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ISO RECOMMENDATION
R 426

CLASSIFICATION OF BRASSES, LEADED BRASSES, SPECIAL BRASSES AND HIGH TENSILE BRASSES

1st EDITION

March 1965

For each individual country the only valid standard is the national standard of that country.

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BRIEF HISTORY

The ISO Recommendation R 426, *Classification of Brasses, Leaded Brasses, Special Brasses and High Tensile Brasses*, was drawn up by Technical Committee ISO/TC 26, *Copper and Copper Alloys*, the Secretariat of which is held by the Deutscher Normenausschuss (DNA).

Work on this question by the Technical Committee began in 1960 and led, in 1962, to the adoption of a Draft ISO Recommendation.

In December 1962, this Draft ISO Recommendation (No. 543) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies:

Australia	Germany	Romania
Belgium	Greece	Spain
Brazil	India	Sweden
Canada	Iran	Switzerland
Chile	Italy	Turkey
Denmark	Japan	United Kingdom
Finland	Netherlands	Yugoslavia
France	Poland	

One Member Body opposed the approval of the Draft:

U.S.S.R.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in March 1965, to accept it as an ISO RECOMMENDATION.

ISO Recommendation R 426 March 1965

CLASSIFICATION OF BRASSES, LEADED BRASSES, SPECIAL BRASSES AND HIGH TENSILE BRASSES

1. SCOPE

This ISO Recommendation relates to the chemical composition and forms of semi-manufactured products of the following wrought copper alloys:

Brasses,
Leaded brasses,
Special brasses,
High tensile brasses,

currently available in commercial quantities.

It is intended as a classification and not as a specification for the various types. For the classification principles, see Appendix.

2. GENERAL

The chemical compositions given below show only the main constituent elements and usual impurities. It is the responsibility of the supplier to ensure that any element not specifically limited by this ISO Recommendation is not present in an amount such as is generally accepted as having an adverse effect on the product. If the purchaser's requirements necessitate limits for any element not specified, these should be agreed upon between supplier and purchaser.

3. CHEMICAL COMPOSITION (PER CENT)

3.1 Brasses

TABLE 1

Designation	Cu	Zn	Maximum impurities			Average density*
			Fe	Pb	Total	kg/dm³
Cu Zn10	89.0 to 91.0	The remainder	0.1	0.1	0.5	8.80
Cu Zn15	84.0 to 86.0		0.1	0.1	0.5	8.75
Cu Zn20	78.5 to 81.5		0.1	0.1	0.5	8.65
Cu Zn30	68.5 to 71.5		0.1	0.1	0.4	8.55
Cu Zn33	65.5 to 68.5		0.1	0.1	0.5	8.50
Cu Zn37	62.0 to 65.5		0.2	0.3	0.5**	8.45
Cu Zn40	59.0 to 62.0		0.2	0.3	0.5**	8.40

* For information only.
** Excluding Pb.

3.2 Leaded brasses

The classification of leaded brasses is very difficult. It is important to realise that lead is added primarily to brass alloys to facilitate machining and free cutting, but that it has an adverse effect on ductility. Moreover, through long-established practice, different countries have different lead and copper contents within the given ranges for the same end-use.

TABLE 2

Designation	Cu	Pb	Zn	Maximum impurities		Mainly used for	Average density* kg/dm³
				Fe	Total excluding Fe		
Cu Zn40 Pb3	56.0-59.0	2.0-3.5	The remainder	0.35	0.7	General high speed machined parts	8.5
Cu Zn39 Pb2	57.0-60.0	1.0-2.5		0.35	0.7	Hot forgings appropriate for free cutting	8.4
Cu Zn36 Pb3	60.0-63.0	2.5-3.7		0.35	0.5	General high speed machined parts with some cold formability	8.5
Cu Zn40 Pb	59.0-62.0	0.3-0.8		0.2	0.3	General applications with reasonable machinability	8.4
Cu Zn38 Pb1	59.0-63.0	0.5-1.5		0.2	0.3	Reasonable machinability with sufficient ductility to permit a degree of cold bending and cold forming	8.4
Cu Zn36 Pb2	61.0-64.0	1.0-2.0		0.2	0.3	Good machinability with sufficient ductility to permit a degree of rivetting, heading and cold forming	8.5

* For information only.

3.3 Special brasses

TABLE 3

Designation	Cu*	Sn	Al	As**	Zn	Maximum impurities			Average density***
						Fe	Pb	Total	kg/dm³
Cu Zn21 Al2	76.0-79.0	—	1.8-2.5	0.02-0.08	The remainder	0.07	0.07	0.3	8.35
Cu Zn28 Sn1	69.0-73.0	0.9-1.3	—	0.02-0.08		0.07	0.07	0.3	8.55
Cu Zn38 Sn1	59.5-63.5	0.7-1.4	—	—		0.2	0.2	0.5	8.40

* Ni up to 0.5 per cent counts as copper.
** And/or Sb, and/or P.
*** For information only.

