



**SLOVENSKI STANDARD**  
**SIST EN 13602:2013**

**01-september-2013**

**Nadomešča:**  
**SIST EN 13602:2004**

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**Baker in bakrove zlitine - Vlečena okrogla bakrova žica za proizvodnjo električnih prevodnikov**

Copper and copper alloys - Drawn, round copper wire for the manufacture of electrical conductors

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**Ta slovenski standard je istoveten z: EN 13602:2013**

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**ICS:**

77.150.30      Bakreni izdelki                      Copper products

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EUROPEAN STANDARD

**EN 13602**

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2013

ICS 77.150.30

Supersedes EN 13602:2002

English Version

## Copper and copper alloys - Drawn, round copper wire for the manufacture of electrical conductors

Cuivre et alliages de cuivre - Fils ronds en cuivre étirés  
pour la fabrication des conducteurs électriques

Kupfer und Kupferlegierungen - Gezogener Runddraht aus  
Kupfer zur Herstellung elektrischer Leiter

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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## Foreword

This document (EN 13602:2013) 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 13602:2002.

In comparison with EN 13602:2002, the following changes were made:

- Terms have been modified.
- Normative references have been updated.
- Editorial modifications have been made.

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 13602:2002, *Copper and copper alloys — Drawn round copper wire for the manufacture of electrical conductors*.

<https://standards.iteh.ai/catalog/standards/sist/1f5fa4bc-39d5-4e88-aa14-c712dc42ef91/sist-en-13602-2013>

The products specified in this European Standard are those which are especially suitable for electrical purposes, i.e. with specified electrical properties. Drawn round wire for general purposes is specified in EN 12166.

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 13601, *Copper and copper alloys — Copper rod, bar and wire for general electrical purposes*
- 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 dimensional tolerances for drawn round copper wire from 0,04 mm up to and including 5,0 mm for the manufacture of electrical conductors intended for the production of bare and insulated cables and flexible cords.

This standard covers plain or tinned, single or multilined, annealed or hard drawn wire. It does not include wire for enamelling (winding wire, magnet wire), for electronic application and for contact wire for electric traction.

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

**NOTE** Due to the thermal and/or mechanical treatment involved in cabling processes, the properties of conductors in the final cable or cord differ from those of the original wire supplied. Requirements for conductors taken from cable or cord are given in appropriate cable standards.

## 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 610, *Tin and tin alloys — Ingot tin*

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 13603, *Copper and copper alloys — Test methods for assessing protective tin coatings on drawn round copper wire for electrical purposes*

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

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

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

ISO 4739, *Wrought copper and copper alloy products — Selection and preparation of specimens and test pieces for mechanical testing*

ISO 7801, *Metallic materials — Wire — Reverse bend test*

ISO 7802, *Metallic materials — Wire — Wrapping test*

**EN 13602:2013 (E)****3 Terms and definitions**

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

**3.1  
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]

**3.2  
multiline wire**

number of wires of the same nominal diameter and material condition wound at the same time on the same spool with the wires having a maximum of one twist per revolution of the spool

Note 1 to entry: Generally, the wires are drawn simultaneously on the same machine.

**3.3  
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**

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**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.

**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:

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

A... Material condition designated by the minimum value of elongation requirement for the product with mandatory elongation requirements.



Exact conversion between the material conditions designated R... and A... 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 (wire);
- b) number of this European Standard (EN 13602);
- c) material designation, either symbol or number (see Table 1 and Table 2);
- d) material condition designation (see Table 3 and Table 4);
- e) surface condition: plain (P) or tinned (grade A, B or C, see Table 7);
- f) nominal dimensions:
  - 1) single wire (S): diameter;
  - 2) multiline wire (M): number of wires and diameter;
- g) form of delivery: coil (Y) or spool (Z).

