

AEROSPACE MATERIAL SPECIFICATION



AMS 2223G

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Superseding AMS 2223F

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 "exclusive" is used to apply only to the higher figure of a specified range.

1.1 MAM 2223 is the metric version of this AMS.

2. DIAMETER:

See Table 1 and 2.1.

TABLE 1 - Average Diameter Tolerance

Specified Diameter Inches	Average Diameter Tolerance Inch, Plus and Minus
Up to 0.125, incl	0.002
Over 0.125 to 0.625, incl	0.002
Over 0.625 to 1, incl	0.0025
Over 1 to 2, incl	0.003
Over 2 to 3, incl	0.004
Over 3 to 4, incl	0.005
Over 4 to 5, incl	0.006
Over 5 to 6, incl	0.007
Over 6 to 8, incl	0.008
Over 8 to 10, incl	0.010

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- 2.1 Applicable to inside or outside diameter. Table 1 is applicable to both refractory and non-refractory alloys.
- 2.2 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 specified in Table 2; 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.

TABLE 2 - Roundness Tolerance

Ratio of Specified 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; Nonrefractory:

See Table 3.

- 3.1.1 When round tube is ordered by outside and inside diameter, the maximum plus and minus deviation of the wall thickness from the nominal at any point shall not exceed the values given in Table 3 by more than 50%.

- 3.1.2 Percent of specified wall expressed to the nearest 0.001 inch.

3.2 Round, Refractory:

See Table 4.

4. LENGTH:

See Table 5.

TABLE 3 - Wall Tolerance, Inch, Plus and Minus, Non-Refractory Rounds

Wall Thickness Inch	Outside Diameter Inch (See 3.1.1) 1/32 to 1/8, incl	Outside Diameter Inch (See 3.1.1) Over 1/8 to 5/8 incl	Outside Diameter Inch (See 3.1.1) Over 5/8 to 1 incl	Outside Diameter Inches (See 3.1.1) Over 1 to 2 incl	Outside Diameter Inches (See 3.1.1) Over 2 to 4 incl	Outside Diameter Inches (See 3.1.1) Over 4 to 7 incl	Outside Diameter Inches (See 3.1.1) Over 7 to 10 incl
Up to 0.017, incl	0.002	0.001	0.0015	0.002	---	---	---
Over 0.017 to 0.024, incl	0.003	0.002	0.002	0.0025	---	---	---
Over 0.024 to 0.034, incl	0.003	0.0025	0.0025	0.003	0.004	---	---
Over 0.034 to 0.057, incl	0.003	0.003	0.0035	0.0035	0.005	0.007	---
Over 0.057 to 0.082, incl	---	0.0035	0.004	0.004	0.006	0.008	0.010
Over 0.082 to 0.119, incl	---	0.004	0.005	0.005	0.007	0.009	0.011
Over 0.119 to 0.164, incl	---	0.005	0.006	0.006	0.008	0.010	0.012
Over 0.164 to 0.219, incl	---	0.007	0.009	0.009	0.011	0.012	0.014
Over 0.219 to 0.283, incl	---	---	0.011	0.012	0.014	0.015	0.016
Over 0.283 to 0.379, incl	---	---	0.014	6% (3.1.2)	6% (3.1.2)	7% (3.1.2)	7% (3.1.2)
Over 0.379	---	---	---	6% (3.1.2)	6% (3.1.2)	7% (3.1.2)	7% (3.1.2)

TABLE 4 - Wall Tolerance, Refractory Rounds

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

TABLE 5 - Length Tolerances

Specified Diameter Inches	Length Tolerance, Inch, Plus Only Straight Lengths 6 Inches and Under	Length Tolerance, Inch, Plus Only Straight Lengths Over 6 Inches to 2 Feet Incl	Length Tolerance, Inch, Plus Only Straight Lengths Over 2 to 6 Feet Incl	Length Tolerance, Inch, Plus Only Straight Lengths Over 6 to 14 Feet, Incl	Length Tolerance, Inch, Plus Only Straight Lengths Over 14 Feet	Length Tolerance, Inch, Plus Only Coils 50 Feet and Under	Length Tolerance, Inch, Plus Only Coils Over 50 to 100 Feet, 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	--	--