



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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TOLERANCES, METRIC Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate

1. **SCOPE:** This specification covers established manufacturing tolerances applicable to sheet, strip, and plate of corrosion and heat resistant steels, iron alloys, titanium, and titanium alloys ordered to metric dimensions. These tolerances apply to all conditions, unless otherwise noted. The term "excl" is used to apply only to the higher figure of a specified range.
 - 1.1 These tables are based upon logical metric values and preferred metric sizes.
 - 1.2 Throughout this specification the term "metric" is intended to refer to the SI system.
2. **THICKNESS:** Thickness for sheet and strip is measured at any place on widths less than 25 mm, at any place 10 mm and over from an edge on widths 25 mm and over, and for plate at least 10 mm but not more than 75 mm from an edge.
 - 2.1 **Sheet:** Table I includes crown tolerances.

TABLE I

Thickness Tolerance, Millimetre, Plus and Minus
For Width Ranges Shown
Millimetres

Specified Thickness Millimetres	600 to 1200, incl		Over 1200
	Millimetres		
0.12	0.03		
Over 0.12 to 0.20, incl	0.04		--
Over 0.20 to 0.40, incl	0.05		--
Over 0.40 to 0.60, incl	0.08		0.08
Over 0.60 to 1.00, incl	0.10		0.10
Over 1.00 to 1.60, incl	0.10		0.13
Over 1.60 to 1.80, incl	0.13		0.15
Over 1.80 to 2.00, incl	0.13		0.18
Over 2.00 to 2.50, incl	0.15		0.20
Over 2.50 to 3.00, incl	0.18		0.23
Over 3.00 to 3.50, incl	0.20		0.25
Over 3.50 to 4.00, incl	0.25		0.30
Over 4.00 to 5.00, excl	0.30		0.36

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2.2 Strip: Table II includes crown tolerances.

TABLE II

Thickness Tolerance, Millimetre, Plus and Minus
For Width Ranges Shown,
Millimetres

Specified Thickness Millimetres	Millimetres		
	5.00 to 150, incl	Over 150 to 300, incl	Over 300 to 600 excl
0.12 to 0.25, incl	10%	10%	10%
Over 0.25 to 0.30, incl	0.04	0.04	0.04
Over 0.30 to 0.35, incl	0.04	0.04	0.05
Over 0.35 to 0.45, incl	0.04	0.05	0.05
Over 0.45 to 0.50, incl	0.04	0.05	0.065
Over 0.50 to 0.75, incl	0.05	0.065	0.065
Over 0.75 to 0.90, incl	0.05	0.08	0.08
Over 0.90 to 1.25, incl	0.065	0.09	0.09
Over 1.25 to 1.75, incl	0.08	0.09	0.09
Over 1.75 to 2.50, incl	0.08	0.10	0.13
Over 2.50 to 3.20, incl	0.10	0.115	0.13
Over 3.20 to 4.10, incl	0.115	0.115	0.13
Over 4.10 to 5.00, excl	0.13	0.13	0.15

2.3 Plate: Minus tolerance shall be 0.25 mm for all widths for all thicknesses up to 250 mm, incl, in all alloys; plus tolerances shall be as in Table III. For circles, the plus thickness tolerances in Table III apply to the diameter of the circle corresponding to the width ranges shown. For plates of irregular shape, the plus thickness tolerances apply to the greatest width corresponding to the width ranges shown.

