International Standard ISO 3489

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Wrought copper and copper alloys — Drawn round bars — All minus tolerances on diameter and form tolerances

Cuivre et alliages de cuivre corroyés — Barres étirées de section circulaire — Tolérances en moins sur diamètres et tolérances de forme

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Foreword

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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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Wrought copper and copper alloys — Drawn round bars — All minus tolerances on diameter and form tolerances

1 Scope and field of application

This International Standard specifies the all minus tolerances on diameter in the range from 2 up to and including 80 mm and the form tolerances for wrought copper and copper alloy drawn round bars.

2 Reference

ISO 1637, *Wrought copper and copper alloys — Solid products supplied in straight lengths — Mechanical properties.* *

3 Definition

For the purposes of this International Standard, the following definition applies.

circularity : The difference between the maximum and minimum diameters measured on one cross-section.

4 Dimensions and tolerances

4.1 Diameter

Table 1 — Tolerances on diameter

Values in millimetres

Diameter		Tolerance		
>	⩽	Material group I[1)]	Material group II[2)]	Material group III[3)]
⩾ 2	3	−0,04	−0,06	−0,10
3	6	−0,05	−0,08	−0,12
6	10	−0,06	−0,09	−0,15
10	18	−0,07	−0,11	−0,18
18	30	−0,08	−0,13	−0,21
30	50	−0,16	−0,25	−0,39
50	80	−0,19	−0,30	−0,46

1) Tolerances up to and including 30 mm : h10;
over 30 up to and including 80 mm : h11;

2) Tolerances up to and including 30 mm : h11;
over 30 up to and including 80 mm : h12;

3) Tolerances up to and including 30 mm : h12;
over 30 up to and including 80 mm : h13.

All tolerances rounded off to 2 decimals.

4.2 Circularity

The deviation from circularity shall not exceed half the tolerance on diameter specified in table 1.

4.3 Straightness tolerances

4.3.1 Straightness tolerances apply for drawn bars with diameter equal to or greater than 10 mm for all tempers, except the annealed.

Straightness tolerances for copper and copper alloy bars, except freemachining materials are given in table 2.

Table 2 — Straightness tolerances (excluding freemachining materials)

Values in millimetres

Nominal length l_{nom}		Maximum curvature (depth of arc)
>	⩽	
⩾ 1 000	2 000	2,0 in any length l_m = 1 000
2 000	3 000	5,5 in any length l_m = 2 000
3 000	—	12,0 in any length l_m = 3 000
Local kinks		0,6 in any length l_m = 300

Straightness tolerances for freemachining materials (listed in table 6, material group I) are given in table 3.

Table 3 — Straightness tolerances for freemachining materials

Values in millimetres

Nominal length l_{nom}		Maximum curvature (depth of arc)
>	⩽	
⩾ 1 000	2 000	1,0 in any length l_m = 1 000
2 000	3 000	3,0 in any length l_m = 2 000
3 000	—	7,0 in any length l_m = 3 000
Local kinks		0,4 in any length l_m = 300

* Under revision.

4.3.2 The straightness is measured by determining the curvature "c" against a straightedge, having the appropriate length l_m, when the bar is lying flat on a base plate, (see the figure).

4.4 Length tolerances

4.4.1 Length as manufactured

For length as manufactured, the tolerances in table 4 apply; permissible underlengths are listed in table 5.

4.4.2 Fixed length

The length of fixed lengths shall be agreed upon between the purchaser and supplier. Fixed lengths have a tolerance of $^{+\ 10}_{\ 0}$ mm.

Table 4 — Tolerances on length as manufactured

Values in millimetres

Diameter >	Diameter ⩽	Nominal length	Tolerance
⩽ 1	3	max. 3 000	± 50
3	25	3 000 to 4 000	
25	40		± 100
40	50	2 000 to 4 000	
50	60	2 000 to 3 000	± 200
60	80	1 000 to 2 000	

Table 5 — Permissible underlengths

Diameter mm >	Diameter mm ⩽	Shortest permissible length as % of nominal length	Permissible mass of underlengths as % of lot mass
⩾ 1	25	75	20
25	50	50	40
50	80		50

