



SLOVENSKI STANDARD

SIST EN 13599:2014

01-junij-2014

Nadomešča:
SIST EN 13599:2004

Baker in bakrove zlitine - Bakrove plošče, pločevina in trakovi za uporabo v elektrotehniki

Copper and copper alloys - Copper plate, sheet and strip for electrical purposes

Kupfer und Kupferlegierungen - Platten, Bleche und Bänder aus Kupfer für die Anwendung in der Elektrotechnik

Cuivre et alliages de cuivre - Plaques, tôles et bandes en cuivre pour usages électriques

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Ta slovenski standard je istoveten z: EN 13599:2014

ICS:

77.150.30

Bakreni izdelki

Copper products

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 13599

January 2014

ICS 77.150.30

Supersedes EN 13599:2002

English Version

**Copper and copper alloys - Copper plate, sheet and strip for
electrical purposes**

Cuivre et alliages de cuivre - Plaques, tôles et bandes en
cuivre pour usages électriques

Kupfer und Kupferlegierungen - Platten, Bleche und Bänder
aus Kupfer für die Anwendung in der Elektrotechnik

This European Standard was approved by CEN on 3 November 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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 13599:2014) 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of an identical text or by endorsement, at the latest by July 2014, and conflicting national standards shall be withdrawn at the latest by July 2014.

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 13599:2002.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 2 “Rolled flat products” to revise the following standard:

EN 13599:2002, *Copper and copper alloys — Copper plate, sheet and strip 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 plate, sheet and strip for general purposes are specified in EN 1652.

This is one of a series of European Standards for copper products for electrical purposes. Other copper products are specified as follows: **(standards.iteh.ai)**

EN 13600, *Copper and copper alloys — Seamless copper tubes 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 — Products of high conductivity copper for electronic tubes, semiconductor devices and vacuum applications*

EN 13605, *Copper and copper alloys — Copper profiles and profiled wire for electrical purposes*

In comparison with EN 13599:2002, the following significant changes were made:

- a) Table 2, Cu-FRHC, other elements – content has been modified and a new footnote “d” has been added;
- b) the normative references have been updated.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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 copper plate, sheet and strip for electrical purposes with thicknesses from 0,05 mm up to and including 25 mm and widths from 10 mm up to and including 1 250 mm.

The sampling procedures and the methods of test for verification of conformity to the requirements of this European 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 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)*

ISO 1811-2, *Copper and copper alloys — Selection and preparation of samples for chemical analysis — Part 2: Sampling of wrought products and castings*

3 Terms and definitions

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

3.1

plate

flat rolled product of rectangular cross-section with uniform thickness greater than 10 mm

3.2

sheet

flat rolled product of rectangular cross-section with uniform thickness from 0,2 mm up to and including 10 mm, supplied in straight lengths, usually with sheared or sawn edges

Note 1 to entry: The thickness does not exceed one tenth of the width.

3.3

strip

flat rolled product of rectangular cross-section with uniform thickness from 0,05 mm up to and including 5,0 mm manufactured in coil and supplied in as sheared coils, traverse wound coils or cut to length, usually with slit edges

Note 1 to entry: The thickness does not exceed one tenth of the width.

4 Designations

4.1 Material

4.1.1 General

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

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:

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;

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

NOTE Some R... material conditions in this European Standard apply to products which also have mandatory 0,2 % proof strength requirements.

Exact conversion between 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 European Standard shall consist of:

- denomination (Plate, Sheet or Strip);
- number of this European Standard (EN 13599);
- material designation, either symbol or number (see Table 1);
- material condition designation (see Table 2);

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- nominal dimensions;
- plate: thickness × width × length [either “as manufactured” (ML) or “fixed” (FL) length];
- sheet: thickness × width × length [either “as manufactured” (ML) or “fixed” (FL) length] (see Example 1);
- strip (as sheared coils or as transverse wound coils on spools): thickness × width (see Example 2);
- strip (cut to length): thickness × width × length [either “as manufactured” (ML) or “fixed” (FL) length].

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

EXAMPLE 1 Sheet for electrical purposes conforming to this European Standard, in material designated either Cu-ETP or CW004A, in material condition H040, nominal thickness 6,0 mm, nominal width 600 mm, as manufactured length 2 000 mm, will be designated as follows:

Sheet EN 13599 — Cu-ETP — H040 — 6,0 × 600 × 2 000ML

or

Sheet EN 13599 — CW004A — H040 — 6,0 × 600 × 2 000ML

Denomination

Number of this European Standard

Material designation

Material condition designation

Nominal dimension in millimetres

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EXAMPLE 2 Strip for electrical purposes conforming to this European Standard, in material designated either CuAg0,10 or CW013A, in material condition R290, nominal thickness 2,0 mm, nominal width 1 000 mm, will be designated as follows:

Strip EN 13599 — CuAg0,10 — R290 — 2,0 × 1 000

or

Strip EN 13599 — CW013A — R290 — 2,0 × 1 000

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:
 - 1) plate: number of pieces or mass;
 - 2) sheet: number of pieces or mass;
 - 3) strip (as sheared coils or as transverse wound coils on spools): mass;
 - 4) strip (cut to length): mass or number of pieces;

