SLOVENSKI STANDARD
SIST EN 13605:2004

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Baker in bakrove zlitine – Profili in profilirana žica iz bakra za uporabo v elektrotehniki

Copper and copper alloys - Copper profiles and profiled wire for electrical purposes

Kupfer und Kupferlegierungen - Profile und profilierte Drähte aus Kupfer für die Anwendung in der Elektrotechnik

Cuivre et alliages de cuivre - Profilés et fils profilés en cuivre pour usages électriques

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77.150.30 Bakreni izdelki Copper products

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Copper and copper alloys - Copper profiles and profiled wire for electrical purposes

Cuivre et alliages de cuivre - Profilés et fils profilés en cuivre pour usages électriques

Kupfer und Kupferlegierungen - Profile und profilierte Drähte aus Kupfer für die Anwendung in der Elektrotechnik

This European Standard was approved by CEN on 25 March 2002.

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Foreword

This document EN 13605:2002 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of an identical text or by endorsement, at the latest by January 2003, and conflicting national standards shall be withdrawn at the latest by January 2003.

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 13605, *Copper and copper alloys — Copper profiles and profiled wire 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. Profiles for general purposes are specified in EN 12167.

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

Annex B (informative) gives recommended guidelines for design.

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 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*.

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 the United Kingdom.

1 Scope

This European Standard specifies the composition, property requirements including electrical properties, and tolerances on dimensions and form for copper profiles and profiled wire for electrical purposes which would fit within a circumscribing circle of maximum 180 mm diameter.

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

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 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 ISO 2626, *Copper — Hydrogen embrittlement test (ISO 2626:1973)*.

EN ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method (ISO 6506-1:1999)*.

EN ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method (ISO 6507-1:1997)*.

EN ISO 7438, *Metallic materials — Bend test (ISO 7438:1985)*.

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

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
profile

wrought product of uniform cross-section along its whole length, supplied in straight lengths. It may be solid or hollow:

– if solid, the contour of its cross-section is complex; or
– if hollow, the external contour and/or the internal contour of its cross-section is (are) complex

3.2
profiled wire

particular type of wire, i.e. a wrought product of uniform cross-section along its whole length, supplied in coiled form. It may be solid or hollow:

– if solid, the contour of its cross-section is complex; or
– if hollow the external contour and/or the internal contour of its cross-section is (are) complex

3.3
circumscribing circle
smallest circle which completely encloses the contour of the cross-sections of the profile or profiled wire

4 Designations

4.1 Material

4.1.1 General

The material is designated either by symbol or 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 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:

D Material condition for the product as drawn 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.

NOTE 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 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 (Profile or Profiled wire);

– number of this European Standard (EN 13605);

– material designation, either symbol or number (see Table 1);

– material condition designation (see Table 2);

– for profiles or profiled wire, a number, or the number of a fully dimensioned and toleranced drawing;

– for profiles, length [either "as manufactured" (M) or "fixed" (F) length];

– for profiled wire, form of delivery: coil (Y) or spool (Z).

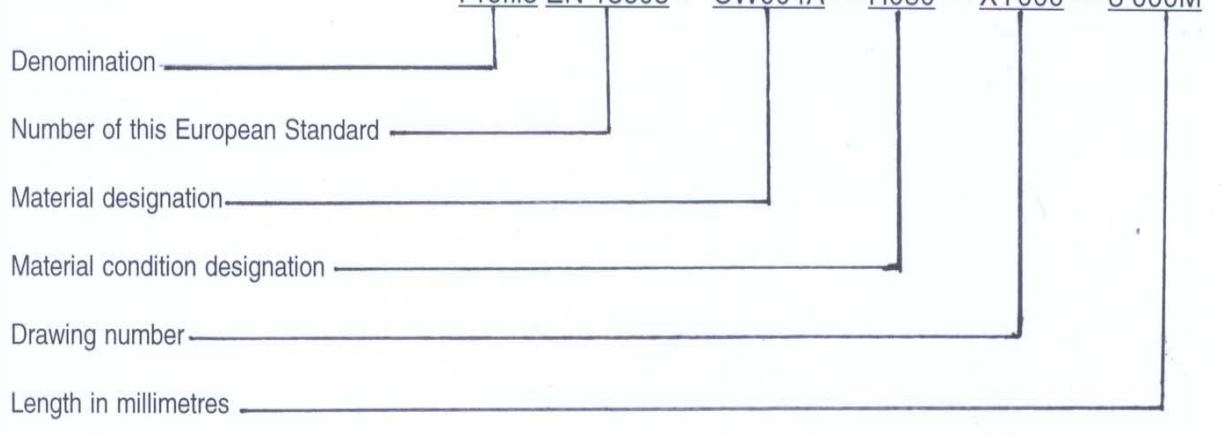
The derivation of a product designation is shown in example 1 and another typical product designation is shown in example 2.

EXAMPLE 1 Profile for electrical purposes conforming to this standard, in material designated either Cu-ETP or CW004A, in material condition H080, drawing number XY000, manufactured length 3 000 mm, shall be designated as follows:

Profile EN 13605 — Cu-ETP — H080 — XY000 — 3 000M

or

Profile EN 13605 — CW004A — H080 — XY000 — 3 000M



EXAMPLE 2 Profiled wire for electrical purposes conforming to this standard, in material designated either CuAg0,10 or CW013A in material condition H035, drawing number BC000, in coils, shall be designated as follows:

Profiled wire EN 13605 — CuAg0,10 — H035 — BC000 — Y

or

Profiled wire EN 13605 — CW013A — H035 — BC000 — Y

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 profiles or number of coils or spools);

b) denomination (Profile or Profiled wire);

c) number of this European Standard (EN 13605);

d) material designation (see Table 1);

e) material condition designation (see 4.2 and Table 2);

f) number of the profile or fully dimensioned and toleranced drawing;

g) for profiles, nominal length [either "as manufactured" (M) or "fixed" (F) length, see 6.6.4];

h) for profiled wire, form of delivery: pancake, traverse wound, bunched coils or on spools (see 6.7);

i) coil dimensions, mass or spool type;

j) for profiled wire, the direction of coiling to be indicated on the drawing (see 6.5);

k) whether Brinell or Vickers hardness test is mandatory;

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

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

l) whether first articles are required (see 6.5);

m) for profiles, whether sawn or sheared ends are required (see 6.6.4);

n) whether special surface conditions are required (see 6.9);

o) for profiled wire, whether form tolerances are required;

p) for profiled wire, whether specific length is required;

q) whether a declaration of conformity is required (see 9.1);

r) whether an inspection document is required, and if so, which type (see 9.2);

s) whether there are any special requirements for marking, packaging or labelling (see clause 10).

EXAMPLE 1 Ordering details for 1 000 pieces of profiles for electrical purposes conforming to EN 13605, in material designated either Cu-ETP or CW004A, in material condition H080, drawing number XY123, manufactured length 3 000 mm:

1 000 pieces Profile EN 13605 — Cu-ETP — H080 — XY123 — 3 000M

or

1 000 pieces Profile EN 13605 — CW004A — H080 — XY123 — 3 000M

EXAMPLE 2 Ordering details for 2 000 kg of profiled wire for electrical purposes conforming to EN 13605, in material designated either CuAg0,10 or CW013A, in material condition H035, drawing number BC123, in 250 kg coils:

2 000 kg Profiled wire EN 13605 — CuAg0,10 — H035 — BC123 — Y—250

or

2 000 kg Profiled wire EN 13605 — CW013A — H035 — BC123 — Y—250

6 Requirements

6.1 Composition

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

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 2. 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 3. The tests shall be carried out in accordance with 8.4.

6.4 Freedom from hydrogen embrittlement

Profiles and profiled wire in copper grades Cu-OF (CW008A), CuAg0,04P (CW014A), CuAg0,07P (CW015A), CuAg0,10P (CW016A), CuAg0,04(OF) (CW017A), CuAg0,07(OF) (CW018A), CuAg0,10(OF) (CW019A), Cu-PHC (CW020A), Cu-HCP (CW021A), shall show no evidence of cracking, when tested and visually examined in accordance with 8.5.

6.5 Drawings

Unless the profile or profiled wire can be described by nominal dimensions, the purchaser shall supply a drawing of the profile or profiled wire showing the dimensions and tolerances and in the case of profiled wire, the direction of coiling and position of the cross-section within the coil.

Special surface requirements, e.g. contact areas, shall be indicated on the drawing.

From the data submitted, the manufacturer of the profile or profiled wire shall prepare a drawing which includes the dimensions and tolerances. This drawing shall be checked and approved by the customer and returned to the manufacturer before die-sinking is started.

By agreement between the purchaser and the manufacturer, first articles shall be sent to the purchaser for approval before commencing bulk production.

6.6 Dimensions and tolerances

6.6.1 General

The tolerances on dimensions and form apply to profiles and tolerances on dimensions apply to profiled wires, within a circumscribing circle with a maximum diameter of 180 mm, see Figure 1.

Dimensions in millimetres

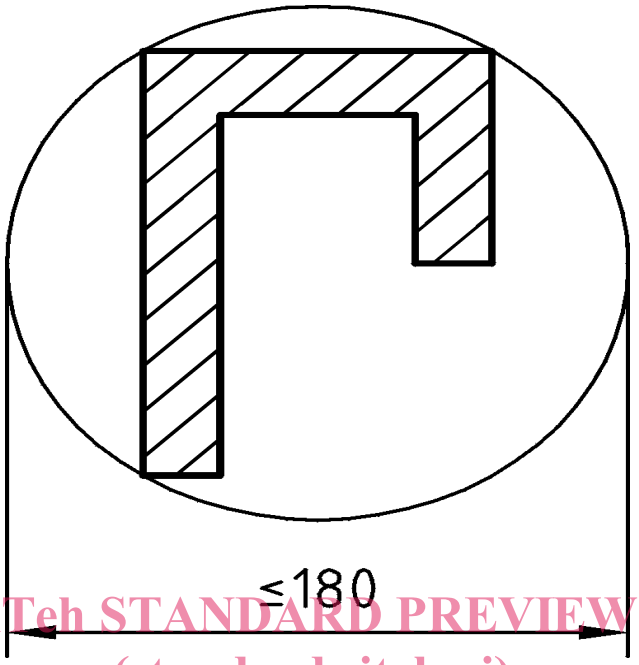


Figure 1

The tolerances specified on drawings shall conform to the requirements of this standard. If no tolerances are specified on the drawings of profiles, the specifications in this standard apply. It is advisable to make a suitable reference to this standard on the drawings.

If required, tighter tolerances than those specified shall be agreed between the purchaser and the supplier.

NOTE Dimensional tolerances are influenced by the fabrication accuracy of the tools, tool wear, and unavoidable deviations caused by fabrication.

6.6.2 Tolerances on cross-sectional dimensions

6.6.2.1 Profiles and profiled wires with a ratio $b_{max.}$ or $h_{max.}$ to $s_{min.}$ less than 20 : 1 shall conform to the requirements given in Table 4, see Figure 2.

6.6.2.2 Profiles and profiled wires with a ratio $b_{max.}$ or $h_{max.}$ to $s_{min.}$ equal to or greater than 20 : 1 shall conform to the requirements given in Table 5, see Figure 2.