BS EN 1172:2011

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Copper and copper alloys — Sheet and strip for building purposes

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National foreword

This British Standard is the UK implementation of EN 1172:2011. It supersedes BS EN 1172:1997 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee NFE/34/1, Wrought and unwrought copper and copper alloys.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 71443 6

ICS 77.150.30

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2011.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1172

November 2011

ICS 77.150.30

Supersedes EN 1172:1996

English Version

Copper and copper alloys - Sheet and strip for building purposes

Cuivre et alliages de cuivre - Tôles et bandes pour le bâtiment

Kupfer und Kupferlegierungen - Bleche und Bänder für das Bauwesen

This European Standard was approved by CEN on 15 October 2011.

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Foreword

This document (EN 1172:2011) 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of an identical text or by endorsement, at the latest by May 2012, and conflicting national standards shall be withdrawn at the latest by May 2012.

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 1172:1996.

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

— EN 1172:1996, *Copper and copper alloys — Sheet and strip for building purposes*.

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

— EN 1652, *Copper and copper alloys — Plate, sheet, strip and circles for general 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*

— EN 13599, *Copper and copper alloys — Copper plate, sheet and strip for electrical purposes*

In comparison with the first edition of EN 1172:1996, the following significant technical changes were made:

a) Addition of four new materials: CuSn0,15 (CW117C), CuAl5Zn5Sn1 (CW309G), CuSn4 (CW450K) and CuZn15 (CW502L) into Tables 1 and 2;

b) Addition of thickness 0,4 mm.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies requirements for copper sheet and strip in thicknesses from 0,4 mm up to and including 1 mm and in widths up to and including 1 250 mm.

This European Standard is applicable to sheet and strip for use in building construction, e.g. for roof drainage systems, gutters, down pipes, roof coverings, external wall claddings, dormer windows, verges, chimney flashings and roof valleys.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method (ISO 6507-1:2005)*

EN ISO 6507-2, *Metallic materials — Vickers hardness test — Part 2: Verification and calibration of testing machines (ISO 6507-2:2005)*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*

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 80000-1:2009, *Quantities and units — Part 1: General*

3 Terms and definitions

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

3.1
sheet
flat rolled product of rectangular cross-section with uniform thickness from 0,4 mm up to and including 1,0 mm and with width up to and including 1 250 mm, supplied in straight lengths with sheared edges

NOTE 1 Sheet is usually cut from strip.

NOTE 2 Adapted from ISO 197-3:1983.

3.2
strip
flat rolled product of rectangular cross-section with uniform thickness from 0,4 mm up to and including 1,0 mm and with width up to and including 1 250 mm, manufactured in coil and supplied with sheared edges

NOTE Adapted from ISO 197-3:1983.

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 designations are 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, 0,2 % proof strength and elongation requirements;

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

Exact conversion between material conditions designated R… and H… 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:

a) denomination (Sheet or Strip);

b) number of this European Standard (EN 1172);

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

d) material condition designation (see Table 2);

e) nominal dimensions:

1) sheet: thickness × width × length (see Example 1);

2) strip: thickness × width (see Example 2).

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

EXAMPLE 1 Sheet conforming to this standard, in material designated either Cu-DHP or CW024A, in material condition R240, nominal thickness 0,6 mm, nominal width 1 000 mm, nominal length 2 000 mm, shall be designated as follows:

Sheet EN 1172 – Cu-DHP – R240 – 0,6 × 1 000 × 2 000

or

Sheet EN 1172 – CW024A – R240 – 0,6 × 1 000 × 2 000

Denomination

Number of this European Standard

Material designation

Material condition designation

Nominal dimensions in millimetres

EXAMPLE 2 Strip conforming to this standard, in material designated either Cu-DHP or CW024A, in material condition R240, nominal thickness 0,6 mm, nominal width 1 000 mm, shall be designated as follows:

Strip EN 1172 – Cu-DHP – R240 – 0,6 × 1 000

or

Strip EN 1172 – CW024A – R240 – 0,6 × 1 000

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 material required:

   1) sheet: number of pieces or mass;

   2) strip: mass or length;

b) denomination (Sheet or Strip);

c) number of this European Standard (EN 1172);

d) material designation (see Table 1);

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

f) nominal dimensions (see Table 3):

   1) sheet: thickness × width × length;

   2) strip: thickness × width;

g) coil inside diameter (see Table 3).

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:

h) special requirements to be met by the surface (see 6.3);

i) special requirements to be met by the straightness of strip (see 6.4.2.3);

j) special requirements to be met by the flatness of strip, at right angles to the direction of rolling (see 6.4.3);

k) additional marking details (see 9.1);

l) any special requirements for packaging if they are not to be left to the discretion of the supplier (see 9.2).