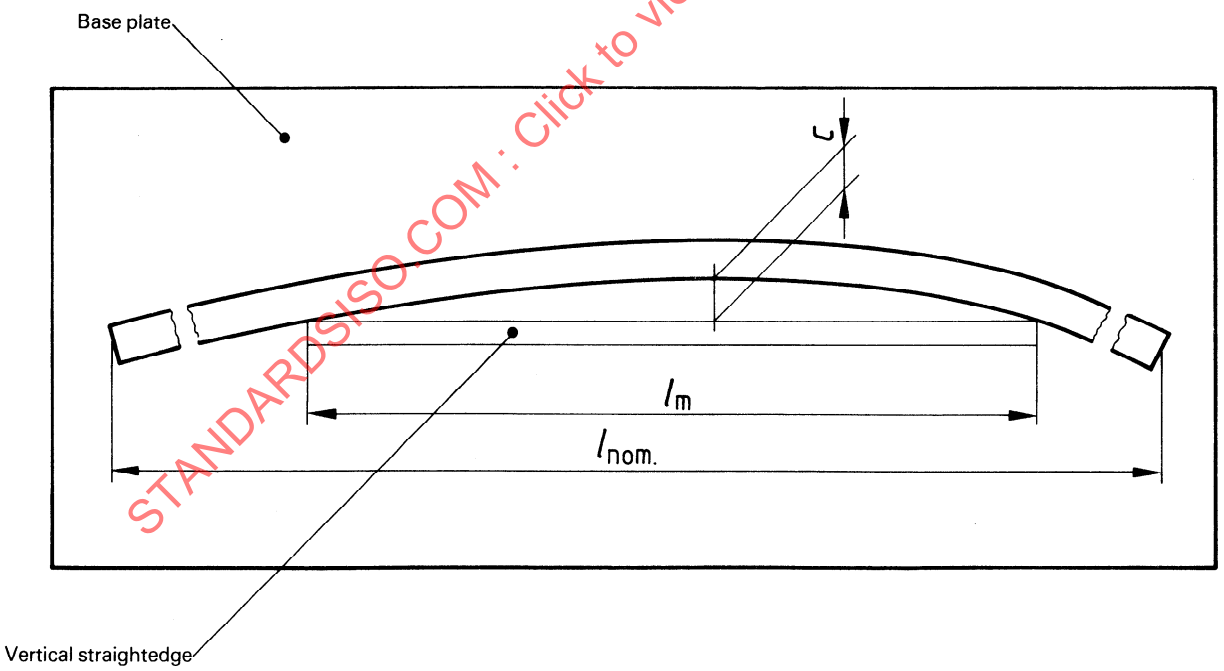

Figure — Measurement of straightness

5 Materials

Drawn round bars according to this International Standard are currently available in commercial quantities in wrought copper and copper alloys listed in table 6.

The mechanical properties of the materials listed are specified in ISO 1637.

The materials are divided into material groups I, II and III as classified in table 6.

Table 6 — Materials

Material group	Type	Designation	
I	**Coppers** (Cu min. 99,85 %)	Cu-ETP Cu-FRHC Cu-FRTP Cu-OF Cu-HCP Cu-DLP Cu-DHP	
	Copper-zinc alloys	CuZn37 CuZn40	
	Coppers (Cu min. 97,5 %)	CuAg 0,05 CuAg 0,1 CuAg 0,05 (OF) CuAg 0,1 (OF) CuAg 0,05 (P) CuAg 0,1 (P) CuCd 1	
		CuS (P0,01) CuS (P0,03) CuTe CuTe (P)	Freemachining material
	Copper-zinc-lead alloys	CuZn34Pb2 CuZn36Pb3 CuZn40Pb CuZn39Pb1 CuZn38Pb2 CuZn40Pb2 CuZn39Pb3 CuZn38Pb4	Freemachining material
II	**Coppers** (Cu min. 97,5%)	CuCr 1 CuCr1Zr	
	Special copper-zinc alloys	CuZn37Sn1Pb1 CuZn38Sn1 CuZn39AlFeMn	
	Copper-tin alloys	CuSn5 CuSn6 CuSn8	
	Copper-nickel alloys	CuNi30Mn1Fe	
	Copper-nickel-zinc alloys	CuNi18Zn19Pb1 CuNi10Zn28Pb1	
III	**Copper-aluminium alloys**	CuAl7Si2 CuAl8Fe3 CuAl9Mn2 CuAl10Fe3 CuAl10Ni5Fe4	
	Special copper alloys	CuBe2 CuBe2Pb CuCo2Be CuNi2Be CuNi1Si CuNi2Si CuSi1 CuSi3Mn1	

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