

AEROSPACE

MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

485 Lexington Ave., New York, N.Y. 10017

AMS 2223D

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TOLERANCES Copper and Copper Alloy Seamless Tubing

1. **PURPOSE:** To publish established manufacturing tolerances.
2. **APPLICATION:** Tolerances shown herein apply, unless otherwise agreed upon by purchaser and vendor. These tolerances apply to all conditions unless otherwise noted. The term "excl" is used to apply only to the higher figure of the specified range.
3. **DIAMETER:**

TABLE I

Nominal OD Inches	Tolerance Applies to	Mean Diameter Tolerance, Inch, Plus and Minus	
		Non-refractory	Refractory
Up to 0.125, incl	ID	0.002	0.003
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

- 3.1 Out-of-roundness (difference between the major and minor diameters at any one cross section) of un-
Ø annealed tubing in straight lengths shall be not greater than the following:

Ratio of Nominal Wall Thickness to Nominal OD	Roundness Tolerance (See Note 1) % of Nominal OD
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 in., min
Over 0.10	0.7; 0.002 in., min

4. WALL THICKNESS:

4.1 Round; Non-Refractory:

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TABLE II

Wall Tolerance, Inch, Plus and Minus (See Note 1)

OD Ranges, Inches

Nominal Wall Thickness Inch	0.031 to 0.125 incl	Over 0.125 to 0.625 incl	Over 0.625 to 1 incl	Over 1 to 2 incl	Over 2 to 4 incl	Over 4 to 7 incl	Over 7 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	--	--	0.011	0.012	0.014	0.016	0.018
0.380 and over	--	--	--	5%	5%	6%	6%

4.2 Round; Refractory:

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TABLE III

Wall Tolerance, Inch, Plus and Minus (See Note 1)

OD Ranges, Inches

Nominal Wall Thickness Inch	0.031 to 0.125 incl	Over 0.125 to 0.625 incl	Over 0.625 to 1 incl	Over 1 to 2 incl	Over 2 to 4 incl	Over 4 to 7 incl	Over 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	--	--	--	0.015	0.018	0.020	0.023
0.380 and over	--	--	--	6%	6%	8%	8%