



# AEROSPACE MATERIAL SPECIFICATION

**AMS2243™****REV. L**

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Superseding AMS2243K

Tolerances  
Corrosion and Heat-Resistant Steel Tubing

## RATIONALE

AMS2243L adds metric values and tolerances to all tables, clarifies mechanical and hydraulic tubing (2.1, 2.2, 3.1, 3.2), and is the result of a Five-Year Review and update of the specification.

### 1. SCOPE

This specification covers manufacturing tolerances applicable to seamless and welded tubing of corrosion and heat-resistant steel. These tolerances apply to all conditions and are based on individual measurements, unless otherwise noted. Tubing may be specified by two dimensions only (OD and wall thickness, ID and wall thickness, or OD and ID).

### 2. DIAMETER

#### 2.1 Mechanical Tubing and Tubing Other than Pressure Tubing; Welded (see 2.1.1) or Seamless (see 2.1.2)

Shall be as shown in Table 1. Standard tolerances shall apply unless special tolerances are specified by the purchaser.

**Table 1A - Tolerances for tubing other than pressure tubing, inch/pound units**

Specified OD or ID Inches	Standard Tolerance, Inches Including Ovality (see 2.3) Plus and Minus	Special Tolerance, Inches Including Ovality (see 2.3) Plus and Minus
Up to 0.5, excl	0.005	0.003
0.5 to 1.5, excl	0.005	0.003
1.5 to 3.5, excl	0.010	0.004
3.5 to 5.5, excl	0.015	0.005
5.5 and over	0.031	0.010

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**Table 1B - Tolerances for tubing other than pressure, diameter, SI units**

Specified OD or ID Millimeters	Standard Tolerance, Millimeters	Special Tolerance, Millimeters
	Including Ovality (see 2.3) Plus and Minus	Including Ovality (see 2.3) Plus and Minus
Up to 14, excl	0.12	0.08
14 to 38, excl	0.12	0.08
38 to 90, excl	0.25	0.10
90 to 140, excl	0.38	0.13
140 and over	0.75	0.25

**2.1.1 Welded Tubing**

Shall be bead-reduced or shall be cold finished by tube-reducing, cold-drawing, machining, or grinding.

**2.1.2 Seamless Tubing**

Shall be cold-finished by tube-reducing, cold-drawing, machining, or grinding.

**2.2 Pressure (Hydraulic) Tubing (see 6.2.5); Cold Drawn or Cold Reduced (Seamless or Welded)**

Shall be as shown in Table 2. Standard tolerances shall apply unless special tolerances are specified by the purchaser.

**Table 2A - Tolerances for pressure tubing, inch/pound units**

Specified OD or ID Inches	Standard OD or ID Tolerance, Inches	Special OD or ID Tolerance, Inches
	Including Ovality (see 2.3) Plus and Minus	Including Ovality (see 2.3) Plus and Minus
Up to 0.5, incl	0.003	0.003
Over 0.5 to 1.0, excl	0.004	0.003
1.0 to 1.5, excl	0.005	0.003
1.5 to 2.0, excl	0.006	0.004
2.0 to 2.5, excl	0.007	0.004
2.5 to 3.5, excl	0.010	0.004
3.5 to 5.5, excl	0.015	0.005
5.5 to 8.0, excl	0.030	0.010
8.0 to 8.625, incl	0.045	0.020

**Table 2B - Tolerances for pressure tubing, SI units**

Specified OD or ID Millimeters	Standard OD or ID Tolerance, Millimeters	Special OD or ID Tolerance, Millimeters
	Including Ovality (see 2.3) Plus and Minus	Including Ovality (see 2.3) Plus and Minus
Up to 14, incl	0.08	0.08
Over 14 to 25, excl	0.10	0.08
25.0 to 38, excl	0.13	0.08
38 to 50, excl	0.15	0.10
50.0 to 65, excl	0.18	0.10
65 to 90, excl	0.25	0.10
90 to 140, excl	0.38	0.13
140 to 200, excl	0.75	0.25
200.0 to 215, incl	1.12	0.50

**2.2.1 Half Tolerances**

When half tolerances are specified, the tolerances of Table 2 shall be plus only; the minus side of the tolerance range shall not be applicable.

