

**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 2205M
Superseding AMS 2205L

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TOLERANCES
Aluminum Alloy and Magnesium Alloy Extrusions

1. **SCOPE:** This specification covers established manufacturing tolerances applicable to aluminum alloy and magnesium alloy extruded bar, rod, wire, shapes, and tubing ordered to inch/pound dimensions. Tolerances greater than standard may be necessary for some shapes; tolerances closer than standard may be possible for others. Tolerances shown herein, however, apply unless otherwise agreed upon by purchaser and vendor and apply to all tempers, unless otherwise noted. The term "excl" is used to apply only to the higher figure of the specified range. The general temper designations "-TX510" and "-TX511" are used for brevity and denote the full temper designations -T3510, -T4510, -T6510, -T8510, -T73510, -T76510, -T3511, -T4511, -T6511, -T8511, -T73511, and -T76511, the "X" representing one or more digits preceding the "510" or "511".
2. **CROSS-SECTIONAL DIMENSIONS OF BARS, RODS, WIRE, SHAPES, AND TUBING:** The tolerance applicable to a dimension composed of two or more component dimensions is the sum of the tolerances of the component dimensions if all the component dimensions are indicated. When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.
 - 2.1 Bars, Rods, Wire, and Shapes Where 25% or Less of the Dimension is Space (Except for Shapes in the TX510 Tempers) (See Note 1 and Fig. 1):
 - 2.1.1 Circumscribing Circle Sizes Under 10 In. in Diameter:

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AMS 2205M

TABLE I

Tolerance, Inch, Plus and Minus

Wall Thickness Completely Enclosing
Space 0.11 sq in. or More
(Eccentricity) (See Notes 2, 3, and 4)

Specified Dimension Inches Col. 1	Alloys		Alloys	
	5083	Other Alloys	5083	Other Alloys
	5086		5086	
	5456		5456	
	Col. 2		Col. 3	
Up to 0.125, excl	0.009	0.006	15% of	10% of
0.125 to 0.250, excl	0.011	0.007	specified dimension;	specified dimension;
0.250 to 0.500, excl	0.012	0.008	0.015, min	0.010, min
0.500 to 0.750, excl	0.014	0.009	0.090, max	0.060, max
0.750 to 1.000, excl	0.015	0.010		
1.000 to 1.500, excl	0.018	0.012		
1.500 to 2.000, excl	0.021	0.014		
2.000 to 4.000, excl	0.036	0.024		
4.000 to 6.000, excl	0.051	0.034		
6.000 to 8.000, excl	0.066	0.044		
8.000 to 10.000, excl	0.081	0.054		

2.1.2 Circumscribing Circle Sizes 10 In. and Over in Diameter:

TABLE II

Tolerance, Inch, Plus and Minus

Wall Thickness Completely Enclosing
Space 0.11 sq in. or More
(Eccentricity) (See Notes 2, 3, and 4)

Specified Dimension Inches Col. 1	Alloys		Alloys	
	5083	Other Alloys	5083	Other Alloys
	5086		5086	
	5456		5456	
	Col. 2		Col. 3	
Up to 0.125, excl	0.021	0.014		
0.125 to 0.250, excl	0.022	0.015		
0.250 to 0.500, excl	0.024	0.016		
0.500 to 0.750, excl	0.025	0.017		
0.750 to 1.000, excl	0.027	0.018		
1.000 to 1.500, excl	0.028	0.019		
1.500 to 2.000, excl	0.036	0.024	15% of	15% of
2.000 to 4.000, excl	0.051	0.034	Specified dimension;	Specified dimension;
4.000 to 6.000, excl	0.066	0.044	0.025, min	0.015, min
6.000 to 8.000, excl	0.081	0.054	0.090, max	0.090, max
8.000 to 10.000, excl	0.096	0.064		
10.000 to 12.000, excl	0.111	0.074		
12.000 to 14.000, excl	0.126	0.084		
14.000 to 16.000, excl	0.141	0.094		
16.000 to 18.000, excl	0.158	0.104		
18.000 to 20.000, excl	0.171	0.114		
20.000 to 22.000, excl	0.186	0.124		
22.000 to 24.000, excl	0.201	0.134		