EXAMPLE Ordering details for 1 000 kg strip conforming to EN 1172, in material designated Cu-DHP or CW024A, in material condition R240, nominal thickness 0,6 mm, nominal width 1 000 mm, nominal inside diameter of coil 500 mm:

1 000 kg Strip EN 1172 – Cu-DHP – R240 – 0,6 × 1 000
– nominal inside diameter of coil 500 mm

or

1 000 kg Strip EN 1172 – CW024A – R240 – 0,6 × 1 000
– nominal inside diameter of coil 500 mm

6 Requirements

6.1 Composition

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

6.2 Mechanical properties

The mechanical properties (tensile strength, 0,2 % proof strength, elongation and Vickers hardness) shall conform to the appropriate requirements given in Table 2. The tests shall be carried out in accordance with 8.2 and 8.3.

6.3 Surface quality

The surface quality of sheet and strip shall be consistent with the manufacturing process, i.e. smooth, clean and free from marked discoloration. Surface irregularities, such as striations in the direction of rolling, marks which have been rolled over, minor scratches, flaking, abrasion marks or residues of coolants and lubricants are permitted unless they impair workability and serviceability.

For special applications, (e.g. where sheet or strip is intended for use as external wall cladding (facade quality)), the requirements to be met by the surface quality shall be agreed between the purchaser and the supplier at the time of enquiry and order.

6.4 Dimensions and tolerances

6.4.1 Thickness, width, length and coil inside diameter

The standardised nominal thicknesses, widths, lengths and coil inside diameters available are given in Table 3.

Thickness, width and length shall conform to the dimensional tolerances given in Table 3.

6.4.2 Straightness of longitudinal edges (edgewise curvature)

6.4.2.1 General

The tolerances on straightness of longitudinal edges are given in 6.4.2.2 and 6.4.2.3.

For special applications [e.g. where sheet or strip is intended for use as external wall cladding (facade quality)], the straightness requirements shall be agreed between the purchaser and the supplier.

6.4.2.2 Sheet

For sheet up to and including 3 000 mm length, the tolerance on straightness of longitudinal edges shall be not more than 1 mm per 1 000 mm gauge length, nor more than 3 mm for a gauge length of 3 000 mm.

6.4.2.3 Strip

The straightness tolerance of the longitudinal edges shall be not more than 1 mm per 1 000 mm gauge length, nor more than 5 mm for a gauge length of 5 000 mm.

6.4.3 Flatness

The flatness shall conform to the tolerances given in Table 4, except for material conditions R220 or H040.

Strip need not meet any requirements for flatness in the direction of rolling, since, when unrolled after reeling, there is always some residual curvature.

For special applications, (e.g. where sheet or strip is intended for use as external wall cladding (facade quality)), the flatness requirements shall be agreed between the purchaser and the supplier.

6.4.4 Squareness of sheet

The squareness shall conform to the tolerances given in Table 5.

6.5 Mass per unit length

The mass per unit length shall be calculated from the nominal sizes of the sheet or strip and from the density of the material given in Table 1.

NOTE Values for mass per unit length are given in Table 3 for information only. Deviation from these values can result from tolerances on nominal sizes and variation of density which is dependent on the composition of the material.

7 Sampling

7.1 Analysis

Sampling, selection of test samples and preparation of test pieces shall be in accordance with ISO 1811-2.

7.2 Mechanical tests

The sampling rate shall be one sampling unit per inspection lot unless otherwise agreed between the purchaser and the supplier at the time of enquiry and order.

The size of the inspection lot shall be subject to agreement between the purchaser and the supplier.

Selection of test samples and preparation of test pieces shall be in accordance with ISO 4739.

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 7.1. 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 8.5 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.

8.2 Tensile test

The tensile strength, 0,2 % proof strength and elongation shall be determined in accordance with EN ISO 6892-1 on the test pieces prepared from the test samples obtained in accordance with 7.2.

8.3 Hardness test

The Vickers hardness shall be determined in accordance with EN ISO 6507-1 or EN ISO 6507-2 as appropriate on the test pieces prepared from the test samples obtained in accordance with 7.2.

8.4 Retests

If there is a failure of one, or more than one, of the tests in 8.1, 8.2 or 8.3, 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.

8.5 Rounding of results

For the purposes 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 80000-1:2009. 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 and 0,2 % proof strength the rounding interval shall be 10.

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 Marking, packaging, labelling

9.1 Marking of sheet and strip

Sheet and strip conforming to this standard, supplied in widths of 500 mm, 600 mm, 670 mm, 700 mm, 800 mm and 1 000 mm, shall be continuously marked with the following details:

a) nominal thickness;

b) number of this European Standard (EN 1172);

c) material symbol or number designation;

d) material condition designation;

e) manufacturer's name or mark;

f) name or symbol of country of origin.

Subject to agreement between the purchaser and the supplier, additional details may be marked, for example, trademark, facade quality.

