 and Table 2);

d) material condition designation (see Table 3);

e) cross-sectional shape (the following designations shall be used, as appropriate: RND for round, SQR for square, RCT for rectangular);

f) nominal dimensions:

1) round tube in straight lengths: outside diameter × wall thickness × length [either as manufactured length (ML) or fixed length (FL) (see 6.5.4)];

2) round tube in level wound coils: outside diameter × wall thickness × nominal coil weight;

3) square or rectangular tube: across-flats dimension(s) × wall thickness × length [either as manufactured length (ML) or fixed length (FL) (see 6.5.4)].

The derivation of a product designation is shown in Example 1 and other typical product designations are shown in Examples 2 and 3.

EXAMPLE 1 Tube for electrical purposes conforming to this standard, in material designated either Cu-ETP or CW004A, in material condition R250, round, with nominal outside diameter 100 mm and nominal wall thickness 5 mm, as manufactured length 3 000 mm, will be designated as follows:

Tube — EN 13600 — Cu-ETP — R250 — RND100 x 5 x 3000ML

or

Tube — EN 13600 — CW004A — R250 — RND100 x 5 x 3000ML

Denomination

Number of this European Standard

Material designation

Material condition designation

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

EXAMPLE 2 Tube for electrical purposes conforming to this standard, in material designated either Cu-0F or CW008A, in material condition H065, square, nominal width across-flats 120 mm, nominal wall thickness 10 mm, fixed length 4 500 mm, will be designated as follows:

Tube EN 13600 — Cu-OF— H065 — SQR120 × 10 × 4 500FL

or

Tube EN 13600 — CW008A — H065 — SQR120 × 10 × 4 500FL

EXAMPLE 3 Tube for electrical purposes conforming to this standard, in material designated either CuAg0,10 or CW013A, in material condition R290, rectangular, with nominal widths across-flats 140 mm and 80 mm, nominal wall thickness 5 mm, fixed length 3 500 mm, will be designated as follows:

Tube EN 13600 — CuAg0,10 — R290 — RCT140 × 80 × 5 × 3 500FL

or

Tube EN 13600 — CW013A— R290 — RCT140 × 80 × 5 × 3 500FL

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, number of tubes);

b) denomination (tube);

c) number of this European Standard (EN 13600);

d) material designation (see Table 1 and Table 2);

e) material condition designation (see 4.2 and Table 3);

f) nominal dimensions:

1) round tube in straight lengths: outside diameter × wall thickness × length [either as manufactured length (ML) or fixed length (FL) (see 6.5.4)];

2) round tube in level wound coils: outside diameter × wall thickness × nominal coil weight;

NOTE For round tubes, upon agreement between purchaser and supplier, the inside diameter can be used as an alternative to the wall thickness.

3) square or rectangular tube: across-flats dimension(s) × wall thickness × length [either as manufactured length (ML) or fixed length (FL) (see 6.5.4)].

It is recommended 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:

g) test method to be used for the measurement of hardness, i.e. Vickers or Brinell (see 8.3);

h) whether special tolerances on dimensions and form are required;

i) whether special surface conditions are required (see 6.7);

j) whether deburring is required (see 6.5.4.1);

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, packaging or labelling (see Clause 10).

EXAMPLE Ordering details for 1 000 pieces tube for electrical purposes conforming to EN 13600, in material designated either Cu-ETP or CW004A, in material condition R250, round, with nominal outside diameter 100 mm and nominal wall thickness 5 mm, as manufactured length 3 000 mm:

1000 pieces Tube EN 13600 — Cu-ETP— R250 — RND100 × 5 × 3000ML

or

1000 pieces Tube EN 13600 — CW004A — R250 — RND100 × 5 × 3000ML

6 Requirements

6.1 Composition

The composition shall conform to the requirements for the appropriate material given in Table 1 and Table 2.

NOTE For characteristics of coppers for electrical purposes, see Annex A.

6.2 Mechanical properties

The mechanical properties shall conform to the appropriate requirements given in Table 3. The tests shall be carried out in accordance with either 8.2 (tensile test) or 8.3 (hardness test).

6.3 Electrical properties

The electrical properties shall conform to the appropriate requirements given in Table 4. The test shall be carried out in accordance with 8.4.

6.4 Freedom from hydrogen embrittlement

Tubes in copper grades Cu-OF (CW008A), CuAg0,10P (CW016A), CuAg0,10(OF) (CW019A), Cu-PHC (CW020A) and Cu-HCP (CW021A) shall show no evidence of cracking, when tested and visually examined in accordance with 8.5.

6.5 Dimensions and tolerances

6.5.1 Outside dimensions

The dimensional tolerances are applied on the outside dimensions and wall thickness, if not otherwise agreed between the purchaser and the supplier.

For round tubes, the diameter shall conform to the tolerances given in Table 5.

For square and rectangular tubes, the outside dimensions shall conform to the tolerances given in Table 6.

6.5.2 Corner radii

The corner radii of square and rectangular tubes shall conform to the requirements given in Table 7.

6.5.3 Wall thickness

The wall thickness of round, square and rectangular tubes, measured at any one point, shall conform to the tolerances given in Table 8.

6.5.4 Length

6.5.4.1 General

Tubes shall be supplied either in manufactured lengths or fixed lengths, with ends either sawn or sheared.

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 j)].

6.5.4.2 Manufactured lengths

Manufactured lengths (ML) shall be supplied in the nominal lengths. The tolerances are by agreement between the purchaser and the supplier.