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AEROSPACE MATERIAL SPECIFICATION

AMS 2245

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Revised

TOLERANCES
Titanium and Titanium-Base Alloy Extruded Bars, Rods, and Shapes

1. SCOPE: This specification covers established manufacturing tolerances applicable to titanium and titanium-base 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.

2. DIAMETER OR THICKNESS:

TABLE I

Nominal Diameter or Distance Between Parallel Sides Inches	Tolerance, Inch, Plus and Minus (See Note 1)
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

TABLE I (SI)

Nominal Diameter or Distance Between Parallel Sides Millimeters	Tolerance, Millimeters, Plus and Minus (See Note 1)
Up to 12.70, excl	0.51
12.70 to 25.40, excl	0.76
25.40 to 50.80, excl	1.02
50.80 to 76.20, excl	1.27
76.20 to 127.00, excl	1.52
127.00 and over	3.18

3. CORNER AND FILLET RADII:

3.1 Bars and Shapes (See Fig. 1):

TABLE II

Specified Radius, In. (mm)	Tolerance, Inch (mm), Plus and Minus: Difference Between Specified Radius and Corner Radius (A)	Tolerance, Inch (mm), Plus and Minus: Difference Between Specified Radius & Fillet Radius (B)
All	0.031 (0.79)	0.062 (1.57)

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4. ANGULARITY (See Note 2):

4.1 Shapes (See Fig. 2):

TABLE III

Minimum Nominal Leg or Metal Thickness Inches (mm)	Tolerance (Allowable Deviation from Nominal Angle) Degrees (Radians), Plus and Minus Ratio: Leg or surface length shall not exceed 14 times the leg or metal thickness.
All	2 (0.035)

5. TRANSVERSE FLATNESS:

5.1 Bars and Shapes (See Fig. 3):

TABLE IV

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

TABLE IV (SI)

Surface Width Millimeters	Tolerance (Allowable Deviation from Flat) Millimeter
Up to 25.40, excl	0.25
25.40 and over	0.25 x W (millimeters)
In any 25.40 mm of width	0.25

6. STRAIGHTNESS (See Fig. 4):

TABLE V

Nominal Diameter (Rod) Nominal Width (Bar) Circumscribing Circle Diameter (See Note 4) Inches (mm)	Tolerance, Inch (mm) (See Note 3)	
	In any Foot (305 mm) or Less of Length	In Total Length Of Piece
All	0.025 (0.64)	0.025 (0.64) x length, ft (305 mm)

7. TWIST (See Note 5):

7.1 Bars and Shapes (See Fig. 5):

TABLE VI

Nominal Width (Bars) Circumscribing Circle Diameter (See Note 4) Inches (mm)	Minimum Thickness Inches (mm)	Tolerance, Degrees (Radians)	
		In Any Foot (305 mm) or Less of Length	In Total Length of Piece
All	All	1 (0.017)	1 x length ft; (0.017 x length (305 mm)) ; 3 (0.052) max

8. LENGTH:

TABLE VII

Circumscribing Circle Diameter (Shapes); Nominal Diameter (Rod); Nominal Width (Bar) Inches (See Note 4)	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 VII (SI)

Circumscribing Circle Diameter (Shapes); Nominal Diameter (Rod); Nominal Width (Bar) Millimeters (See Note 4)	Tolerance, Millimeters, Plus Only Length Ranges, Meters		
	Up to 3.05, Incl	Over 3.05 To 6.10	Over 6.10
Up to 76.20, excl	6.4	7.9	9.5
16.20 to 127.00, excl	7.9	11.1	12.7
127.00 to 228.60, excl	9.5	12.7	15.9

9. SQUARENESS OF CUT ENDS: Ends shall not deviate from square by more than 3 degrees (0.052 rad).

10. SURFACE ROUGHNESS:

TABLE VIII

Nominal Section Thickness Inches	Depth of Imperfection Inch, Maximum (See Notes 6, 7)
Up to 0.250, incl	0.008
Over 0.250 to 0.500, incl	0.010
Over 0.500	0.015

TABLE VIII (SI)

Nominal Section Thickness Millimeters	Depth of Imperfection Millimeter, Maximum (See Notes 6, 7)
Up to 6.35, incl	0.20
Over 6.35 to 12.70, incl	0.25
Over 12.70	0.38

Note 1. Allowable deviation from specified dimension when diameter of circumscribing circle is less than 7 in. (178 mm).

Note 2. Angles are measured with protractors or with gauges. As illustrated, 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.

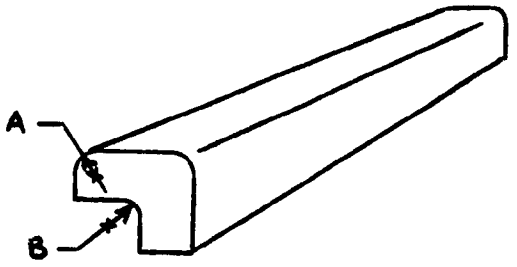
Note 3. When weight of piece on flat surface minimizes deviation.

Note 4. The circumscribing circle diameter is the smallest circle that will completely enclose the cross-section of the extruded product.

Note 5. 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 multipled by the width of the surface of the section that is on the flat surface.

Note 6. 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 I.

Note 7. A maximum roughness equivalent approximately to 250 microinches (6.4 µm) will be permitted. This value should be used as a guide only because surface texture standards are established primarily for machined surfaces. The surface texture standard may not be directly applicable in all respects to extruded surfaces.



A: Corner Radius
B: Fillet Radius

CORNER AND FILLET RADII DIMENSIONS

FIGURE 1