

TOLERANCES
Copper and Copper Alloy Seamless Tubing

1. **SCOPE:** This specification covers established inch/pound manufacturing tolerances applicable to copper and copper alloy seamless tubing ordered to inch/pound dimensions. These tolerances apply to all conditions, unless otherwise noted. The term "excl" is used to apply only to the higher figure of a specified range.

- 1.1 MAM 2223, specified in SI (metric) units, is the equivalent of this AMS.

2. **DIAMETER:**

TABLE I

Specified Diameter Inches	Tolerance Applies to	Mean Diameter Tolerance Inch, Plus and Minus	
		Non-Refractory	Refractory
Up to 0.125, incl	ID	0.002	0.002
Up to 0.125, incl	OD	0.002	0.0025
Over 0.125 to 0.625, incl	ID or OD	0.002	0.0025
Over 0.625 to 1, incl	ID or OD	0.0025	0.003
Over 1 to 2, incl	ID or OD	0.003	0.004
Over 2 to 3, incl	ID or OD	0.004	0.005
Over 3 to 4, incl	ID or OD	0.005	0.006
Over 4 to 5, incl	ID or OD	0.006	0.008
Over 5 to 6, incl	ID or OD	0.007	0.009
Over 6 to 8, incl	ID or OD	0.008	0.010
Over 8 to 10, incl	ID or OD	0.010	0.013

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- 2.1 Out-of-roundness (difference between the major and minor diameters at any one cross-section) of unannealed tubing in straight lengths shall be not greater than the following; if the tolerance is expressed as a percentage of a specified dimension, the tolerance so calculated shall be rounded to the nearest 0.001 inch to obtain the permissible tolerance:

Specified Ratio of Nominal Wall Thickness to Specified Diameter	Roundness Tolerance % of Specified Diameter
0.01 to 0.03, incl	1.5
Over 0.03 to 0.05, incl	1.0
Over 0.05 to 0.10, incl	0.8; 0.002 inch, minimum
Over 0.10	0.7; 0.002 inch, minimum

3. WALL THICKNESS: When the tolerance is expressed as a percentage of a dimension, the tolerance so calculated shall be rounded to the nearest 0.001 inch to obtain the permissible tolerance.

- 3.1 Round; Non-Refractory:

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TABLE II

Specified Wall Thickness Inch	Wall Tolerance, Inch, Plus and Minus OD Ranges, Inches						
	Over 0.031	Over 0.125	Over 0.625	Over 1	Over 2	Over 4	Over 7
	to 0.125, incl	to 0.625, incl	to 1, incl	to 2, incl	to 4, incl	to 7, incl	to 10, incl
Up to 0.018, excl	0.002	0.001	0.0015	0.002	--	--	--
0.018 to 0.025, excl	0.003	0.002	0.002	0.0025	--	--	--
0.025 to 0.035, excl	0.003	0.0025	0.0025	0.003	0.004	--	--
0.035 to 0.058, excl	0.003	0.003	0.0035	0.0035	0.005	0.007	--
0.058 to 0.083, excl	--	0.0035	0.004	0.004	0.006	0.008	0.010
0.083 to 0.120, excl	--	0.004	0.005	0.005	0.007	0.009	0.011
0.120 to 0.165, excl	--	0.005	0.006	0.006	0.008	0.010	0.012
0.165 to 0.220, excl	--	0.007	0.0075	0.008	0.010	0.012	0.014
0.220 to 0.284, excl	--	--	0.009	0.010	0.012	0.014	0.016
0.284 to 0.380, excl	--	--	0.012	5%	5%	6%	6%
0.380 and over	--	--	--	5%	5%	6%	6%

3.2 Round; Refractory:

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TABLE III

Wall Tolerance, Inch, Plus and Minus
OD Ranges, Inches

Specified Wall Thickness Inch	Over Over Over Over Over Over						
	0.031 to 0.125, incl	0.125 to 0.625, incl	0.625 to 1, incl	1 to 2, incl	2 to 4, incl	4 to 7, incl	7 to 10, incl
Up to 0.018, excl	0.0025	0.0015	0.002	0.0025	--	--	--
0.018 to 0.025, excl	0.004	0.0025	0.0025	0.003	--	--	--
0.025 to 0.035, excl	0.004	0.003	0.003	0.004	0.005	--	--
0.035 to 0.058, excl	0.004	0.004	0.0045	0.0045	0.0065	0.009	--
0.058 to 0.083, excl	--	0.0045	0.005	0.005	0.0075	0.010	0.013
0.083 to 0.120, excl	--	0.005	0.0065	0.0065	0.009	0.011	0.014
0.120 to 0.165, excl	--	0.007	0.007	0.0075	0.010	0.013	0.015
0.165 to 0.220, excl	--	--	0.009	0.010	0.013	0.015	0.018
0.220 to 0.284, excl	--	--	0.012	0.013	0.015	0.018	0.020
0.284 to 0.380, excl	--	--	--	6%	6%	8%	8%
0.380 and over	--	--	--	6%	6%	8%	8%

4. LENGTH:

TABLE IV

Length Tolerance, Inch, Plus Only

Specified Diameter Inches	Straight Lengths					Coils	
	6 in. and under	Over 6 in. to 2 ft, incl	Over 2 to 6 ft, incl	Over 6 to 14 ft, incl	Over 14 ft,	50 ft and under	Over 50 to 100 ft, incl
Up to 1, incl	1/32	1/16	3/32	1/4	1/2	12	24
Over 1 to 2, incl	1/16	3/32	1/8	1/4	1/2	12	24
Over 2 to 4, incl	1/16	3/32	1/8	1/4	1/2	--	--
Over 4	--	1/8	1/4	1/4	1/2	--	--