AEROSPACE MATERIAL SPECIFICATION

AMS2245™	REV. C

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Superseding AMS2245B

Tolerances
Titanium and Titanium Alloy Extruded Bars, Rods, and Shapes

RATIONALE

AMS2245C results from a Five-Year Review and editorial update of this specification. Addition of References (Section 2) has renumbered following paragraphs.

1. SCOPE

This specification covers established manufacturing tolerances applicable to titanium and titanium alloy extruded bars, rods, and shapes. These tolerances apply to all conditions, unless otherwise noted. The term "excl" applies only to the higher figure of the specified range.

1.1 Extrusions shall be specified in either inch/pound units or SI units. When inch/pound units are used, the tolerances shown for SI units are not applicable. When SI are used, the tolerances shown for inch/pound units are not applicable.

2. REFERENCES

There are no referenced publications specified herein.

3. DIAMETER OR THICKNESS

Shall be as shown in Table 1.

Table 1A - Tolerance, diameter, inch/pound units

Specified Diameter or Distance Between Parallel Sides Inches	Tolerance, Inches Plus and Minus (see 12.2)
Up to 0.500, excl	0.020
0.500 to 1.000, excl	0.030
1.000 to 2.000, excl	0.040
2.000 to 3.000, excl	0.050
3.000 to 5.000, excl	0.060
5.000 and over	0.125

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Table 1B - Tolerance, diameter, SI units

Specified Diameter or Distance Between Parallel Sides Millimeters	Tolerance, Millimeters Plus and Minus (see 12.2)
Up to 12.50, excl	0.50
12.50 to 25.00, excl	0.75
25.00 to 50.00, excl	1.00
50.00 to 75.00, excl	1.25
75.00 to 125.00, excl	1.50
125.00 and over	3.20

4. CORNER AND FILLET RADII

4.1 Bars and Shapes (see Figure 1)

Shall be as shown in Table 2.

Table 2A - Tolerance, corner and fillet radii, inch/pound units

Specified Radius Inches	Tolerance, Inches, Plus and Minus	
	Difference Between Specified Radius and Corner Radius (A)	Difference Between Specified Radius and Fillet Radius (B)
All	0.031	0.062

Table 2B - Tolerance, corner and fillet radii, SI units

Specified Radius Millimeters	Tolerance, Millimeters, Plus and Minus	
	Difference Between Specified Radius and Corner Radius (A)	Difference Between Specified Radius and Fillet Radius (8)
All	0.80	1.60

5. ANGULARITY (SEE 12.3)

5.1 Shapes (see Figure 2)

Shall be as shown in Table 3.

Table 3 - Tolerance on angularity

Minimum Specified Leg or Metal Thickness Inches	Tolerance (Allowable Deviation from Specified Angle) Degrees, Plus and Minus (Ratio: Leg or Surface Length Shall Not Exceed 14 Times the Leg or Metal Thickness)
All	2

6. TRANSVERSE FLATNESS

6.1 Bars and Shapes (see Figure 3)

Shall be as shown in Table 4.

Table 4A - Transverse flatness tolerance, inch/pound units

Surface Width (W) Inches	Tolerance (Allowable Deviation from Flat) Inches
Up to 1.000, excl	0.010
1.000 and over	0.010 x W
In any 1 inch of width	0.010

Table 4B - Transverse flatness tolerance, SI units

Surface Width (W) Millimeters	Tolerance (Allowable Deviation from Flat) Millimeters
Up to 25.00, excl	0.25
25.00 and over	0.25 x W
In any 25.00 mm of width	0.010

7. STRAIGHTNESS (SEE FIGURE 4)

Shall be as shown in Table 5.

Table 5A - Straightness tolerance, inch/pound units

Specified Diameter (Rod) Specified Width (Bar) Circumscribing Circle Diameter (see 12.5) Inches	Tolerance, Inches (see 12.4)	
	In Any Foot or Less of Length	In Total Length of Piece
All	0.025	0.025 x length, feet

Table 5B - Straightness tolerance, SI units

Specified Diameter (Rod) Specified Width (Bar) Circumscribing Circle Diameter (see 12.5) Millimeters	Tolerance, Inches (see 12.4)	
	In Any 300 mm or Less of Length	In Total Length of Piece
All	0.65	0.65 per 300 mm of length

8. TWIST (SEE 12.6)

8.1 Bars and Shapes (see Figure 5)

Shall be as shown in Table 6.

