

AEROSPACE
MATERIAL
SPECIFICATION

MAM 2202A
Superseding MAM 2202

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TOLERANCES, METRIC

Aluminum Alloy and Magnesium Alloy Sheet and Plate

1. SCOPE: This specification covers established manufacturing tolerances applicable to aluminum alloy and magnesium alloy sheet and plate ordered to metric dimensions. These tolerances apply to all conditions, unless otherwise noted.
 - 1.1 These tables are based on logical metric values and preferred metric sizes.
 - 1.2 Throughout this specification, the term "metric" is intended to refer to the SI system.

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2. THICKNESS: (See Note 1):

2.1 Alloys 1060, 1100, 1350 (EC), 3003, 3005, 3105, 5005, 5050, 5357, 5457, 5657, and 1100 Reflector Sheet, Clad 1100 Reflector Sheet, and Clad 3003 Reflector Sheet (See Note 2):

TABLE I

Flat Sheet, Coiled Sheet, and Plate

			<u>Tolerances, Millimetres, Plus and Minus</u>						
			<u>Width Ranges, Millimetres</u>						
			Up	Over	Over	Over	Over	Over	Over
			to	to	to	to	to	to	to
Specified Thickness			1000,	1000,	1500,	2000,	2500,	3000,	3500,
Thickness			incl	incl	incl	incl	incl	incl	incl
	0.15 to	0.25, incl	0.025	0.040	--	--	--	--	--
Over	0.25 to	0.40, incl	0.030	0.050	--	--	--	--	--
Over	0.40 to	0.63, incl	0.040	0.06	0.08	0.10	--	--	--
Over	0.63 to	0.80, incl	0.045	0.07	0.09	0.11	--	--	--
Over	0.80 to	1.00, incl	0.050	0.08	0.10	0.12	0.16	--	--
Over	1.00 to	1.20, incl	0.06	0.09	0.12	0.14	0.18	--	--
Over	1.20 to	1.60, incl	0.08	0.10	0.14	0.16	0.20	0.24	--
Over	1.60 to	2.00, incl	0.09	0.11	0.16	0.18	0.22	0.26	--
Over	2.00 to	2.50, incl	0.10	0.12	0.18	0.22	0.26	0.30	--
Over	2.50 to	3.20, incl	0.12	0.14	0.20	0.26	0.30	0.34	--
Over	3.20 to	4.00, incl	0.14	0.18	0.24	0.30	0.34	0.40	--
Over	4.00 to	5.00, incl	0.18	0.24	0.29	0.34	0.40	0.46	--
Over	5.00 to	6.30, incl	0.24	0.30	0.34	0.40	0.46	0.56	0.70
Over	6.30 to	8.00, incl	0.32	0.36	0.40	0.48	0.56	0.70	0.92
Over	8.00 to	10.00, incl	0.44	0.44	0.52	0.60	0.70	0.86	1.05
Over	10.00 to	16.00, incl	0.60	0.60	0.68	0.78	0.90	1.05	1.20
Over	16.00 to	25.00, incl	0.80	0.80	0.94	1.10	1.30	1.55	1.90
Over	25.00 to	40.00, incl	1.00	1.00	1.20	1.40	1.65	1.95	2.30
Over	40.00 to	60.00, incl	1.40	1.40	1.60	1.90	2.30	2.60	3.00
Over	60.00 to	80.00, incl	2.00	2.00	2.10	2.80	3.30	3.30	--
Over	80.00 to	100.00, incl	2.60	2.60	2.95	3.40	3.90	4.10	--
Over	100.00 to	160.00, incl	3.40	3.40	3.80	4.30	--	--	--

