SLOVENSKI STANDARD
SIST EN 1652:2000

01-november-2000

Baker in bakrove zlitine - Plošče, pločevina, trakovi in diski za splošno uporabo

Copper and copper alloys - Plate, sheet, strip and circles for general purposes

Kupfer und Kupferlegierungen - Platten, Bleche, Bänder, Streifen und Ronden zur allgemeinen Verwendung

Cuivre et alliages de cuivre - Plaques, tôles, bandes et disques pour usages généraux

Ta slovenski standard je istoveten z: **EN 1652:1997**

ICS:

77.150.30	Bakreni izdelki	Copper products

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Descriptors: copper, copper alloys, rolled products, metal plates, steel strips, blank, designation, chemical composition, mechanical properties, dimensions, dimensional tolerances, sampling, tests, verification

English version

Copper and copper alloys - Plate, sheet, strip and circles for general purposes

Cuivre et alliages de cuivre - Plaques, tôles, bandes et disques pour usages généraux

Kupfer und Kupferlegierungen - Platten, Bleche, Bänder, Streifen und Ronden zur allgemeinen Verwendung

This European Standard was approved by CEN on 6 November 1997.

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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 Central Secretariat 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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by June 1998, and conflicting national standards shall be withdrawn at the latest by June 1998.

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

EN 1652
Copper and copper alloys – Plate, sheet, strip and circles for general purposes

This is one of a series of European Standards for copper and copper alloy rolled flat products. Other products are, or will be, specified as follows:

EN 1172
Copper and copper alloys – Sheet and strip for building purposes

EN 1653
Copper and copper alloys – Plate, sheet and circles for boilers, pressure vessels and hot water storage units

EN 1654
Copper and copper alloys – Strip for springs and connectors

EN 1758
Copper and copper alloys – Strip for lead frames

Copper and copper alloys – Copper plate, sheet and strip for electrical purposes (WI: 00133022)

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the composition, property requirements and tolerances on dimensions and form for copper and copper alloy plate, sheet, strip and circles for general purposes.

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.

EN 1655
Copper and copper alloys – Declarations of conformity

prEN 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 2624
Copper and copper alloys – Estimation of average grain size (ISO 2624 : 1990)

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

ISO 6507-1
Metallic materials – Hardness test – Vickers test – Part 1: HV 5 to HV 100

ISO 6507-2
Metallic materials – Hardness test – Vickers test – Part 2: HV 0,2 to less than HV 5

ISO 7438
Metallic materials – Bend test

ISO 7799
Metallic materials – Sheet and strip 3 mm thick or less – Reverse bend test

ISO 8490
Metallic materials – Sheet and strip – Modified Erichsen cupping 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 a bibliography, see annex A.

3 Definitions

For the purposes of this standard, the following definitions, based on ISO 197-3, 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. The thickness does not exceed one tenth of the width.

3.3 strip

Flat rolled product of rectangular cross-section with uniform thickness from 0,1 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. The thickness does not exceed one tenth of the width.

3.4 circle

Circular blank.

4 Designations

4.1 Material

4.1.1 General

The material is designated either by a symbol or a 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 and elongation requirements;

H... Material condition designated by the minimum value of hardness requirement for the product with mandatory hardness requirements;

G... Material condition designated by the mid-range value of grain size requirement for the product with mandatory grain size and hardness requirements.

Exact conversion between material conditions designated R..., H... and G... 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 (Plate, Sheet, Strip or Circle);
- number of this European Standard (EN 1652);
- material designation, either symbol or number (see tables 1 and 2);
- material condition designation (see table 3);
- nominal dimensions:
  - plate: thickness × width × length [either "as manufactured" (M) or "fixed" (F) length] (see example 1);
  - sheet: thickness × width × length [either "as manufactured" (M) or "fixed" (F) length];
  - strip (in coils or on spools): thickness × width;
  - strip (cut to length): thickness × width × length [either "as manufactured" (M) or "fixed" (F) length];
  - circles: thickness × diameter (see example 2).

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

EXAMPLE 1:
Plate conforming to this standard, in material designated either Cu-OF or CW008A, in material condition H065, nominal thickness 14,25 mm, nominal width 350,5 mm, as manufactured length 1 200 mm, shall be designated as follows:

Plate EN 1652 – Cu-OF – H065 – 14,25 × 350,5 × 1 200M

or

Plate EN 1652 – CW008A – H065 – 14,25 × 350,5 × 1 200M

Denomination

Number of this European Standard

Material designation

Material condition designation

Nominal dimensions in millimetres

EXAMPLE 2:
Circle conforming to this standard, in material designated either CuNi12Zn24 or CW403J, in material condition R550, nominal thickness 1,115 mm, nominal diameter 345,5 mm, shall be designated as follows:

Circle EN 1652 – CuNi12Zn24 – R550 – 1,115 × 345,5

or

Circle EN 1652 – CW403J – R550 – 1,115 × 345,5

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:

- plate: number of pieces or mass;
- sheet: number of pieces or mass;
- strip (in coils or on spools): mass;
- strip (cut to length): mass or number of pieces;
- circle: number of pieces or mass;

b) denomination (Plate, Sheet, Strip or Circle);

c) number of this European Standard (EN 1652);

d) material designation (see tables 1 and 2);

e) material condition designation (see 4.2 and table 3) if the choice is not to be left to the discretion of the supplier;

f) nominal dimensions:

- plate, sheet, strip (cut to length): thickness × width × length (either "as manufactured" or "fixed" length);
- strip (in coils or on spools): thickness × width;
- circles: thickness × diameter;

g) coil size (strip) requirements: nominal inside diameter in millimetres and maximum outside diameter in millimetres and either maximum mass in kilograms or approximate specific coil weight (mass per width) in kilograms per millimetre;

h) spool size (strip): type or dimensions.

NOTE: 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) thickness tolerance required for hot rolled plate or circles with width or diameter over 1 500 mm (see table 4);

j) width tolerance required for plate or sheet with width over 1 250 mm (see table 7);

k) squareness requirement for cut plate or sheet with width over 1 250 mm (see table 9);

l) tolerance on diameter required for circles with diameter over 2 000 mm and thickness over 2,5 mm up to and including 5,0 mm (see table 10);

m) whether one or more technological tests are required, and if so, the test method(s) and test(s) acceptance criteria (see 8.5);

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

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

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

EXAMPLE:
Ordering details for 1 500 kg strip conforming to EN 1652, in material designated either CuZn37 or CW508L, in material condition R480, nominal thickness 0,543 mm, nominal width 219,25 mm, nominal inside diameter of coil 300 mm, maximum outside diameter of coil 950 mm, approximate specific coil weight (mass per width) 4,5 kg/mm:

1 500 kg Strip EN 1652 – CuZn37 – R480 – 0,543 × 219,25
– nominal inside diameter of coil 300 mm
– maximum outside diameter of coil 950 mm
– approximate specific coil weight 4,5 kg/mm

or

1 500 kg Strip EN 1652 – CW508L – R480 – 0,543 × 219,25
– nominal inside diameter of coil 300 mm
– maximum outside diameter of coil 950 mm
– approximate specific coil weight 4,5 kg/mm

6 Requirements

6.1 Composition

The composition shall conform to the requirements for the appropriate material given in tables 1 and 2.

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

6.2 Mechanical properties

The mechanical properties shall conform to the appropriate requirements given in table 3. The tests shall be carried out in accordance with 8.2 and 8.3.

6.3 Grain size

The grain size of G... condition material shall conform to the appropriate requirements given in table 3. The test shall be carried out in accordance with 8.4.

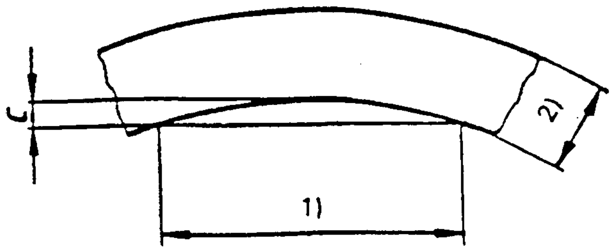
6.4 Dimensions and tolerances

Plate, sheet, strip and circles shall conform to the appropriate tolerances on dimensions and form given in tables 4 to 10. Plate, sheet and strip up to 5 000 mm in length may be supplied in "as manufactured" or "fixed" lengths (see table 8).

6.5 Edgewise curvature *c*

For the straightness of the longitudinal edge, 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 11.

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 11 multiplied by 4.



1) measuring length
2) strip width

Figure 1: Edgewise curvature *c*

6.6 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.

7 Sampling

7.1 General

When required (e.g. if necessary in accordance with specified procedures of a supplier's quality 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.

NOTE 1: When preparing the test sample, care should be taken to avoid contaminating or overheating the test sample. Carbide tipped tools are recommended; steel tools, if used, should be made of magnetic material to assist in the subsequent removal of extraneous iron. If the test samples are in finely divided form (e.g. drillings, millings), they should be treated carefully with a strong magnet to remove any particles of iron introduced during preparation.

NOTE 2: In cases of dispute concerning the results of analysis, the full procedure given in ISO 1811-2 should be followed.

Results may be used from analyses carried out at an earlier stage of manufacturing the product, e.g. at the casting or master coil stage, if the material identity is maintained and if the quality system of the manufacturer is certified as conforming to EN ISO 9001 or EN ISO 9002.

7.3 Tensile, hardness, grain size and technological tests

The sampling rate shall be one test sample per master coil. Sampling units shall be selected from the finished products. The test samples shall be cut from the sampling units. Test samples, and test pieces prepared from them, shall not be subjected to any further treatment, other than any machining operations necessary in the preparation of the test pieces.

8 Test methods

8.1 Analysis

Analysis shall be carried out on the test pieces, or test portions, prepared from the test samples obtained in accordance with 7.2. Except in cases of dispute, the analytical methods used shall be at the discretion of the supplier. For expression of results, the rounding rules given in 8.7 shall be used.