3.4 High tensile brass

The range of available high tensile brass compositions is extremely wide. There are many special alloys of this type that have particular properties which may be superior in some respects to those possessed by alloys falling within the compositional range shown in the table below. These special alloys are too numerous and too varied to be suitable for classification by ISO.

The compositional range shown in the table includes a range of high tensile brass alloys made by many countries. These alloys will meet the requirements to be indicated in the tables of mechanical properties which are in preparation.

Where a particular physical property requirement, such as special corrosion resistance, is desired by the user of the alloy, he is advised to consult the manufacturer regarding a suitable composition.

TABLE 4

Designation	Cu	Al	Fe	Mn	Zn	Sn	Pb	Ni	Other elements Total	Average density*
						max.	max.	max.	max.	kg/dm³
CuZn39AlFeMn	56.0-61.0	0.2-1.5**	0.2-1.5	0.2-2.0	The remainder	1.2	1.5	2.0	0.5	8.3

* For information only.
** For good soldering less than 0.2 per cent.

4. FORMS OF SEMI-MANUFACTURED PRODUCTS

TABLE 5

Alloy	Plate, Sheet	Strip	Rod, Bar	Sections*	Tube	Wire	Forgings
Brasses							
Cu Zn10	x	x	(x)		(x)	(x)	
Cu Zn15	x	x	(x)		(x)	(x)	
Cu Zn20	x	x	(x)		(x)	(x)	
Cu Zn30	x	x	(x)		x	(x)	
Cu Zn33	x	x			(x)	(x)	
Cu Zn37	x	x	x	(x)	x	x	
Cu Zn40	x	(x)	x	x	x	(x)	(x)
Leaded brasses							
Cu Zn40 Pb3	(x)	(x)	x	x	(x)	(x)	
Cu Zn 39 Pb2	(x)	x	x	x	(x)	(x)	x
Cu Zn36 Pb3	(x)	(x)	x	x	x	(x)	(x)
Cu Zn40 Pb	x		x		(x)		
Cu Zn38 Pb1		x	x	(x)	x	x	(x)
Cu Zn36 Pb2	(x)	x	x		(x)	x	
Special brasses							
Cu Zn21 A12	x		(x)		x		
Cu Zn28 Sn1	x	(x)			x		
Cu Zn38 Sn1	x		x	(x)	(x)		(x)
High tensile brass							
Cu Zn39 Al Fe Mn	(x)	(x)	x	x	x	(x)	x

* sections or shapes made by extruding, or by a combination of extruding and drawing.

x indicates the main manufactured forms.

(x) indicates forms manufactured in smaller quantities, e.g. in certain countries only or for special purposes.
If no symbol is given, the form is not considered of importance for that alloy, but it does not necessarily indicate that such a product cannot be manufactured.

APPENDIX

CLASSIFICATION PRINCIPLES FOR WROUGHT COPPER AND COPPER ALLOYS

This Classification of wrought copper and copper alloys has been compiled as an initial step towards the preparation of international specifications.

It is stressed that the Classification is not intended to be used as a specification. It is a guide indicating the availability, forms of manufacture, compositions and properties of the alloys in most general use. Users of the Classification are recommended, in all cases, to consult the national standards for precise details of alloys in which they are interested.

Concerning the structure of the Classification, it is important to note the following points:

A-1. **Selection of alloys for inclusion in the Classification**

The alloys selected are those considered to be of most importance and in widest use at the present time. The exclusion of an alloy does not mean that it is inferior to those selected, but that its use is either restricted to a few countries, that it is made in relatively small quantities or that its use is limited to a few specialized applications.

A-2. **Designation**

The principle of designations for copper and copper alloys is laid down in the ISO Recommendation relating thereto, at present Draft ISO Recommendation No. 723.

A-3. **Chemical composition**

The chemical composition has been stated with maximum and minimum limits for the main constituent elements, except in case where either copper or zinc is expressed as the remainder. Impurities have always been given maximum limits.

The use of compositional limits instead of nominal compositions showing only the main elements was a majority decision. It was felt that nominal compositions, with no stated limits to the main constituent elements, were too vague, since even a precise statement of mechanical and physical properties, which has not been attempted in the Classification, would not always be sufficient to differentiate between alloys of similar composition, e.g. the various types of leaded brasses.

A-4. **Densities**

Average density figures are given as a guide to mass calculations. Because of differences in complexity between the groups of alloys, a single decimal place (e.g. 8.5) has been given in some cases, whereas for other groups the second decimal place rounded off to 0.05 (e.g. 8.50 or 8.55) has been given.