2.2 Shapes Where More Than 25% of the Dimension is Space (Except in the -TX510 Tempers)
(See Notes 5 and 6, and Fig. 1):

2.2.1 Circumscribing Circle Sizes Under 10 In. in Diameter:

TABLE III

Specified Dimension Inches Col. 1		Tolerance, Inch, Plus and Minus When Specified Dimension is at Following Distances in Inches from Base of Cantilevered Leg									
		0.250 to		0.625 to		1.250 to		2.500 to		4.000 to	
		0.625, excl	Alloys	1.250, excl	Alloys	2.500, excl	Alloys	4.000, excl	Alloys	6.000, excl	8.000, incl
Up to 0.125, excl	0.125 to 0.250, excl	0.013	5083	0.010	5083	0.015	5083	0.016	5083	0.020	5083
	0.250 to 0.500, excl	0.016	5086	0.012	5086	0.018	5086	0.018	5086	0.022	5086
	0.500 to 0.750, excl	0.021	5456	0.016	5456	0.023	5456	0.020	5456	0.025	5456
	0.750 to 1.000, excl	0.023	Alloys	0.018	Alloys	0.025	Alloys	0.022	Alloys	0.030	Alloys
	1.000 to 1.500, excl	0.027	Col. 4	0.021	Col. 4	0.029	Col. 4	0.026	Col. 4	0.036	Col. 4
0.125 to 0.250, excl	0.250 to 0.500, excl	0.031	5083	0.024	5083	0.033	5083	0.031	5083	0.041	5083
	0.500 to 0.750, excl	0.046	5086	0.034	5086	0.050	5086	0.048	5086	0.057	5086
	0.750 to 1.000, excl	0.061	5456	0.044	5456	0.067	5456	0.064	5456	0.081	5456
	1.000 to 1.500, excl	0.076	Alloys	0.054	Alloys	0.084	Alloys	0.082	Alloys	0.104	Alloys
	1.500 to 2.000, excl	0.091	Col. 5	0.064	Col. 5	0.101	Col. 5	0.100	Col. 5	0.127	Col. 5
0.250 to 0.500, excl	0.500 to 0.750, excl	0.013	5083	0.010	5083	0.015	5083	0.016	5083	0.020	5083
	0.750 to 1.000, excl	0.016	5086	0.012	5086	0.020	5086	0.018	5086	0.022	5086
	1.000 to 1.500, excl	0.021	5456	0.016	5456	0.023	5456	0.020	5456	0.025	5456
	1.500 to 2.000, excl	0.023	Alloys	0.018	Alloys	0.025	Alloys	0.022	Alloys	0.030	Alloys
	2.000 to 4.000, excl	0.027	Col. 6	0.021	Col. 6	0.029	Col. 6	0.026	Col. 6	0.036	Col. 6
0.500 to 0.750, excl	0.750 to 1.000, excl	0.031	5083	0.024	5083	0.033	5083	0.031	5083	0.041	5083
	1.000 to 1.500, excl	0.046	5086	0.034	5086	0.050	5086	0.048	5086	0.057	5086
	1.500 to 2.000, excl	0.061	5456	0.044	5456	0.067	5456	0.064	5456	0.081	5456
	2.000 to 4.000, excl	0.076	Alloys	0.054	Alloys	0.084	Alloys	0.082	Alloys	0.104	Alloys
	4.000 to 6.000, excl	0.091	Col. 7	0.064	Col. 7	0.101	Col. 7	0.100	Col. 7	0.127	Col. 7
0.750 to 1.000, excl	1.000 to 1.500, excl	0.013	5083	0.010	5083	0.015	5083	0.016	5083	0.020	5083
	1.500 to 2.000, excl	0.016	5086	0.012	5086	0.020	5086	0.018	5086	0.022	5086
	2.000 to 4.000, excl	0.021	5456	0.016	5456	0.023	5456	0.020	5456	0.025	5456
	4.000 to 6.000, excl	0.023	Alloys	0.018	Alloys	0.025	Alloys	0.022	Alloys	0.030	Alloys
	6.000 to 8.000, excl	0.027	Col. 8	0.021	Col. 8	0.029	Col. 8	0.026	Col. 8	0.036	Col. 8
1.000 to 1.500, excl	1.500 to 2.000, excl	0.031	5083	0.024	5083	0.033	5083	0.031	5083	0.041	5083
	2.000 to 4.000, excl	0.046	5086	0.034	5086	0.050	5086	0.048	5086	0.057	5086
	4.000 to 6.000, excl	0.061	5456	0.044	5456	0.067	5456	0.064	5456	0.081	5456
	6.000 to 8.000, excl	0.076	Alloys	0.054	Alloys	0.084	Alloys	0.082	Alloys	0.104	Alloys
	8.000 to 10.000, excl	0.091	Col. 9	0.064	Col. 9	0.101	Col. 9	0.100	Col. 9	0.127	Col. 9

2.2.2.2 Circumscribing Circle Sizes 10 In. and Over in Diameter:

TABLE IV

Tolerance, Inch, Plus and Minus
When Specified Dimension is at Following Distances in
Inches from Base of Cantilevered Leg