NOTE: In cases of dispute concerning the results of analysis, the methods of analysis to be used should be in accordance with the appropriate ISO standards agreed between the disputing parties.

8.2 Tensile test

The tensile properties shall be determined in accordance with EN 10002-1 on the test pieces prepared from the test samples obtained in accordance with 7.3, except that the gauge length for determining elongation shall be:

a) for thickness over 2,5 mm, gauge length $l_0 = 5{,}65\sqrt{S_0}$ (Elongation A);

b) for thickness from 0,10 mm up to and including 2,5 mm, a fixed gauge length of 50 mm (Elongation A_{50mm}).

8.3 Hardness test

The Vickers hardness shall be determined in accordance with ISO 6507-1 or ISO 6507-2 as appropriate, on the test pieces prepared from the test samples obtained in accordance with 7.3.

For the Vickers test according to ISO 6507-1 a test force selected from one of those given in ISO 6507-1 shall be used.

For the Vickers test according to ISO 6507-2 a test force selected from one of those given in ISO 6507-2 shall be used.

8.4 Estimation of average grain size

The average grain size shall be estimated in accordance with EN ISO 2624 on the test pieces prepared from the test samples obtained in accordance with 7.3.

8.5 Technological tests

The technological tests shall be agreed between the purchaser and the supplier [see 5 m)], e.g.:

a) bend test, in accordance with ISO 7438;

b) reverse bend test, in accordance with ISO 7799;

c) Erichsen cupping test, in accordance with ISO 8490.

8.6 Retests

If there is a failure of one, or more than one, of the tests in 8.1 to 8.5, two test samples from the same inspection lot shall be permitted to be selected for retesting the failed property (properties). One of these test samples shall be taken from the same sampling unit as that from which the original failed test piece was taken, unless that sampling unit is no longer available, or has been withdrawn by the supplier.

If the test pieces from both test samples pass the appropriate test(s), then the inspection lot represented shall be deemed to conform to the particular requirement(s) of this standard. If a test piece fails a test, the inspection lot represented shall be deemed not to conform to this standard.

8.7 Rounding of results

For the purpose of determining conformity to the limits specified in this standard, an observed or a calculated value obtained from a test shall be rounded in accordance with the following procedure, which is based upon the guidance given in annex B of ISO 31-0 : 1992. It shall be rounded in one step to the same number of figures used to express the specified limit in this standard, except that for tensile strength the rounding interval shall be 10 N/mm^2 and for elongation the value shall be rounded to the nearest 1 %.

The following rules shall be used for rounding:

a) if the figure immediately after the last figure to be retained is less than 5, the last figure to be retained shall be kept unchanged;

b) if the figure immediately after the last figure to be retained is equal to or greater than 5, the last figure to be retained shall be increased by one.

9 Declaration of conformity and inspection documentation

9.1 Declaration of conformity

When requested by the purchaser [see 5 n)] and agreed with the supplier, the supplier shall issue for the products the appropriate declaration of conformity in accordance with EN 1655.

9.2 Inspection documentation

When requested by the purchaser [see 5 o)] and agreed with the supplier, the supplier shall issue for the products the appropriate inspection document in accordance with EN 10204.

10 Marking, packaging, labelling

Unless otherwise specified by the purchaser and agreed by the supplier, the marking, packaging and labelling shall be left to the discretion of the supplier [see 5 p)].

Table 1: Composition of copper

Material designation		Composition in % (m/m)								Density[2] g/cm^3
		Element	Cu[1]	Bi	O	P	Pb	Other elements (see note)		
Symbol	Number							total	excluding	approx.
Cu-ETP	CW004A	min.	99,90	–	–	–	–	–	Ag, O	8,9
		max.	–	0,000 5	0,040[3]	–	0,005	0,03		
Cu-FRTP	CW006A	min.	99,90	–	–	–	–	–	Ag, Ni, O	8,9
		max.	–	–	0,100	–	–	0,05		
Cu-OF	CW008A	min.	99,95	–	–	–	–	–	Ag	8,9
		max.	–	0,000 5	–[4]	–	0,005	0,03		
Cu-DLP	CW023A	min.	99,90	–	–	0,005	–	–	Ag, Ni, P	8,9
		max.	–	0,000 5	–	0,013	0,005	0,03		
Cu-DHP	CW024A	min.	99,90	–	–	0,015	–	–	–	8,9
		max.	–	–	–	0,040	–	–		

[1]) Including Ag, up to a maximum of 0,015 %.
[2]) For information only.
[3]) Oxygen content up to 0,060 % is permitted, subject to agreement between the purchaser and the supplier.
[4]) The oxygen content shall be such that the material conforms to the hydrogen embrittlement requirements of prEN 1976.
NOTE: The total of other elements (than copper) is defined as the sum of Ag, As, Bi, Cd, Co, Cr, Fe, Mn, Ni, O, P, Pb, S, Sb, Se, Si, Sn, Te and Zn, subject to the exclusion of any individual elements indicated.