TABLE III

Thickness Tolerance, Millimetres, Plus
For Width Ranges Shown, Millimetres

Specified Thickness Millimetres	For Width Ranges Shown, Millimetres			
	Over 120 to 2140, incl	Over 2140 to 3050, incl	Over 3050 to 3650, incl	Over 3650
5 to 10, excl	1.15	1.25	1.90	--
10 to 20, excl	1.40	1.50	2.15	2.30
20 to 25, excl	1.50	1.65	2.40	2.55
25 to 50, excl	1.80	1.90	4.45	2.90
50 to 75, excl	3.20	3.80	6.20	5.10
75 to 100, excl	4.45	5.35	8.90	7.10
100 to 150, excl	6.35	7.60	8.90	10.15
150 to 200, excl	8.90	10.15	12.15	14.20
200 to 250, incl	11.45	13.70	16.00	--

3. WIDTH:

3.1 Sheet:

3.1.1 Stretcher Levelled, Resquared:

TABLE IV

Specified Thickness Millimetres	Width Tolerance, Millimetres, Plus Only For Width Ranges Shown, Millimetres	
	600 to 1200, excl	1200 and over
Up to 3.30, excl	1.6	3.2
3.30 to 3.80, incl	3.2	3.2
Over 3.80 to 4.30, incl	4.8	4.8
Over 4.30 to 5.00, excl	6.4	6.4

3.1.2 Not Resquared, Flat or in Coils:

TABLE V

Specified Width Millimetres	Width Tolerance, Millimetres Plus Only
600 to 1200, excl	1.6
1200 and over	3.2

3.2 Strip:

3.2.1 Rolled Edge or Approximately Square Edge Produced by Rolling or Filing After Slitting:

TABLE VI

Specified Width Millimetres	Specified Thickness Millimetres	Width Tolerance, Millimetre Plus and Minus
Up to 7.0, incl	Up to 1.6, incl	0.13
Over 7.0 to 20.0, incl	Up to 2.5, incl	0.13
Over 20.0 to 120, incl	Up to 3.5, incl	0.13
Over 120 to 250, incl	0.20 to 3.5, incl	0.25
Over 250 to 500, incl	0.40 to 3.0, incl	0.25
Over 500	0.60 to 2.0, incl	0.40

3.2.2 Slit Edge:

TABLE VII

Specified Width Millimetres	Width Tolerance, Millimetre, Plus and Minus For Thickness Ranges Shown, Millimetres			
	Up to 1.75, incl	Over 1.75 to 2.50, incl	Over 2.50 to 4.00, incl	Over 4.00 to 5.00, excl
5.0 to 12.5, incl	0.1	0.2	0.3	---
Over 12.5 to 150, incl	0.1	0.2	0.3	0.4
Over 150 to 225, incl	0.1	0.3	0.4	0.5
Over 225 to 300, incl	0.3	0.3	0.4	0.5
Over 300 to 500, incl	0.4	0.4	0.5	0.8
Over 500 to 600, incl	0.5	0.5	0.5	0.8

3.3 Plate: Minus tolerance shall be 6 mm for all widths and lengths in all thicknesses up to 25 mm, incl; plus tolerances shall be as shown in Table VIII. Width tolerances for plates over 25 mm thick shall be as agreed upon by purchaser and vendor.

TABLE VIII

Specified Width Millimetres	Specified Length Millimetres	Width Tolerance, Millimetres Plus		
		For Thickness Ranges Shown Millimetres		
		4.8 to 9.5 excl	9.5 to 12.5, incl	Over 12.5 to 25, incl
Over 250 to 1220, incl	Up to	3	5	8
Over 1220 to 1525, incl	3, 650,	5	6	10
Over 1525 to 2140, incl	incl	6	8	11
Over 2140 to 2750, incl		8	10	13
Over 2750		10	11	16
Over 250 to 1220, incl	Over	5	6	8
Over 1220 to 1525, incl	3, 650 to	6	8	10
Over 1525 to 2140, incl	6, 100	10	11	13
Over 2140 to 2750, incl	incl	11	13	16
Over 2750		13	16	18
Over 250 to 1220, incl	Over	6	8	10
Over 1220 to 1525, incl	6, 100 to	8	10	13
Over 1525 to 2140, incl	9, 150	11	13	16
Over 2140 to 2750, incl	incl	14	16	19
Over 2750		16	18	22
Over 250 to 1525, incl	Over	11	13	16
Over 1525 to 2140, incl	9, 150	13	16	19
Over 2140 to 2750, incl	12, 200,	14	19	22
Over 2750	incl	19	22	25
Over 250 to 1525, incl	Over	11	13	16
Over 1525 to 2140, incl	12, 200 to	13	16	19
Over 2140 to 2750, incl	15, 200,	16	19	22
Over 2750	incl	19	22	25
Over 250 to 1525, incl	Over	13	16	19
Over 1525 to 2750, incl	15, 200	16	19	22
Over 2750		22	25	29