## 2.3 Ovality, All Tubing

All of the tolerances shown in Tables 1 and 2 include ovality except on light-walled tubing where the specified wall thickness is 3% or less of the specified OD. On such light-walled tubing, there is an additional ovality tolerance (in addition to the tabular tolerances) equal to  $\pm 0.5\%$  of the specified OD (or ID); however, the average diameter shall be within the tabular tolerances.

## 3. WALL THICKNESS

### 3.1 Mechanical Tubing and Tubing Other than Pressure Tubing; Welded or Seamless

Shall be as shown in Table 3. Standard tolerances shall apply unless special tolerances specified by the purchaser.

**Table 3A - Wall thickness tolerances, other than pressure tubing - inch/pound units**

Specified OD or ID Inches	Standard Wall Thickness Tolerance, % Plus or Minus		Special Wall Thickness Tolerance, % Plus or Minus	
	For Wall Thickness, Inches, Shown		For Wall Thickness, Inches, Shown	
	Under 0.250	0.250 and Over	Under 0.250	0.250 and Over
Up to 0.5, excl	15	15	10	10
0.5 to 1.5, excl	12.5	10	10	10
1.5 to 3.5, excl	12.5	10	12.5	10
3.5 to 5.5, excl	12.5	10	12.5	10
5.5 and Over	12.5	10	12.5	10

**Table 3B - Wall thickness tolerances, other than pressure tubing - SI units**

Specified OD or ID Millimeters	Standard Wall Thickness Tolerance, % Plus or Minus		Special Wall Thickness Tolerance, % Plus or Minus	
	For Wall Thickness, Millimeters, Shown		For Wall Thickness, Millimeters, Shown	
	Under 6.25	6.25 and Over	Under 6.25	6.25 and Over
Up to 14, excl	15	15	10	10
14 to 38, excl	12.5	10	10	10
38 to 90, excl	12.5	10	12.5	10
90 to 140, excl	12.5	10	12.5	10
140 and Over	12.5	10	12.5	10

### 3.2 Pressure (Hydraulic) Tubing (see 6.2.5); Seamless or Welded

Shall be  $\pm 10\%$  for all specified diameters.

#### 3.2.1 Half Tolerances

When half tolerances are specified, tolerance shall be +10%, only. The minus side of the tolerance range shall not be applicable.

## 4. LENGTH

When cut lengths are specified, the following tolerances apply to straight tubing in lengths.

**Table 4A - Length tolerance, inch/pound units**

Specified Length in Feet	Specified OD or ID Inches	Tolerance, Inches Plus Only
Up to 24, incl	Up to 1.5, incl Over 1.5	0.12 0.38
24 to 34, incl	Up to 1.5, incl Over 1.5	0.25 0.50
34 to 44, incl	Up to 1.5, incl Over 1.5	0.37 0.50
Over 44	Up to 1.5, incl Over 1.5	0.50 0.50

**Table 4B - Length tolerance, SI units**

Specified Length in Meters	Specified OD or ID Millimeters	Tolerance, Millimeters Plus Only
Up to 8, incl	Up to 38, incl Over 38	3 10
8 to 10.5, incl	Up to 38, incl Over 38	6 14
10.5 to 13.5, incl	Up to 38, incl Over 38	10 14
Over 13.5	Up to 38, incl Over 38	14 14

## 5. STRAIGHTNESS

The maximum allowable deviation from a straight edge shall be as shown in Table 5. These tolerances apply to all types of tubing to which this specification applies.

**Table 5A - Allowable deviation, inch/pound units**

Specified OD or ID Inches	Maximum Curvature in any 3 Feet Inches	Maximum Curvature in Total Length Inches
Up to 5.0, incl	0.030	$0.010 \times \text{length in feet}$
Over 5.0 to 8.0, incl	0.045	$0.015 \times \text{length in feet}$
Over 8.0	0.060	$0.020 \times \text{length in feet}$

**Table 5B - Allowable deviation, SI units**

Specified OD or ID Millimeters	Maximum Curvature in any Meter, Millimeters	Maximum Curvature in Total Length Millimeters
Up to 130, incl	0.75	$0.75 \times \text{length in meters or fraction thereof}$
Over 130 to 200, incl	1.10	$1.10 \times \text{length in meters or fraction thereof}$
Over 200	1.50	$1.50 \times \text{length in meters or fraction thereof}$