INTERNATIONAL STANDARD 1638

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Wrought copper and copper alloys — Drawn solid products supplied in coils or on reels — Mechanical properties

Cuivre et alliages de cuivre corroyés — Produits étirés pleins livrés sur bobines ou en couronnes — Caractéristiques mécaniques

First edition — 1974-11-01

UDC 669.3-426 : 539.3/.6 **Ref. No. ISO 1638-1974 (E)**

Descriptors : copper, copper alloys, wrought products, wire, mechanical properties.

Price based on 5 pages

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 1638 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	France	South Africa, Rep. of
Austria	Hungary	Spain
Belgium	India	Sweden
Canada	Japan	Switzerland
Chile	Netherlands	Thailand
Czechoslovakia	New Zealand	Turkey
Denmark	Norway	U.S.A.
Egypt, Arab Rep. of	Portugal	U.S.S.R.
Finland	Romania	

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Germany
Italy
United Kingdom

Printed in Switzerland

Wrought copper and copper alloys — Drawn solid products supplied in coils or on reels — Mechanical properties

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the mechanical properties of drawn solid products, supplied in coils or on reels, in wrought copper and copper alloys the chemical compositions of which are listed in the appropriate International Standards (see 2.1).

NOTES

1 In order to overcome various national interpretations of the term "wire", these manufactured products having a round or regular polygonal cross-section with a diameter or width across flats not exceeding 5 mm are grouped under the general heading : "solid products supplied in coils or on reels". By agreement some of these materials can be supplied in straight lengths.

2 For the mechanical properties of solid products with a diameter or width across flats exceeding 5 mm and normally supplied in straight lengths, see ISO 1637.

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 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 1187, *Special wrought copper alloys.*

ISO/R 1336, *Wrought alloyed coppers.*

ISO/R 1137, *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 397, *Wrapping test for copper and copper alloy wire.*

ISO/R 420, *Tensile testing of copper and copper alloy wire.*

ISO 2625, *Copper and copper alloys — Reverse bend testing of wire.*

ISO 2627, *Copper and copper alloys — Simple torsion testing of wire.*

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.

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.

5 MECHANICAL PROPERTIES

Mechanical properties are given in table 2.

6 TEST METHODS

6.1 Tensile test

According to ISO/R 402.

6.2 Other methods of test

(To be agreed between the interested parties.)

6.2.1 *Wrapping test*

According to ISO/R 397.

6.2.2 *Simple torsion test*

According to ISO 2627.

6.2.3 *Reverse bend test*

According to ISO 2625.

6.3 Selection of test pieces

According to ISO ...

TABLE 1

Temper designation	0,2 % proof stress $R_{p0,2}$	Tensile strength R_m	Elongation A	Vickers hardness HV
	N/mm^2	N/mm^2	%	
O	–	min.	min.	–
H				
T	–	min.	–	–

TABLE 2

Designation		Dimensions	R_m	$A^{1)}$
Alloy	**Temper**	mm	N/mm²	%
Coppers				
Cu-ETP **Cu-FRHC**	O	1 to 1,5	min. 210	min. 25
		1,5 to 5	min. 210	min. 30
	HC	1 to 5	min. 390	–
	HD	1 to 3	min. 420	–
Alloyed coppers				
Cu Ag0,05 **Cu Ag0,1** **Cu Ag0,05 (P)** **Cu Ag0,1 (P)**	O	1 to 1,5	min. 210	min. 25
		1,5 to 5	min. 210	min. 30
	HC	1 to 5	min. 390	–
	HD	1 to 3	min. 420	–
Cu Cd1	HC	1 to 5	min. 490	–
	HD	1 to 3	min. 590	–
Copper-zinc alloys (Brasses)				
Cu Zn5	O	1 to 5	min. 220	min. 30
	HC	1 to 5	min. 320	min. 5
Cu Zn10	O	1 to 5	min. 240	min. 30
	HC	1 to 5	min. 350	min. 5
Cu Zn15	O	1 to 5	min. 260	min. 30
	HC	1 to 5	min. 370	min. 5
Cu Zn20	O	1 to 5	min. 260	min. 35
	HC	1 to 5	min. 390	min. 5
Cu Zn30	O	1 to 5	min. 280	min. 35
	HC	1 to 5	min. 420	min. 7
Cu Zn33	O	1 to 5	min. 280	min. 35
	HC	1 to 5	min. 430	min. 7
Cu Zn37	O	1 to 5	min. 290	min. 30
	HB	1 to 3	min. 440	min. 4
		3 to 5		min. 7
	HC	1 to 3	min. 540	min. 2
		3 to 5		min. 3
	HD	1 to 3	min. 690	–

1) For coppers and alloyed coppers, $L_o = 200$ mm (8 in)
For copper-zinc alloys (brasses), $L_o = 100$ mm (4 in)

} applicable to material of 1 mm diameter and above.

TABLE 2 (*continued*)

Designation		Dimensions	R_m	$A^{1)}$
Alloy	**Temper**	mm	N/mm²	%
Copper-zinc-lead alloys				
Cu Zn35 Pb2 **Cu Zn36 Pb1**	O	1 to 5	min. 340	min 25
	HB	1 to 3	min. 390	min. 10
		3 to 5		min. 15
Cu Zn38 Pb2	O	1 to 5	min. 340	min. 25
	HB	1 to 3	min. 390	min. 7
		3 to 5		min. 10
Cu Zn40 Pb	O	1 to 5	min. 340	min. 25
	HC	1 to 5	min. 450	min. 5
Copper-tin alloys (Phosphor-bronzes)				
Cu Sn2	O	1 to 5	min. 260	min. 35
	HC	1 to 3	min. 360	min. 10
Cu Sn4	O	1 to 5	min. 310	min. 40
	HC	1 to 3	min. 490	min. 3
		3 to 5		min. 5
	HE	1 to 3	min. 690	–
Cu Sn6	O	1 to 5	min. 370	min. 40
	HE	1 to 3	min. 740	–
Cu Sn8	O	1 to 5	min. 390	min. 40
	HC	1 to 3	min. 590	min. 5
Cu Sn10	O	1 to 5	min. 410	min. 50
	HC	1 to 3	min. 640	min. 2
Copper-nickel alloys (Cupro-nickels)				
Cu Ni44 Mn1	O	1 to 5	min. 410	min. 30
Copper-nickel-zinc alloys				
Cu Ni18 Zn20	O	1 to 5	min. 390	min. 35
	HD	1 to 3	min. 640	–
Cu Ni15 Zn21	O	1 to 5	min. 360	min. 35
	HD	1 to 3	min. 590	min. 5
Cu Ni12 Zn24	O	1 to 5	min. 340	min. 38
	HB	1 to 3	min. 490	min. 5

1) L_o = 100 mm (4 in) applicable to material of 1 mm diameter and above.