INTERNATIONAL STANDARD 1635

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Wrought copper and copper alloys — Round tubes for general purposes — Mechanical properties

Cuivre et alliages de cuivre corroyés — Tubes ronds pour usages généraux — Caractéristiques mécaniques

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 1635 was drawn up by Technical Committee ISO/TC 26, *Copper and copper alloys,* and circulated to the Member Bodies in December 1971.

It has been approved by the Member Bodies of the following countries :

Australia	Hungary	South Africa, Rep. of
Austria	India	Spain
Belgium	Italy	Sweden
Canada	Japan	Switzerland
Chile	Korea, Rep. of	Thailand
Czechoslovakia	Netherlands	Turkey
Denmark	New Zealand	United Kingdom
Egypt, Arab Rep. of	Norway	U.S.A.
Finland	Portugal	U.S.S.R.
France	Romania	

The Member Body of the following country expressed disapproval of the document on technical grounds :

Germany

Printed in Switzerland

Wrought copper and copper alloys — Round tubes for general purposes — Mechanical properties

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the mechanical properties of round tubes for general purposes in wrought copper and copper alloys the chemical compositions of which are listed in the appropriate International Standards (see 2.1).

NOTES

1 Tubes are usually supplied in straight lengths, except copper tubes in the annealed condition (temper O), which may be supplied in coils or on reels.

2 For the mechanical properties of condenser and heat exchanger tubes, see ISO 1636.

2 REFERENCES

2.1 Chemical composition and forms of semi-manufactured products

ISO 426, *Wrought copper-zinc alloys — Chemical composition and forms of wrought products —*

Part I : Non-leaded, special and high tensile alloys.

Part II : Leaded alloys.

ISO 427, *Wrought copper-tin alloys — Chemical composition and forms of wrought products.*

ISO 428, *Wrought copper-aluminium alloys — Chemical composition and forms of wrought products.*

ISO 429, *Wrought copper-nickel alloys — Chemical composition and forms of wrought products.*

ISO 430, *Wrought copper-nickel-zinc alloys — Chemical composition and forms of wrought products.*

ISO/R 1336, *Wrought alloyed coppers.*

ISO/R 1337, *Wrought coppers.*

2.2 Designations

ISO/R 1190, *Copper and copper alloys — Code of designation —*

Part I : Designation of materials.

Part II : Designation of tempers.

2.3 Test methods

ISO/R 195, *Drift expanding test on copper and copper alloy tubes.*

ISO/R 399, *Vickers hardness test for copper and copper alloys (Test loads from 2.5 to 50 kgf).*

ISO/R 401, *Tensile testing of copper and copper alloy tubes of circular section.*

ISO/R 1556, *Copper and copper alloy tubes of circular section — Flattening test.*

ISO . . ., *Copper, copper alloys and alloyed copper — Selection of specimens and test pieces.* [1)]

1) In preparation.

3 ESSENTIAL PROPERTIES REQUIREMENTS

Table 1 embodies the principle that two properties are generally sufficient to define the condition of the material. The properties to be specified vary according to the temper and application of the material as set out in the table.

4 DIMENSIONAL LIMITS

Dimensional limitations which can have an effect on the properties obtained are given in table 2; products having dimensions outside these ranges may not comply with these properties.

Where the properties are not affected by dimensions or where the latter are unimportant, a dash (—) is inserted.

5 MECHANICAL PROPERTIES

Mechanical properties are given in table 2.

6 TEST METHODS

6.1 Tensile test

According to ISO/R 401.

6.2 Vickers hardness test

According to ISO/R 399 for test loads within the range from 2,5 up to 50 kgf.

6.3 Other methods of test

(To be agreed between the interested parties.)

6.3.1 *Drift expanding test*

According to ISO/R 195.

6.3.2 *Flattening test*

According to ISO/R 1556.

6.4 Selection of test pieces

According to ISO . . .

TABLE 1

Use	Temper designation	0,2 % proof stress $R_{p0,2}$	Tensile strength R_m	Elongation A	Vickers hardness HV
		N/mm²	N/mm²	%	
General purposes	M	—	approx.	approx.	max.
	O	—	—	min.	max.
	H[1)]	—	min. — max.	approx.	approx.
	H[2)]	—	approx.	approx.	min. — max.
Structural purposes[3)]	M	min.	approx.	min.	—
	H				

1) Temper H for wrought coppers.

2) Temper H for wrought copper alloys.

3) Structural purposes are defined as those purposes where the load-bearing properties of the material are the most important.

TABLE 2

Designation		Dimensions		$R_{p0,2}$	R_m	$A^{1)}$	HV
Alloy	Temper	Diameter	Wall thickness				
		mm	mm	N/mm²	N/mm²	%	
Coppers, Alloyed coppers							
Cu-ETP Cu-FRHC Cu-DHP Cu As(P)	O	–	–	–	–	min. 35	max. 65
	HA	max. 200	max. 10	–	250 to 290	approx. 20	approx. 80
	HB	max. 100	max. 6	–	290 to 370	approx. 10	approx. 100
Copper-zinc alloys (Brasses)							
Cu Zn15	O	–	–	–	–	min. 40	max. 80
	HB	–	max. 5		approx. 390	approx. 17	90 to 140
Cu Zn30	O	–	–	–	–	min. 45	max. 90
	HB	–	max. 5	–	approx. 440	approx. 20	100 to 150
Cu Zn37	O	–	–	–		min. 40	max. 90
	HB	–	max. 5	–	approx. 470	approx. 13	120 to 170
Cu Zn40	O	–	–			min. 25	max. 100
	HB	–	max. 5	–	approx. 510	approx. 10	130 to 180
Copper-zinc-lead alloys (Leaded brasses)							
Cu Zn38 Pb2	O	–	–	–	–	min. 30	max. 100
	HB	–	max. 5	–	approx. 470	approx. 13	120 to 170
Special copper-zinc alloys (Special brasses)							
Cu Zn20 Al2	O	–	–	–	–	min. 45	max. 90
	HB	–	max. 5	–	approx. 490	approx. 20	120 to 180
Cu Zn28 Sn1	O	–	–	–	–	min. 45	max. 110
	HB	–	max. 5		approx. 420	approx. 35	100 to 150
High tensile copper-zinc alloys (High tensile brasses)							
Cu Zn39 Al Fe Mn	M	–	–	min. 200	approx. 500	min. 18	–
Copper-tin alloys (Phosphor-bronzes)							
Cu Sn8	O	–	–	–	–	min. 50	max. 120
	HB	–	max. 5	–	approx. 570	approx. 18	140 to 190
Copper-aluminium alloys (Aluminium bronzes)							
Cu Al5	M	–	2 to 10	Min. 100	approx. 410	min. 40	–
	O	–	2 to 10	–	–	min. 45	max. 110
Copper-nickel alloys							
Cu Ni5 Fe1 Mn	O	–	–	–	–	min. 30	max. 100
Cu Ni10 Fe1 Mn	O	–	–	–	–	min. 30	max. 110
Cu Ni20 Mn1 Fe	O	–	–	–	–	min. 35	max. 110
Cu Ni30 Mn1 Fe	O	–	–	–	–	min. 35	max. 115
Copper-nickel-zinc alloys							
Cu Ni12 Zn24	O	–	–	–	–	min. 38	max. 115
	HB	–	–	–	approx. 440	approx. 30	100 to 150

1) $L_o = 5{,}65\sqrt{S_o}$

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