



AEROSPACE MATERIAL SPECIFICATION

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AMS 2263C
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TOLERANCES Nickel, Nickel Alloy, and Cobalt Alloy Tubing

1. **SCOPE:** This specification covers established inch-pound manufacturing tolerances applicable to seamless and welded thin-wall aircraft tubing of nickel, nickel alloys, and cobalt alloys ordered to inch-pound dimensions. These tolerances apply to all conditions and are based on individual measurements, unless otherwise noted. The term "excl" is used to apply only to the higher figure of a specified range.
2. **DIAMETER:** Mean diameter is the average of two measurements taken at right angles to each other at the same section. Ovality is the difference between the maximum and minimum diameters of any one section of a tube.

2.1 **Seamless, Cold Finished:**

2.1.1 **Nickel-Copper Alloy, Annealed:**

TABLE I

Specified OD Inches	Specified Wall Thickness % of OD	Tolerance, Inch				
		OD		Mean OD		Ovality
		Plus	Minus	Plus	Minus	
Up to 0.400, incl	Up to 3.0, incl	--	--	0.004	0	0.004
	Over 3.0	0.004	0	--	--	--
Over 0.400 to 0.625, excl	Up to 3.0, incl	--	--	0.005	0	0.005
	Over 3.0	0.005	0	--	--	--
0.625 to 1.500, incl	Up to 3.0, incl	--	--	0.005	0.005	0.01xOD
	Over 3.0	0.005	0.005	--	--	--
Over 1.500 to 4.500, incl	Up to 3.0, incl	--	--	0.010	0.010	0.01xOD
	Over 3.0	0.010	0.010	--	--	--
Over 4.500 to 6.000, incl	Up to 3.0, incl	--	--	0.015	0.015	0.01xOD
	Over 3.0	0.030	0.030	0.015	0.015	--
Over 6.000 to 7.500, incl	Up to 3.0, incl	--	--	0.020	0.020	0.01xOD
	Over 3.0	0.040	0.040	0.020	0.020	--
Over 7.500 to 8.625, incl	Up to 3.0, incl	--	--	0.025	0.025	0.01xOD
	Over 3.0	0.050	0.050	0.025	0.025	--

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2.1.2 Nickel-Chromium-Iron Alloy, Annealed:

TABLE II

Specified OD Inches	Specified Wall Thickness % of OD	Tolerance, Inch				Ovality
		OD		Mean OD		
		Plus	Minus	Plus	Minus	
Up to 0.400, incl	Up to 3.0, incl	--	--	0.004	0	0.004
	Over 3.0	0.004	0	--	--	--
Over 0.400 to 0.625, excl	Up to 3.0, incl	--	--	0.005	0.005	0.005
	Over 3.0	0.005	0.005	--	--	--
0.625 to 1.500, incl	Up to 3.0, incl	--	--	0.0075	0.0075	0.01xOD
	Over 3.0	0.0075	0.0075	--	--	--
Over 1.500 to 3.500, incl	Up to 3.0, incl	--	--	0.010	0.010	0.01xOD
	Over 3.0	0.010	0.010	--	--	--
Over 3.500 to 4.500, incl	Up to 3.0, incl	--	--	0.015	0.015	0.01xOD
	Over 3.0	0.015	0.015	--	--	--
Over 4.500 to 6.000, incl	Up to 3.0, incl	--	--	0.020	0.020	0.01xOD
	Over 3.0	0.040	0.040	0.020	0.020	--
Over 6.000 to 6.625, incl	Up to 3.0, incl	--	--	0.025	0.025	0.01xOD
	Over 3.0	0.050	0.050	0.025	0.025	--

2.2 Copper Furnace Brazed, Cold Finished:

2.2.1 Nickel-Copper Alloy, Annealed:

TABLE III

Specified OD Inch	Specified Wall Thickness Inch	OD Tolerance, Inch	
		Plus	Minus
0.125	0.028	0.001	0.001
0.188	0.028	0.001	0.001
0.250	0.028	0.003	0
0.312	0.028	0.003	0
0.375	0.028	0.003	0
0.500	0.028	0.005	0
0.625	0.028	0.005	0
0.625	0.035	0.005	0

2.3 Welded, All Alloys: OD tolerances apply to mean OD for tubing with specified wall thickness of 3% or less of specified OD. OD and ID tolerances shall not both apply to the same lot of tubing.

TABLE IV

Specified OD Inches	Specified Wall Thickness % of OD	<u>Tolerance, Inch</u> <u>Plus and Minus</u>		Ovality
		OD	ID	
Up to 0.094, incl	Up to 3.0, incl Over 3.0	0.001	0.001	0.001
		0.001	0.001	--
Over 0.094 to 0.1875, excl	Up to 3.0, incl Over 3.0	0.0015	0.0015	0.0015
		0.0015	0.0015	--
0.1875 to 0.500, excl	Up to 3.0, incl Over 3.0	0.003	0.005	0.003
		0.003	0.005	--
0.500 to 1.000, excl	Up to 3.0, incl Over 3.0	0.004	0.006	0.004
		0.004	0.006	--
1.000 to 1.500, excl	Up to 3.0, incl Over 3.0	0.005	0.007	0.005
		0.005	0.007	--
1.500 to 2.000, excl	Up to 3.0, incl Over 3.0	0.006	0.008	0.006
		0.006	0.008	--
2.000 to 2.500, excl	Up to 3.0, incl Over 3.0	0.007	0.010	0.007
		0.007	0.010	--
2.500 to 3.500, excl	Up to 3.0, incl Over 3.0	0.010	0.014	0.010
		0.010	0.014	--
3.500 to 5.000, excl	Up to 3.0, incl Over 3.0	0.015	0.020	0.015
		0.015	0.020	--

3. WALL THICKNESS:

3.1 Seamless, Cold Finished:

3.1.1 Wall thickness of all tubes except for those alloys and sizes shown in 3.1.2 and 3.1.3 shall not vary more than $\pm 10\%$.

3.1.2 Nickel-Copper Alloy, Seamless:

3.1.2.1 Wall thickness may vary $\pm 12.5\%$ for the following sizes:

3.1.2.1.1 Tubes with specified OD over 0.400 to 0.625 in., excl, with specified wall thicknesses of 0.040 in. and over.

3.1.2.1.2 Tubes with specified wall thicknesses more than 25% of the specified OD.

3.1.2.1.3 Tubes over 4.500 in. in specified OD.