SLOVENSKI STANDARD
SIST EN 13602:2004

01-januar-2004

Baker in bakrove zlitine ï Vleļ ena okrogla bakrova ģica za proizvodnjo elektriļ nih prevodnikov

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

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

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

Ta slovenski standard je istoveten z: **EN 13602:2002**

ICS:

77.150.30	Bakreni izdelki	Copper products

SIST EN 13602:2004 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13602

March 2002

ICS 77.150.30

English version

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

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This European Standard was approved by CEN on 22 February 2002.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 13602:2002 E

Contents

Foreword

This document EN 13602:2002 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of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 5 "Copper for electrical purposes" to prepare the following standard:

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

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.

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 13601, *Copper and copper alloys — Copper rod, bar and wire for general electrical purposes.*

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.*

EN 50149, *Railway applications — Fixed installations; Electric traction — Copper and copper wire alloy grooved contact wire.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and 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 multiline, 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 methods of test 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 cablemaking 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

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

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 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test (at ambient temperature).*

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.*

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 preparations of specimens and test pieces for mechanical testing.*

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

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

NOTE Informative references to documents used in the preparation of this standard, and cited at the appropriate places in the text, are listed in the bibliography.

3 Terms and definitions

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

3.1
wire
wrought product of uniform cross-section along its whole length, supplied in coiled form as coils or on reels, or spools or in drums. The cross-sections are round, square, hexagonal or rectangular

NOTE This definition is based on ISO 197-3.

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

Generally the wires are drawn simultaneously on the same machine

3.3
circularity (wire)
difference between the maximum and the minimum diameters measured at any one cross-section

4 Designations

4.1 Material

4.1.1 General

The material is designated either by symbol or number (see Tables 1 and 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 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 (Wire);

– number of this European Standard (EN 13602);

– material designation, either symbol or number (see Tables 1 and 2);

– material condition designation (see Tables 3 and 4);

– surface condition: plain (P) or tinned (grade A, B or C, see Table 7);

– nominal dimensions;

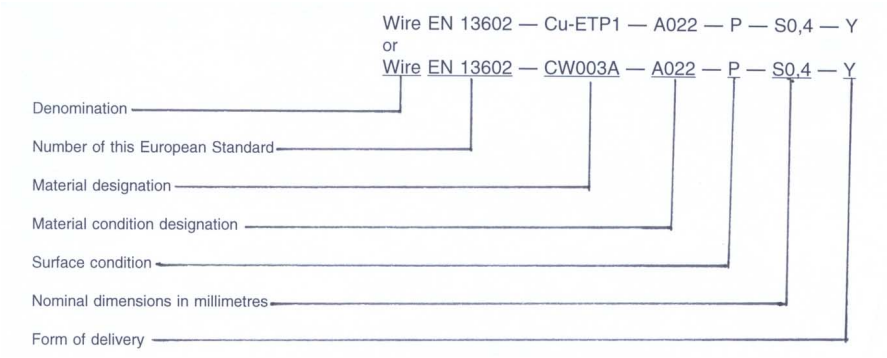
  – single wire (S): diameter;
  – multiline wire (M): number of wires and diameter;

– form of delivery: coil (Y) or spool (Z).

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, shall be designated as follows:



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, shall 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, shall 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, shall be designated as follows:

Wire EN 13602 — Cu-FRHC — A018 — C — M10 × 0,5 — Z
or
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 Tables 1 and 2);

e) material condition designation (see 4.2 and Tables 3 and 4);

f) surface condition (see 6.6);

- plain or
- tinned (grade A, B or C, see Table 7);

g) nominal dimensions;

- single wire: nominal diameter;
- multiline wire: number of wires × 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.

NOTE 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 × 0,5 — Y
— dynamically coiled
— coil nominal inside diameter 500 mm

or

1 500 kg Wire EN 13602 — CW003A — A018 — B — M10 × 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 Tables 1 and 2.

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

6.2 Mechanical properties

6.2.1 Plain wire

The mechanical properties of plain wire shall conform to the appropriate requirements given in Table 3. The tests shall be carried out in accordance with 8.2.

6.2.2 Tinned wire

The mechanical properties of tinned wire shall conform to the appropriate requirements given in Table 4. The tests shall be carried out in accordance with 8.2.

6.3 Electrical properties

The electrical properties of plain and of tinned wire shall conform to the appropriate requirements given in Table 5. The test shall be carried out in accordance with 8.4.

6.4 Dimensions

The geometrical properties of the wires are defined by diameters which shall conform to the tolerances given in Table 6.

6.5 Ductility

Wire in the material condition R... with diameter from 0,5 mm up to and including 5,0 mm shall neither break nor show any crack, when tested in accordance with 8.3.1 and examined without optical magnification.

When tested in accordance with 8.3.2 the number of bends before break shall be at least equal to the values given in Table 8 for annealed wire and Table 9 for hard drawn wire.

6.6 Surface condition

6.6.1 General

Wire shall be supplied either plain (P) or tinned. Three grades of thickness of unalloyed tin coating are available, see A, B or C in Table 7.

6.6.2 Plain wire

The wire 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 drawn products and is permissible unless otherwise specified. Discoloration is permissible as long as it does not impair utilization.

Special requirements relating to surface quality shall be agreed between the purchaser and the supplier [see 5 f)].