2.2 Aluminum Alloys Other Than Those Listed in 2.1 and All Magnesium Alloys
(See Note 2):

TABLE II

Flat Sheet, Coiled Sheet, and Plate

Tolerances, Millimetres, Plus and Minus
Width Ranges, Millimetres

Specified Thickness Millimetres	Up to 925 incl	Over 925 to 1225 incl	Over 1225 to 1375 incl	Over 1375 to 1850 incl	Over 1850 to 2150 incl	Over 2150 to 2500 incl	Over 2500 to 3000 incl	Over 3000 to 3500 incl	Over 3500 to 4000 incl	Over 4000 to 4500 incl
Over 0.15 to 0.25 incl	0.03	0.06	0.06	--	--	--	--	--	--	--
Over 0.25 to 0.50 incl	0.04	0.06	0.09	--	--	--	--	--	--	--
Over 0.50 to 0.63 incl	0.05	0.06	0.09	0.10	0.10	--	--	--	--	--
Over 0.63 to 0.80 incl	0.05	0.06	0.10	0.12	0.13	0.15	--	--	--	--
Over 0.80 to 1.00 incl	0.06	0.08	0.10	0.13	0.13	0.15	--	--	--	--
Over 1.00 to 1.20 incl	0.06	0.08	0.10	0.13	0.14	0.18	0.20	0.25	--	--
Over 1.20 to 1.60 incl	0.08	0.10	0.13	0.15	0.15	0.18	0.20	0.25	--	--
Over 1.60 to 2.00 incl	0.08	0.10	0.13	0.15	0.18	0.20	0.23	0.30	--	--
Over 2.00 to 2.50 incl	0.09	0.10	0.13	0.15	0.20	0.24	0.25	0.32	--	--
Over 2.50 to 3.20 incl	0.11	0.13	0.13	0.18	0.23	0.25	0.30	0.40	--	--
Over 3.20 to 4.00 incl	0.15	0.17	0.20	0.23	0.28	0.33	0.38	0.44	--	--
Over 4.00 to 5.00 incl	0.18	0.22	0.25	0.28	0.33	0.38	0.43	0.48	--	--
Over 5.00 to 6.30 incl	0.23	0.26	0.28	0.33	0.38	0.43	0.51	0.60	--	--
Over 6.30 to 8.00 incl	0.33	0.33	0.33	0.38	0.43	0.51	0.58	0.80	1.05	1.30
Over 8.00 to 10.00 incl	0.44	0.48	0.48	0.48	0.58	0.66	0.66	0.90	1.10	1.40
Over 10.00 to 16.00 incl	0.60	0.60	0.60	0.64	0.76	0.90	0.90	1.00	1.20	1.70
Over 16.00 to 25.00 incl	0.76	0.76	0.76	0.76	1.00	1.10	1.30	1.45	1.50	2.00
Over 25.00 to 40.00 incl	1.00	1.00	1.00	1.20	1.30	1.40	1.65	1.95	2.10	2.50
Over 40.00 to 60.00 incl	1.40	1.40	1.40	1.50	1.70	1.90	2.30	2.60	3.00	--
Over 60.00 to 80.00 incl	2.00	2.00	2.00	2.10	2.40	2.80	3.30	3.30	--	--
Over 80.00 to 100.00 incl	2.60	2.60	2.60	2.90	3.10	3.40	3.90	4.10	--	--
Over 100.00 to 160.00 incl	3.40	3.40	3.40	3.60	4.00	4.30	--	--	--	--

3. WIDTH (See Note 3):

3.1 Sheared Flat Sheet and Plate:

3.1.1 Sheet:

TABLE III

Tolerance, Millimetres, Plus and Minus
Thickness Ranges, Millimetres

Specified Width Millimetres	Over 0.15 to 3.20, incl	Over 3.20 to 6.30, incl
Up to 250, incl	1.5	2
Over 250 to 500, incl	2	2.5
Over 500 to 1000, incl	2.5	3
Over 1000 to 2000, incl	3	3.5
Over 2000 to 3000, incl	4	4.5
Over 3000 to 4000, incl	4.5	5

3.2.1 Plate, Thickness Over 6.30 to 12.50 Millimetres, Incl:

TABLE IV

Specified Width Millimetres	Tolerance, Millimetres Plus Only
Up to 250, incl	6
Over 250 to 500, incl	7
Over 500 to 1000, incl	8
Over 1000 to 2000, incl	9
Over 2000 to 3000, incl	11
Over 3000 to 4000, incl	12
Over 4000 to 5000, incl	14

