

Introduction

The EN Standards

The EN series of standards for copper and copper alloys offers a selection of materials to suit a very wide variety of end uses. They represent a consensus agreement on those most frequently ordered by consumers.

Commencing in the late 1980s, drafting of European Standards for Copper and Copper Alloys became a major activity for national standards' organisations and their industrial partners.

Because a large number of national preferences have needed to be taken into account against the background of a pan-European agreement to develop tight product standards, the EN standards are more complex than the old BS standards. Furthermore, the EN standards tend to cover narrower fields than BS standards; hence there are more alloys in the EN series than in the old BS standards.

This publication summarises the main compositions and the range of properties. For full details refer to the standards documents obtainable from: The British Standards Institution, 398 Chiswick High Road, London W4 4AL. Tel: 020 8996 9001 Fax: 020 8996 7001
www: bsi-global.com

Withdrawal of Old Standards

As the new standards have been published they were in conflict with the old British Standards. These were withdrawn, as were those of other European countries, leaving Europe with one harmonised series of standards published in each country but applicable across all.

The majority of the new standards, published or due during the period 1996-2003, caused withdrawal of conflicting national standards such as BS 1400 for castings, the BS 287x series for wrought materials and the BS 143x series covering coppers for electrical purposes.

Materials popularly used from the old BS standards continue to be available but the new designations should be used.

Numbers and Titles of Standards

Table 1 shows EN standards' titles, categorised by product type, and the BS standards that have been replaced. During the standardisation process, at the stage of draft for public comment, an EN number is allocated. At this stage drafts are identified with the prefix 'pr'. After successful formal vote, when the draft is approved for publication throughout Europe, the EN implementation uses the same number.

Table 2 shows old BS standard numbers in numerical order and their replacement EN standards.

Product Forms

As part of the standardisation process, uniform definitions have now been adopted for all product forms. This will result in some products having new terminology. As an example, the term 'wire' now includes all material made in coil form.

Material Designations

Material designations (individual copper and copper alloy identifications) are in two forms, symbol and number. As with many other existing European national standards, symbols are based on the ISO compositional system (e.g. CuZn37 is 63/37 brass). ISO and EN symbols may be identical but the detailed compositional limits are not always identical and cannot be assumed to refer to unique materials.

Numbering System

A new numbering system has therefore been developed to offer a more user- and computer-friendly alternative. The system is a 6-character, alpha-numeric series, beginning C for copper based material; the second letter indicates the product form as follows:-

- B – Materials in ingot form for re-melting to produce cast products
- C – Materials in the form of cast products
- F – Filler materials for brazing and welding
- M – Master alloys
- R – Refined unwrought copper
- S – Materials in the form of scrap
- W – Materials in the form of wrought products
- X – Non-standardised materials

A three-digit number series in the 3rd, 4th and 5th places is used to designate each material and can range from 001 to 999. Numbers are allocated in preferred groups, each series being shown below. The sixth character, a letter, indicates the copper or alloy grouping as follows:-

Number series	Letters	Materials
000-099	A or B	Copper
100-199	C or D	Copper alloys, low alloyed (less than 5% alloying elements)
200-299	E or F	Miscellaneous copper alloys (5% or more alloying elements)
300-349	G	Copper-aluminium alloys
350-399	H	Copper-nickel alloys
400-449	J	Copper-nickel-zinc alloys
450-499	K	Copper-tin alloys
500-599	L or M	Copper-zinc alloys, binary
600-699	N or P	Copper-zinc-lead alloys
700-799	R or S	Copper-zinc alloys, complex

Symbol Designations

- The symbols used are based on the ISO designation system (ISO 1191 Pt1).
- The principal element, copper, is first.
- Other alloying elements are included in decreasing order of percentage content.
- Where contents are similar, alphabetical order may be used.
- The numbers after elements represent nominal compositions.
- No number is normally used if the nominal composition is less than 1%.

Material Condition (Temper) Designations

Material condition (alternative term – temper) designations are defined in EN 1173. In most product standards, materials are available in a choice of material conditions. Depending on the product standard there may be one or more mandatory properties associated with the particular material condition. For designation purposes the principal mandatory property for each material condition is identified by a letter, as follows:-

- A – Elongation
- B – Spring bending limit
- D – As drawn, without specified mechanical properties
- G – Grain size
- H – Hardness (Brinell or Vickers)
- M – As manufactured, without specified mechanical properties
- R – Tensile strength
- Y – 0.2% proof strength

Products can only be ordered to one material condition and not a combination. However, besides the designating property, other properties may be mandatory; check the standard document for full details.

Normally three digits, but in a few instances four digits, follow the material condition designating letter, where appropriate, to indicate the value of the mandatory property with the possibility of a final character, 'S', for the stress relieved condition. Normally the value refers to a minimum for the property. Sometimes, as with grain size, it refers to a nominal mid-range value.

Tables 6 to 12 show not only the existence of copper or copper alloys in particular standards but also the material conditions available as mandatory properties within those standards.

Castings

For castings, properties are dependent on the casting process used. This is designated according to the system:

- GS sand casting
- GM permanent mould casting
- GZ centrifugal casting
- GC continuous casting
- GP pressure diecasting

Examples

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|---------------|--|
| CW614N – R420 | refers to wrought CuZn39Pb3 copper-zinc-lead alloy to be supplied to a minimum tensile strength of 420 N/mm ² |
| CC750S-GS | refers to sand cast CuZn33Pb2 copper-zinc duplex alloy |

Ordering Information

Each product standard gives examples of the full ordering information required including quantity, product form, standard number, designation, condition, tolerances and packaging.

Typical Properties

In Tables 6 to 12, typical properties are usually shown as ranges. For materials available in both 'soft' condition, for example as forging stock, and 'very hard', for example as spring wire, then the ranges are very wide. Tables 14 to 18 show typical properties for ranges of brasses similar to those previously included in British Standards in order to give a closer idea of the range of properties available in each product form.

It is vital that designers and purchasers consult with suppliers to clarify what property values and combinations are available to be best fit for purpose in the desired product form.

Declarations of Conformity

Where the full quality systems standardised in EN ISO 9001 series of standards are not required, a declaration of conformity may still be needed to confirm compliance with order requirements:

In EN 1655 'Copper and Copper Alloys – Declarations of Conformity', four levels of declaration of conformity are available:

Type A for suppliers who do not have a certified quality assurance scheme.

Type B for suppliers who do not have a certified quality assurance scheme but have access to an accredited laboratory.

Type C for suppliers who have a certified quality assurance scheme but do not have access to an accredited laboratory.

Type D for suppliers who have both a certified quality assurance scheme and access to an assessed laboratory.

These declarations are more specific than those based on systems used for steels included in EN 10204 'Metallic Products – Types of Inspection Documents'.