- b) denomination (Plate, Sheet or Strip);
- c) number of this European Standard (EN 13599);
- d) material designation (see 4.1 and Table 1);
- e) material condition designation (see 4.2 and Table 2);
- f) nominal dimensions:
 - 1) plate, sheet, strip (cut to length): thickness [for thicknesses from 0,05 mm up to and including 3,2 mm and with widths from 10 mm up to and including 200 mm, thickness tolerance either “normal” (N) or “special” (S)] × width × length (either “as manufactured” or “fixed” length);
 - 2) strip (as sheared coils or as transverse wound coils on spools): thickness [for thicknesses from 0,05 mm up to and including 3,2 mm and with widths from 10 mm up to and including 200 mm, thickness tolerance either “normal” (N) or “special” (S)] × width;
- g) size of sheared coils (strip) requirements: nominal inside diameter in millimetres and maximum outside diameter in millimetres and either maximum mass in kilograms or approximate specific coil mass (mass per width) in kilograms per millimetre;
- h) size of transverse wound coils (strip): type or dimensions.

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:

- i) maximum edgewise curvature values for strip over 3,2 mm up to and including 5,0 mm thickness and width over 30 mm (see Table 9);
- j) whether special surface conditions are required (see 6.8);
- 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 1 Ordering details for 100 sheets for electrical purposes conforming to EN 13599, in material designated either Cu-ETP or CW004A, in material condition H040, nominal thickness 6,0 mm, nominal width 600 mm, as manufactured length 2 000 mm:

100 pieces Sheet EN 13599 — Cu-ETP — H040 — 6,0 × 600 × 2 000ML

or

100 pieces Sheet EN 13599 — CW004A — H040 — 6,0 × 600 × 2 000ML

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EXAMPLE 2 Ordering details for 5 000 kg strip for electrical purposes conforming to EN 13599, in material designated either CuAg0,10 or CW013A, in material condition R290, nominal thickness 0,4 mm, normal thickness tolerance, nominal width 60 mm, nominal inside diameter of coil 400 mm, maximum outside diameter of coil 960 mm and approximate specific coil mass (mass per width) 4,5 kg/mm:

5 000 kg Strip EN 13599 — CuAg0,10 — R290 — 0,4N × 60
 — nominal inside diameter of coil 400 mm
 — maximum outside diameter of coil 960 mm
 — approximate specific coil mass 4,5 kg/mm

or

5 000 kg Strip EN 13599 — CW013A — R290 — 0,4N × 60
 — nominal inside diameter of coil 400 mm
 — maximum outside diameter of coil 960 mm
 — approximate specific coil mass 4,5 kg/mm

6 Requirements

6.1 Composition

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

Percentage content of the element shown as “remainder” (Rem.) is usually calculated by difference from 100 %.

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

6.2 Mechanical properties

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The mechanical properties shall conform to the appropriate requirements given in Table 2. The tests shall be carried out in accordance with either 8.2 (tensile test) or 8.3 (hardness test).

6.3 Bending characteristics

The bending edge shall show no evidence of cracks on the tension side, when tested and examined with the unaided eye, corrected to normal vision if necessary, in accordance with 8.4.

6.4 Electrical properties

The electrical properties shall conform to the appropriate requirements given in Table 3. The test shall be carried out in accordance with 8.5.

6.5 Freedom from hydrogen embrittlement

Sheet and strip 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 8.6.

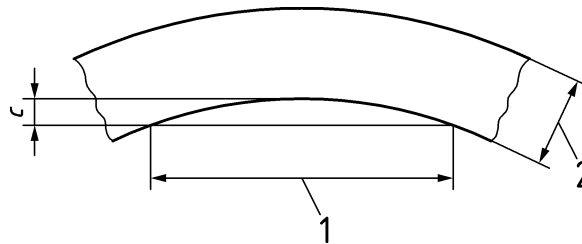
6.6 Dimensions and tolerances

Plate, sheet and strip shall conform to the appropriate tolerances on dimensions and form given in Tables 4 to 8. Plate, sheet and strip up to 5 000 mm in length may be supplied in “as manufactured” or “fixed lengths” (see Table 7).

6.7 Edgewise curvature c

For the straightness of the longitudinal edge of strip, which unless otherwise agreed between the purchaser and the supplier shall be based on a measuring length of 1 000 mm, the edgewise curvature c (see Figure 1) shall not exceed the values given in Table 9.

If the purchaser and the supplier agree on a measuring length of 2 000 mm, the edgewise curvature c shall not exceed the values given in Table 9 multiplied by 4.



Key

- 1 measuring length
- 2 strip width
- c edgewise curvature

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Figure 1 — Edgewise curvature c

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6.8 Surface condition

The products shall be clean and free from injurious defects which shall be specified by agreement between the purchaser and the supplier at the time of enquiry and order. A superficial film of residual lubricant is normally present on cold rolled products and is permissible unless otherwise specified. Discoloration is permissible as long as it does not impair utilisation.

Special requirements, for the application, e.g. contact area, surface coating, shall be agreed between the purchaser and the supplier [see Clause 5 list entry j)]. The dimensions, mechanical and electrical properties of plate, sheet and strip with surface coatings shall be agreed between the purchaser and the supplier.

7 Sampling

7.1 General

When required, (e.g. if necessary in accordance with specified procedures of a supplier's quality management 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 ISO 1811-2. 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.