3.2 Slit Coiled Sheet (See Note 1):

TABLE V

Tolerances, Millimetres, Plus and Minus
Thickness Ranges, Millimetres

Specified Width Millimetres	Over 0.15 to 3.20, incl	Over 3.20 to 5.00, incl	Over 5.00 to 6.30, incl
Up to 150, incl	0.25	--	--
Over 150 to 250, incl	0.5	1	1
Over 250 to 500, incl	1	1	1
Over 500 to 750, incl	1	1	1.5
Over 750 to 1000, incl	1	1.5	2
Over 1000 to 1500, incl	1.5	2	3
Over 1500 to 2000, incl	2.5	3	4
Over 2000 to 2500, incl	3.5	--	--

3.3 Sawed Flat Sheet and Plate:

TABLE VI

Specified Width Millimetres	Tolerances, Millimetres	
	Thickness Ranges, Millimetres	
	Over 2.00 to 6.30, incl	Over 6.30 to 160.00, incl
Up to 1,000, incl	+ 3	+ 6, -0
Over 1,000 to 2,000, incl	+ 3	+ 7, -0
Over 2,000 to 3,000, incl	+ 4	+ 8, -0
Over 3,000 to 4,000, incl	+ 4	+ 9, -0
Over 4,000 to 5,000, incl	+ 5	+10, -0
Over 5,000 to 7,500, incl	+ 6	+12, -0
Over 7,500 to 10,000, incl	+ 7	+14, -0
Over 10,000 to 12,500, incl	+ 8	+16, -0
Over 12,500 to 15,000, incl	+ 9	+18, -0
Over 15,000 to 17,500, incl	+10	+20, -0
Over 17,500 to 20,000, incl	+11	+22, -0

4. LENGTH (See Note 3):4.1 Sheared Flat Sheet and Plate:4.1.1 Sheet:

TABLE VII

Specified Length Millimetres	Tolerances, Millimetres, Plus and Minus	
	Thickness Ranges, Millimetres	
	Over 0.15 to 3.20, incl	Over 3.20 to 6.30, incl
Up to 1,000, incl	2	2.5
Over 1,000 to 2,000, incl	2.5	3
Over 2,000 to 3,000, incl	3	3
Over 3,000 to 4,000, incl	3	3.5
Over 4,000 to 5,000, incl	3.5	4
Over 5,000 to 7,500, incl	4.5	5
Over 7,500 to 10,000, incl	5	6
Over 10,000 to 12,500, incl	6	7
Over 12,500 to 15,000, incl	7	8
Over 15,000 to 17,500, incl	8	9

4.1.2 Plate, Thickness Over 6.30 to 12.50 Millimetres, Incl:

TABLE VIII

Specified Length Millimetres	Tolerance, Millimetres Plus Only
Up to 1,000, incl	8
Over 1,000 to 2,000, incl	9
Over 2,000 to 3,000, incl	10
Over 3,000 to 4,000, incl	10
Over 4,000 to 5,000, incl	11
Over 5,000 to 7,500, incl	13
Over 7,500 to 10,000, incl	14
Over 10,000 to 12,500, incl	16
Over 12,500 to 15,000, incl	18
Over 15,000 to 17,500, incl	19
Over 17,500 to 20,000, incl	21

4.2 Sawed Flat Sheet and Plate:

TABLE IX

Specified Length Millimetres	Tolerance, Millimetres Thickness Ranges, Millimetres	
	Over 2.00 to 6.30, incl	Over 6.30 to 160.00, incl
Up to 1,000, incl	+ 3	+ 6, -0
Over 1,000 to 2,000, incl	+ 3	+ 7, -0
Over 2,000 to 3,000, incl	+ 4	+ 8, -0
Over 3,000 to 4,000, incl	+ 4	+ 9, -0
Over 4,000 to 5,000, incl	+ 5	+10, -0
Over 5,000 to 7,500, incl	+ 6	+12, -0
Over 7,500 to 10,000, incl	+ 7	+14, -0
Over 10,000 to 12,500, incl	+ 8	+16, -0
Over 12,500 to 15,000, incl	+ 9	+18, -0
Over 15,000 to 17,500, incl	+10	+20, -0
Over 17,500 to 20,000, incl	+11	+22, -0

