



**SLOVENSKI STANDARD**  
**SIST EN 13601:2013**

**01-september-2013**

**Nadomešča:**  
**SIST EN 13601:2004**

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**Baker in bakrove zlitine - Drogovi, palice in žice za splošno uporabo v elektrotehniki**

Copper and copper alloys - Copper rod, bar and wire for general electrical purposes

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 13601**

June 2013

ICS 77.150.30

Supersedes EN 13601:2002

English Version

## Copper and copper alloys - Copper rod, bar and wire for general electrical purposes

Cuivre et alliages de cuivre - Barres et fils en cuivre pour usages électriques généraux

Kupfer und Kupferlegierungen - Stangen und Drähte aus Kupfer für die allgemeine 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.

CEN members are the national standards bodies of 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 United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

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## Foreword

This document (EN 13601:2013) 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 13601:2002.

In comparison with EN 13601:2002, the following significant technical changes have been made:

- Maximum diameters or widths across-flats for round, square and hexagonal rod have been expanded.
- Terms and definitions clause has been modified.
- Cu-OFE (CW009A) and Cu-PHCE (CW022A) have been added.
- Tolerances on width and thickness of bar and rectangular wire have been modified (see Table 6).

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 13601:2002, *Copper and copper alloys – Copper rod, bar and wire for general 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 rod, bar and wire for general purposes are specified in EN 12163, EN 12166 and EN 12167.

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 13600, *Copper and copper alloys – Seamless copper tubes for 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.

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## EN 13601:2013 (E)

## 1 Scope

This European Standard specifies the composition, property requirements including electrical properties, and tolerances on dimensions and form for copper rod, bar and wire for general electrical purposes. Cross-sections and size ranges are:

- round, square and hexagonal rod with diameters or widths across-flats from 2 mm up to and including 160 mm;
- bar with thicknesses from 2 mm up to and including 40 mm and widths from 3 mm up to and including 200 mm;
- round, square, hexagonal and rectangular wire with diameters or widths across-flats from 2 mm up to and including 25 mm, as well as thicknesses from 0,5 mm up to and including 12 mm with widths from 1 mm up to and including 200 mm.

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

NOTE Drawn, round copper wire — plain or tinned, single or multiline — for the manufacture of electrical conductors is specified in EN 13602.

## 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* 13

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EN 1976, *Copper and copper alloys — Cast unwrought copper products* 3

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)*

IEC 60468, *Method of measurement of resistivity of metallic materials*



### 3 Terms and definitions

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

#### 3.1

##### **bar**

straight product of uniform rectangular cross-section along its whole length

[SOURCE: EN 12167:2011, 3.2]

#### 3.2

##### **rod**

straight product of uniform cross-section along its whole length

[SOURCE: EN 12163:2011, 3.1]

#### 3.3

##### **wire**

wound product of uniform cross-section along its whole length

Note 1 to entry: Rectangles may have round or sharp corners.

[SOURCE: EN 12166:2011, 3.1]

#### 3.4

##### **deviation from circular form**

difference between the maximum and the minimum diameters measured at any one cross-section of a round product

[SOURCE: EN 12163:2011, 3.2]

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### 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 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.

**EN 13601:2013 (E)****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 (rod, bar or wire);
- b) number of this European Standard (EN 13601);
- 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, HEX for hexagonal);
- f) nominal cross-sectional dimensions:
  - 1) round rod or wire: diameter;
  - 2) square or hexagonal rod or wire: width across-flats;
  - 3) bar or rectangular wire: thickness × width;
- g) tolerance class for round, square or hexagonal rod or wire (see Table 4);
- h) corner type for square or hexagonal rod, bar or rectangular wire (the following designations shall be used as appropriate: SH for sharp, RD for rounded, CE for semi-circular edges) (see 6.6.2).

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

EXAMPLE 1 Rod for electrical purposes conforming to this standard, in material designated either Cu-ETP or CW004A, in material condition H085, round, with nominal diameter 15 mm and tolerance Class A, will be designated as follows:

**Rod — EN 13601 — Cu-ETP — H085 — RND15A**

or

**Rod — EN 13601 — CW004A — H085 — RND15A**

Denomination

Number of this European Standard

Material designation

Material condition designation

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

EXAMPLE 2 Bar for electrical purposes conforming to this standard, in material designated either CuAg0,10 or CW013A, in material condition R280, rectangular, nominal thickness 15 mm, nominal width 100 mm, semi-circular edge, will be designated as follows:

**Bar EN 13601 — CuAg0,10 — R280 — 15 × 100 — CE**

or

**Bar EN 13601 — CW013A — R280 — 15 × 100 — CE**

EXAMPLE 3 Wire for electrical purposes conforming to this standard, in material designated either Cu-OF or CW008A, in material condition H035, hexagonal, with nominal width across-flats 8 mm, tolerance Class B and sharp corners, will be designated as follows:

**Wire EN 13601 — Cu-OF — H035 — HEX8B — SH**

or

**Wire EN 13601 — CW008A — H035 — HEX8B — SH**

## 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:

- quantity of product required (mass, number of rods or bars or coils of wire);
- denomination (rod, bar or wire);
- number of this European Standard (EN 13601);
- material designation (see Table 1 and Table 2);
- material condition designation (see 4.2 and Table 3);
- cross-sectional shape (round, square, hexagonal or rectangular);
- nominal dimensions (diameter, width across-flats or thickness × width);

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- h) tolerance class for round, square or hexagonal rod or wire: either Class A (minus tolerance only) or Class B (plus/minus tolerance) (see Table 4);
- i) type of corner (see 6.6.2);
- j) for rod or bar, the length required (see 6.6.3);
- k) for wire, the coil type: pancake, traverse wound, bunch or on drums (see 6.8);
- l) coil size requirements: inside and/or outside diameter and width or mass.

It is recommended that the product designation, as described in 4.3, is used for b) to i).

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

- m) test method to be used for measurement of hardness, i.e. Brinell or Vickers (see 8.3) unless the test method is to be left to the discretion of the supplier;
- n) whether sawn or sheared ends are required (see 6.6.3);
- o) whether special surface conditions are required (see 6.10);
- p) whether a bend test is required (see 6.3);
- q) whether form tolerances for wire are required (see 6.7.1);
- r) whether length of wire is required (see 6.6.3);
- s) whether sampling is required (see Clause 7);
- t) whether a declaration of conformity is required (see 9.1);
- u) whether an inspection document is required, and if so, which type (see 9.2);
- v) whether there are any special requirements for marking, packaging or labelling (see Clause 10).

EXAMPLE 1 Ordering details for 250 pieces bar for general electrical purposes conforming to EN 13601, in material designated either CuAg0,10 or CW013A, in material condition R280, rectangular, nominal thickness 15 mm, nominal width 100 mm, semi-circular edge, fixed length 4 500 mm:

**250 pieces Bar EN 13601— CuAg0,10 — R280 — 15 × 100 — CE— 4500 FL**

or

**250 pieces Bar EN 13601— CW013A — R280 — 15 × 100 — CE—4500 FL**

EXAMPLE 2 Ordering details for 1 000 kg wire for general electrical purposes conforming to EN 13601, in material designated either Cu-OF or CW008A, in material condition H035, hexagonal, nominal width across flats 8 mm, tolerance Class B, with sharp corners, nominal inside diameter of coil 500 mm:

**1 000 kg Wire EN 13601— Cu-OF — H035 — HEX8B — SH— nominal inside diameter of coil 500 mm**

or

**1 000 kg Wire EN 13601— CW008A — H035 — HEX8B — SH— nominal inside diameter of coil 500 mm**