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

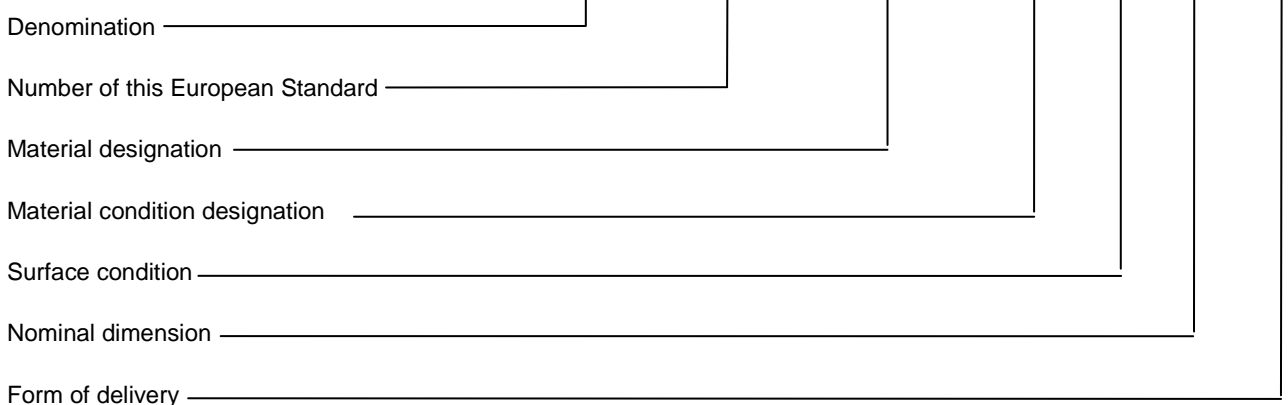
EXAMPLE 1 Plain single wire

Drawn round wire for electrical purposes conforming to this standard, in material designated either Cu-ETP1 or CW003A, in material condition A022, produced as a plain single wire, nominal diameter 0,4 mm, in coils, will be designated as follows:

**Wire — EN 13602 — Cu-ETP1 — A022 — P — S0,4 — Y**

or

**Wire — EN 13602 — CW003A — A022 — P — S0,4 — Y**



**EN 13602:2013 (E)****EXAMPLE 2** Plain multiline wire

Drawn round wire for electrical purposes conforming to this standard, in material designated either Cu-ETP or CW004A, in material condition A020, produced as plain multiline wire of 7 wires, nominal diameter 0,4 mm, in coils, will be designated as follows:

**Wire EN 13602 — Cu-ETP — A020 — P — M7 × 0,4 — Y**

or

**Wire EN 13602 — CW004A — A020 — P — M7 × 0,4 — Y**

**EXAMPLE 3** Tinned single wire

Drawn round wire for electrical purposes conforming to this standard, in material designated either Cu-OF1 or CW007A, in material condition A024, produced as tinned grade B single wire, nominal diameter 1,2 mm, in coils, will be designated as follows:

**Wire EN 13602 — Cu-OF1 — A024 — B — S1,2 — Y**

or

**Wire EN 13602 — CW007A — A024 — B — S1,2 — Y**

**EXAMPLE 4** Tinned multiline wire

Drawn round wire for electrical purposes conforming to this standard, in material designated either Cu-FRHC or CW005A, in material condition A018, produced as tinned grade C, multiline wire of 10 wires, nominal diameter 0,5 mm, on spools, will be designated as follows:

**Wire EN 13602 — Cu-FRHC — A018 — C — M10 × 0,5 — Z**

or <https://standards.iteh.ai/catalog/standards/sist/1f5fa4bc-39d5-4e88-aa14-c712dc42ef91/sist-en-13602-2013>

**Wire EN 13602 — CW005A — A018 — C — M10 × 0,5 — Z**

**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 or number of coils or spools);
- b) denomination (wire);
- c) number of this European Standard (EN 13602);
- d) material designation (see Table 1 and Table 2);
- e) material condition designation (see 4.2 and Table 3 and Table 4);
- f) surface condition (see 6.6):
  - 1) plain; or
  - 2) tinned (grade A, B or C, see Table 7);
- g) nominal dimensions:

- 1) single wire: nominal diameter;
- 2) multiline wire: number of wires  $\times$  nominal diameter of individual wires;
- h) form of delivery: coil (Y) or spool (Z);
- i) coil size or spool type;
- j) whether the multiline wire has to be coiled dynamically or statically.

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

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

- k) whether special surface conditions are required (see 6.6);
- l) which form of ductility test is required (see 8.3);
- m) which test method is required for assessing tin coating (see 8.5) and if continuity of tin coating, whether wire diameters from 0,04 mm up to and including 0,315 mm are to be tested. If so, the test piece length and pass/fail criteria shall be agreed;
- n) whether a special weight or length per coil or per spool is required;
- o) whether a declaration of conformity is required (see 9.1);
- p) whether an inspection document is required, and if so, which type (see 9.2);
- q) whether there are any special requirements for marking, packaging or labelling (see Clause 10).

EXAMPLE Ordering details for 1 500 kg drawn round wire for electrical purposes conforming to EN 13602, in material designated either Cu-ETP1 or CW003A, in material condition A018, produced as tinned grade B, multiline wire of 10 wires, nominal diameter 0,5 mm in coils, dynamically coiled, coil nominal inside diameter 500 mm:

**1 500 kg Wire EN 13602 — Cu-ETP1 — A018 — B — M10  $\times$  0,5 — Y**

— dynamically coiled

— coil nominal inside diameter 500 mm

or

**1 500 kg Wire EN 13602 — CW003A — A018 — B — M10  $\times$  0,5 — Y**

— dynamically coiled

— coil nominal inside diameter 500 mm

## 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.