5. LATERAL BOW (Camber) (See Note 4):5.1 Sheared or Sawed Flat Sheet:TABLE X

Tolerance, Millimetres (See Note 5)
Specified Thickness
Over 0.15 to 3.20 Millimetres, incl

Specified Length Millimetres	Up to 100 Millimetres incl, Wide	Over 100 to 250 Millimetres incl, Wide	Over 250 to 900 Millimetres incl, Wide	Over 900 Millimetres Wide
Up to 1000, incl	3	1	1	0.5
Over 1000 to 2000, incl	11	3.5	2.5	1.5
Over 2000 to 3000, incl	25	8	5	3
Over 3000 to 4000, incl	45	13	9	5
Over 4000 to 5000, incl	70	21	14	8
Over 5000 to 6000, incl	100	30	20	12

TABLE X (Continued)

Tolerance, Millimetres (See Note 5)
Specified Thickness
Over 3.20 to 6.30 Millimetres, incl

Specified Length Millimetres	Over 100 to 400 Millimetres incl, Wide	Over 400 Millimetres Wide
Up to 1000, incl	1	0.5
Over 1000 to 2000, incl	3	1.5
Over 2000 to 3000, incl	6	3
Over 3000 to 4000, incl	11	5
Over 4000 to 5000, incl	17	8
Over 5000 to 6000, incl	25	12

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5.2 Slit Coiled Sheet:

TABLE XI

Tolerance, Millimetres in 2000 Millimetres
Thickness Ranges, Millimetres

Specified Width Millimetres	Over 0.15 to 1.60, incl	Over 1.60 to 3.20, incl
12 to 24, incl	20	-
Over 25 to 50, incl	15	-
Over 50 to 100, incl	10	10
Over 100 to 250, incl	6	6
Over 250	5	5

5.3 Sheared or Sawed Plate, Thickness 6.30 to 150.00 Millimetres, Incl:

TABLE XII

Tolerance, Millimetres (See Note 5)
Specified Width, Millimetres

Specified Length Millimetres	Up to 250 Millimetres incl	Over 250 to 400 Millimetres incl	Over 400 Millimetres
Up to 1000, incl	3	1	0.5
Over 1000 to 2000, incl	11	3	2
Over 2000 to 3000, incl	25	6	3.5
Over 3000 to 4000, incl	45	11	6
Over 4000 to 5000, incl	70	17	10
Over 5000 to 6000, incl	100	25	14

6. FLATNESS:

6.1 Flat Sheet and Plate, AZ31B Magnesium Alloy:

TABLE XIII

Tolerance, Millimetres (See Note 6)
-0 and -H24 Tempers -H26 Temper

Specified Thickness Millimetres	Any 300 Millimetres	Any 1000 Millimetres	Any 300 Millimetres	Any 1000 Millimetres
3.20 to 6.30, incl	0.50	0.75	0.50	0.75
Over 6.30 to 12.50, incl	0.60	0.90	0.65	0.95
Over 12.50 to 25.00, incl	0.75	1.15	1.25	1.90
Over 25.00 to 50.00, incl	1.00	1.50	1.25	1.90

6.2 Plate, Magnesium Alloys Other Than AZ31B, All Tempers:TABLE XIV

Specified Thickness Millimetres	Tolerance, Millimetres (See Note 5)
Over 6.30 to 80.00, incl	7 in 2000

6.3 Flat Sheet, Aluminum Alloys:6.3.1 Alloys 1060, 1100, 1350 (EC), 3003, 3005, 3105, 5005, 5050, 5357, 5457, and 5657 (See Notes 2 and 8):TABLE XV

Tolerance, Millimetres (See Notes 9, 10, 11)
 Ranges of Distance from Center to Center of
 Buckles or Edgewaves, Millimetres (See Notes 7, 12)