Specified Dimension Inches Col. 1	0.250 to 0.625, excl		0.625 to 1.250, excl		1.250 to 2.500, excl		2.500 to 4.000, excl		4.000 to 6.000, excl		6.000 to 8.000, incl	
	Alloys	Other	Alloys	Other	Alloys	Other	Alloys	Other	Alloys	Other	Alloys	Other
Up to 0.125, excl	0.025	0.018	0.027	0.020	--	0.035	--	--	--	--	--	--
0.125 to 0.250, excl	0.026	0.019	0.029	0.022	0.035	0.028	--	--	--	--	--	--
0.250 to 0.500, excl	0.028	0.020	0.032	0.024	0.038	0.030	0.058	0.050	--	--	--	--
0.500 to 0.750, excl	0.030	0.022	0.035	0.027	0.049	0.040	0.068	0.060	--	--	--	--
0.750 to 1.000, excl	0.031	0.023	0.039	0.030	0.057	0.050	0.079	0.070	0.099	0.090	--	--
1.000 to 1.500, excl	0.033	0.024	0.043	0.034	0.069	0.060	0.089	0.080	0.109	0.100	--	--
1.500 to 2.000, excl	0.046	0.034	0.056	0.044	0.082	0.070	0.102	0.090	0.122	0.110	0.182	0.170
2.000 to 4.000, excl	0.061	0.044	0.071	0.054	0.097	0.080	0.117	0.100	0.137	0.120	0.197	0.180
4.000 to 6.000, excl	0.076	0.054	0.086	0.064	0.112	0.090	0.132	0.110	0.152	0.130	0.212	0.190
6.000 to 8.000, excl	0.091	0.064	0.101	0.074	0.127	0.100	0.147	0.120	0.167	0.140	0.227	0.200
8.000 to 10.000, excl	0.106	0.074	0.116	0.084	0.142	0.110	0.162	0.130	0.182	0.150	0.242	0.210
10.000 to 12.000, excl	0.121	0.084	0.131	0.094	0.157	0.120	0.177	0.140	0.197	0.160	0.257	0.220
12.000 to 14.000, excl	0.136	0.094	0.146	0.104	0.172	0.130	0.192	0.150	0.212	0.170	0.272	0.230
14.000 to 16.000, excl	0.151	0.104	0.161	0.114	0.187	0.140	0.207	0.160	0.227	0.180	0.287	0.240
16.000 to 18.000, excl	0.166	0.114	0.176	0.124	0.202	0.150	0.222	0.170	0.242	0.190	0.302	0.250
18.000 to 20.000, excl	0.181	0.124	0.191	0.134	0.217	0.160	0.237	0.180	0.257	0.200	0.317	0.260
20.000 to 22.000, excl	0.196	0.134	0.206	0.144	0.232	0.170	0.252	0.190	0.272	0.210	0.332	0.270
22.000 to 24.000, incl	0.211	0.144	0.221	0.154	0.247	0.180	0.267	0.200	0.287	0.220	0.347	0.280

2.3 Shapes in the -TX510 Tempers: Tolerances shall be as agreed upon by purchaser and vendor.

2.4 Round Tubing (Except in the -TX510 tempers):

TABLE V

Specified OD or ID Inches (See Note 9)	Tolerance, Inch, Plus and Minus			
	Mean Diameter (See Note 7)		Diameter at Any Point (Ovality) (See Note 8)	
	Alloys		Alloys	
	5083		5083	
	5086	Other	5086	Other
	5456	Alloys	5456	Alloys
Up to 0.500, excl*	--	0.008	--	0.016
0.500 to 1.000, excl	0.015	0.010	0.030	0.020
1.000 to 2.000, excl	0.018	0.012	0.038	0.025
2.000 to 4.000, excl	0.023	0.015	0.045	0.030
4.000 to 6.000, excl	0.038	0.025	0.075	0.050
6.000 to 8.000, excl	0.053	0.035	0.113	0.075
8.000 to 10.000, excl	0.068	0.045	0.150	0.100
10.000 to 12.000, excl	0.083	0.055	0.188	0.125
12.000 to 14.000, excl	0.098	0.065	0.225	0.150
14.000 to 16.000, excl	0.113	0.075	0.263	0.175
16.000 to 18.000, excl	0.128	0.085	0.300	0.200

*Not applicable to aluminum

2.5 Square, Rectangular, Hexagonal, and Octagonal Tubing (Except in the TX510 Tempers):



TABLE VI

Specified Width or Depth Inches (See Note 9)	Tolerance, Inch, Plus and Minus					
	At Corners		Not at Corners (See Note 8)			
	Square and Rectangular		Square, Hexagonal, and Octagonal		Rectangular	
	Alloys		Alloys		All Alloys	
	5083	Other	5083	Other		
	5086	Alloys	5086	Alloys		
0.500 to 0.750, excl*	0.018	0.012	0.030	0.020	The tolerance for the width is the value in the pre- ceding column for dimension equal to depth, and con- versely, but in no case less than that for its own dimen- sion at the corners (See Note 10).	
0.750 to 1.000, excl	0.021	0.014	0.030	0.020		
1.000 to 2.000, excl	0.027	0.018	0.038	0.025		
2.000 to 4.000, excl	0.038	0.025	0.053	0.035		
4.000 to 5.000, excl	0.053	0.035	0.068	0.045		
5.000 to 6.000, excl	0.068	0.045	0.083	0.055		
6.000 to 7.000, excl	0.083	0.055	0.098	0.065		
7.000 to 8.000, excl	0.098	0.065	0.108	0.075		
8.000 to 9.000, excl	0.113	0.075	0.123	0.085		
9.000 to 10.000, excl	0.128	0.085	0.143	0.095		
10.000 to 11.000, excl	0.143	0.095	0.158	0.105		
11.000 to 13.000, excl	0.158	0.105	0.173	0.115		

*0.250 to 0.750, excl, for magnesium