Table 6A - Tolerance on twist, inch/pound units

Specified Width (Bars) Circumscribing Circle Diameter (see 12.5) Inches	Tolerance, Degrees		
	Minimum Thickness Inches	In Any Foot or Less of Length	In Total Length of Piece
All	All	1	1 x length feet; 3 maximum

Table 6B - Tolerance on twist, SI units

Specified Width (Bars) Circumscribing Circle Diameter (see 12.5) Millimeters	Tolerance, Degrees		
	Minimum Thickness Millimeters	In Any 300 mm or Less of Length	In Total Length of Piece
All	All	1	1 per 300 mm of length; 3 maximum

9. LENGTH

Tolerance on length shall be as shown in Table 7.

Table 7A - Tolerance on length, inch/pound units

Circumscribing Circle Diameter (Shapes); Specified Diameter (Rod); Specified Width (Bar) Inches (see 12.5)	Tolerance, Inch, Plus Only Length Ranges, Feet		
	Up to 10, incl	Over 10 to 20, incl	Over 20
Up to 3.000, excl	1/4	5/16	3/8
3.000 to 5.000, excl	5/16	7/16	1/2
5.000 to 9.000, excl	3/8	1/2	5/8

Table 7B - Tolerance on length, SI units

Circumscribing Circle Diameter (Shapes); Specified Diameter (Rod); Specified Width (Bar) Millimeters (see 12.5)	Tolerance, Millimeters, Plus Only Length Ranges, Meters		
	Up to 3.0, incl	Over 3.0 to 6.0, incl	Over 6.0
Up to 75.00, excl	6.2	7.8	9.4
75.00 to 125.00, excl	7.8	10.9	12.5
125.00 to 225.00, excl	9.4	12.5	15.6

10. SQUARENESS OF CUT ENDS

Ends shall not deviate from square by more than 3 degrees.

11. SURFACE ROUGHNESS

Shall be as shown in Table 8.

Table 8A - Surface imperfections, inch/pound units

Specified Section Thickness Inches	Depth of Imperfection Inches, Maximum (see 12.7, 12.8)
Up to 0.250, incl	0.008
Over 0.250 to 0.500, incl	0.010
Over 0.500	0.015

Table 8B - Surface imperfections, SI units

Specified Section Thickness Millimeters	Depth of Imperfection Millimeters, Maximum (see 12.7, 12.8)
Up to 6.25, incl	0.20
Over 6.25 to 12.50, incl	0.25
Over 12.50	0.38

12. NOTES

12.1 Revision Indicator

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

12.2 Allowable deviation from specified dimension when diameter of circumscribing circle is less than 7 inches when inch/pound units are used, or 175 mm when SI units are used.

12.3 Angles are measured with protractors or with gauges. As illustrated in sketch 1, a four point contact system is used, two contact points being as close to the angle vertex as practical, and the others near the ends of the respective surfaces forming the angle. Between these points of measurement, surface flatness is the controlling tolerance.

Sketch 1

12.4 When weight of piece on flat surface minimizes deviation.

12.5 The circumscribing circle diameter is the smallest circle that will completely enclose the cross-section of the extruded product.

12.6 Twist is normally measured by placing the extruded section on a flat surface and measuring the maximum distance at any point along its length between the bottom surface of the section and the flat surface. From this measurement, the deviation from true straightness of the section is subtracted. The remainder is the twist. To convert the standard twist tolerance to an equivalent linear value, the tangent of the standard tolerance is multiplied by the width of the surface of the section that is on the flat surface.

12.7 The depth of local defects, such as gouges, dents, die lines, laps, and handling marks shall be included within the minimum dimensions permitted by the tolerances of Table 1.