Specified Thickness Millimetres	Up to 500, incl	Over 500 to 1000, incl	Over 1000 to 1500, incl	Over 1500 to 2000, incl	Over 2000
Over 0.50 to 1.60, incl	2	4	6	8	10
Over 1.60 to 6.30, incl	3	5	8	10	13

6.3.2 Alloys Other Than Those Listed in 6.3.1 (See Notes 2 and 8):TABLE XVI

Tolerance, Millimetres (See Notes 9, 10, 11)
 Ranges of Distance from Center to Center of
 Buckles or Edgewaves, Millimetres (See Notes 7, 12)

Specified Thickness Millimetres	Up to 500, incl	Over 500 to 1000, incl	Over 1000 to 1500, incl	Over 1500 to 2000, incl	Over 2000
Over 0.50 to 1.60, incl	4	6	9	11	14
Over 1.60 to 6.30, incl	5	7	10	12	15

6.4 Plate, Aluminum Alloys Only (-HX2, -HX4, -HX6, -T36, -T361, -T37, -T86, -T861, and -T87 Tempers:6.4.1 Longitudinal Flatness:TABLE XVII

Specified Thickness Millimetres	Tolerance, Millimetres (See Note 7)
Over 6.30 to 160.00 incl	7 in any 2000 mm or less

6.4.2 Transverse Flatness:

TABLE XVIII

Specified Thickness Millimetres	Tolerance, Millimetres (See Note 7)			
	Width Ranges, Millimetres			
	Up to 500, incl	Over 500 to 1000, incl	Over 1000 to 1500, incl	Over 1500 to 2000,
incl				
	(See Note 13)			
Over 6.30 to 16.00, incl	Only Short	7	10	13
Over 16.00 to 40.00, incl	Cycle	6	8	10
Over 40.00 to 80.00, incl	Flatness	5	6	7
Over 80.00 to 160.00, incl	Tolerance	4	5	6
	Applies			

6.4.3 Short Cycle Flatness (See Note 14):

TABLE XIX

Specified Thickness Millimetres	Tolerance, Millimetres (See Note 15)
Over 6.30 to 16.00, incl	2.50
Over 16.00 to 160.00, incl	1.80

6.5 Plate, Aluminum Alloys in the -T351, -T451, -T651, -T6151, -T7351, -T7651, and -T851 Tempers and LA141A Magnesium Alloy:

6.5.1 Longitudinal Flatness:

TABLE XX

Specified Thickness Millimetres	Tolerance, Millimetres (See Note 7)
Over 6.30 to 80.00, incl	5 in any 2000 mm (See Note 16)
Over 80.00 to 160.00, incl	3.5 in any 2000 mm or less

6.5.2 Transverse Flatness:

TABLE XXI

Specified Thickness Millimetres	Tolerance, Millimetres (See Note 7)			
	Width Ranges, Millimetres			
	Up to 500, incl	Over 500 to 1000, incl	Over 1000 to 1500 incl	Over 1500 to 2000, incl (See Note 13)
Over 6.30 to 16.00, incl	Only	6	8	10
Over 16.00 to 40.00, incl	Short	4	6	8
Over 40.00 to 80.00, incl	Cycle	3	4	5
Over 80.00 to 160.00, incl	Flatness	2.5	3	3.5
	Tolerance Applies			

6.5.3 Short Cycle Flatness (See Note 14):

TABLE XXII

Specified Thickness Millimetres	Tolerance, Millimetres (See Note 15)
Over 6.30 to 16.00, incl	2.00
Over 16.00 to 160.00, incl	1.50

7. SQUARENESS OF FLAT SHEET AND PLATE:

TABLE XXIII

Specified Length Millimetres	Allowable Difference in Length of Diagonals, Millimetres	
	Width Ranges, Millimetres (See Note 17)	
	Up to 1000	Over 1000
Up to 3500, incl	0.8 x each 100 mm segment of width	0.7 x each 100 mm segment of width
Over 3500	1.2 x each 100 mm segment of width	1.0 x each 100 mm segment of width