9.2 Packaging

Unless otherwise specified by the purchaser and agreed by the supplier, the packaging shall be left to the discretion of the supplier (see 5 l).

9.3 Labelling

The packaging of each consignment shall be labelled at least with the following details:

a) quantity (mass, number of units);

b) dimensions: (for sheet: thickness × width × length; for strip: thickness × width×coil inside diameter);

c) material designation;

d) manufacturer.

Table 1 — Composition

Material designation		Composition % (mass fraction)										Density [a] g/cm^3
Symbol	Number	Element	Cu	Al	Fe	Ni	P	Pb	Sn	Zn	others total	approx.
Cu-DHP [b]	**CW024A**	min. max.	99,90 [c] —	— —	— —	— —	0,015 0,040	— —	— —	— —	— —	8,9
CuSn0,15	**CW117C**	min. max.	Rem. —	— —	— 0,02	— 0,02	— 0,015	— —	0,10 0,15	— 0,10	— 0,10	8,9
CuZn0,5 [d]	**CW119C**	min. max.	Rem. —	— —	— —	— —	— 0,02	— —	— —	0,1 1,0	— 0,1	8,9
CuAl5Zn5Sn1 [e]	**CW309G**	min. max.	Rem. —	4,0 6,0	0,15 —	— —	— 0,05	— —	0,3 1,5	4,0 6,0	— 0,5	8,2
CuSn4	**CW450K**	min. max.	Rem. —	— —	— 0,1	— 0,2	0,01 0,4	— 0,02	3,5 4,5	— 0,2	— 0,2	8,9
CuZn15 [f]	**CW502L**	min. max.	84,0 86,0	— 0,02	— 0,05	— 0,3	— —	— 0,05	— 0,1	Rem. —	— 0,1	8,8

[a] For information only.

[b] With very good welding, brazing and soldering properties.

[c] Including Ag, up to a maximum of 0,015 %.

[d] Only for gutters, downpipes and accessories. Welding, brazing, and heat treatment can lead to evaporation of zinc.

[e] Good soldering properties with suitable flux and solder.

[f] Good brazing and soldering properties. Brazing can lead to evaporation of zinc.

Table 2 — Mechanical properties

Designation		Material condition	Tensile strength R_m N/mm²		0,2 % proof strength $R_{p0,2}$ N/mm²		Elongation A_{50mm} %	Hardness HV	
Material Symbol	Material Number		min.	max.	min.	max.	min.	min.	max.
Cu-DHP **CuZn0,5**	**CW024A** **CW119C**	R220	220	260	—	140	33	—	—
		H040	—	—	—	—	—	40	65
		R240	240	300	140	—	8	—	—
		H065	—	—	—	—	—	65	95
		R290	290	—	250	—	—	—	—
		H090	—	—	—	—	—	90	—
CuSn0,15	**CW117C**	R250	250	320	200	—	9	—	—
		H060	—	—	—	—	—	60	90
		R300	300	370	250	—	4	—	—
		H085	—	—	—	—	—	85	110
CuAl5Zn5Sn1	**CW309G**	R400	400	—	170	—	45	—	—
		H080	—	—	—	—	—	80	—
CuSn4	**CW450K**	R290	290	390	—	190	40	—	—
		H070	—	—	—	—	—	70	100
CuZn15	**CW502L**	R310	310	370	200	290	10	—	—
		H090	—	—	—	—	—	90	115

Table 3 — Dimensions, tolerances and mass per unit length

Nominal dimensions mm				Tolerances mm			Mass per unit length[a] at 100 mm width kg/m
thickness	width up to and including	preferred length of sheet	coil inside diameter for strip	thickness	width	length of sheet	approximate
0,4	1 250	2 000 or 3 000	300, 400, 500 or 600	± 0,02	+2 0	+10 0	0,356
0,5							0,445
0,6							0,534
0,7							0,623
0,8							0,712
1,0							0,890

[a] Calculated with a density of 8,9 g/cm^3.

Table 4 — Flatness of sheet

Nominal width mm	Gauge length mm	Number of waves	Flatness tolerance mm
up to and including 1 250	1 000	1	2
		> 1	1

Table 5 — Squareness of sheet

Dimensions in millimetres

Nominal width		Maximum allowable differences between diagonals for lengths	
		from 1 000 up to and including 2 000	over 2 000 up to and including 3 000
over	up to and including		
—	700	6	7
700	1 250	8	9

Bibliography

[1] EN 1173, *Copper and copper alloys —Material condition designation*

[2] EN 1412, *Copper and copper alloys — European numbering system*

[3] ISO 197-3:1983, *Copper and copper alloys — Terms and definitions — Part 3: Wrought products*

[4] ISO 1190-1, *Copper and copper alloys — Code of designation — Part 1: Designation of materials*

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