AEROSPACE MATERIAL SPECIFICATION

AMS2223™	REV. J

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Revised 2023-12

Superseding AMS2223H

Tolerances
Copper and Copper Alloy Seamless Tubing

RATIONALE

AMS2223J results from a Five-Year Review and update of this specification with changes to update Applicable Documents (see Section 2), diameter tolerance usage (see 3.1), and wall thickness tolerances (see Tables 3 and 4, and 4.1.2), to relocate Definitions (see 2.2), and to add a note regarding usage of non-refractory and refractory tables in this specification (see 9.2).

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.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS7766 Terms Used in Aerospace Metals Specifications

2.2 Definitions

Terms used in AMS are defined in AS7766.

3. DIAMETER

See Table 1 and 3.1.

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Table 1 - Average diameter tolerance

Specified Diameter Inches	Average Diameter Tolerance Inches, 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

3.1 Applicable to inside or outside diameter. Table 1 is applicable to all copper and copper alloy seamless tubing, and both refractory and non-refractory alloys (see 9.2).

3.2 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

4. 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.

4.1 Round, Nonrefractory (see 9.2)

See Table 3.

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Table 3 - Wall thickness tolerance, inch, plus and minus, non-refractory rounds

	Wall thickness tolerance, Inches, Plus and Minus (see 4.1.2)						
Wall Thickness Inches	Outside Diameter Inches (See 4.1.1) .031 to .125, Incl	Outside Diameter Inches (See 4.1.1) Over .125 to .625 Incl	Outside Diameter Inches (See 4.1.1) Over .625 to 1 Incl	Outside Diameter Inches (See 4.1.1) Over 1 to 2 Incl	Outside Diameter Inches (See 4.1.1) Over 2 to 4 Incl	Outside Diameter Inches (See 4.1.1) Over 4 to 7 Incl	Outside Diameter Inches (See 4.1.1) 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%	6%	7%	7%
Over 0.379	--	--	--	6%	6%	7%	7%

4.1.1 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%.

4.1.2 When specified as a percentage, wall tolerance shall be expressed to the nearest 0.001 inch.

4.2 Round, Refractory (see 9.2)

See Table 4.

Table 4 - Wall thickness tolerance, inches, plus and minus, refractory rounds

	Wall thickness tolerance, Inches, Plus and Minus (see 4.1.2)						
Specified Wall Thickness Inches	Outside Diameter Inches 0.031 to 0.125, Incl	Outside Diameter Inches, Over 0.125 to 0.625, Incl	Outside Diameter Inches, Over 0.625 to 1, Incl	Outside Diameter Inches, Over 1 to 2, Incl	Outside Diameter Inches, Over 2 to 4, Incl	Outside Diameter Inches, Over 4 to 7, Incl	Outside Diameter 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 0165, 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%

5. LENGTH

See Table 5.

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