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4. LENGTH:

4.1 Sheet:

4.1.1 Stretcher Leveled, Resquared:

TABLE IX

Specified Thickness Millimetres	Specified Length Millimetres	Length Tolerance, Millimetres Plus Only
Up to 3.0, excl	Up to 1220, excl	1.6
Up to 3.0, excl	1220 and over	3.2
3.0 to 3.5, incl	All	3.2
Over 3.5 to 4.5, incl	All	4.8
Over 4.5 to 5.0, incl	All	6.4

4.1.2 Not Resquared:

TABLE X

Specified Length Millimetres	Length Tolerance, Millimetres Plus Only
Up to 3050, incl	6.4
Over 3050 to 6100, incl	12.5

4.2 Strip:

TABLE XI

Specified Length Millimetres	Length Tolerance, Millimetres Plus Only
Up to 1525, incl	9.5
Over 1525 to 3050, incl	12.5
Over 3050 to 6100, incl	16.0

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4.3 Plate: Minus tolerances shall be 6 mm for all lengths and widths in all thicknesses up to 25 mm, incl; plus tolerances shall be as shown in Table XII. Length tolerances for plate over 25 mm thick shall be as agreed upon by purchaser and vendor.

TABLE XII

Specified Width Millimetres	Specified Length Millimetres	Length Tolerance, Millimetres, Plus		
		For Thickness Ranges Shown		
		4.8 to 9.5, excl	9.5 to 12.5 incl	Over 12.5 to 25, incl
Over 250 to 1220, incl	Up to	5	6	10
Over 1220 to 1525, incl	3,650	6	8	11
Over 1525 to 2140, incl	incl	8	10	13
Over 2140 to 2750, incl		10	11	14
Over 2750		11	13	18
Over 250 to 1220, incl	Over	10	13	16
Over 1220 to 1525, incl	3,650 to	11	16	19
Over 1525 to 2140, incl	6,100	13	18	19
Over 2140 to 2750, incl	incl	14	19	22
Over 2750		16	22	25
Over 250 to 1220, incl	Over	13	16	19
Over 1220 to 1525, incl	6,100 to	16	19	19
Over 1525 to 2140, incl	9,150	18	19	22
Over 2140 to 2750, incl	incl	19	22	25
Over 2750		22	25	25
Over 250 to 1525, incl	Over	29	32	35
Over 1525 to 2750, incl	9150 to	32	35	38
Over 2750	12,200, incl	35	38	41
Over 250 to 1525, incl	Over	32	38	41
Over 1525 to 2750, incl	12,200 to	35	38	41
Over 2750	15,200, incl	38	41	44
Over 250 to 2750, incl	Over	44	48	48
Over 2750	15,200	44	51	57

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5. STRAIGHTNESS:

5.1 Sheet and Strip:

TABLE XIII

Specified Width Millimetres	Camber Tolerance, Millimetres, in Any 2500 Millimetres of Length
Up to 40, incl	13.0
Over 40 to 600, excl	6.6
600 to 910, incl	3.3
Over 910	2.5

5.2 Plate: Shall be of such straightness that the maximum edgewise curvature (depth of arc) shall not exceed 3.1 mm in any 1500 mm of length.

6. FLATNESS: The following tolerances do not apply to strip, dead soft sheet, or deep drawing sheet for which there are no established tolerances. In all cases, the "Variation from Flat" is the maximum deviation from a horizontal flat surface.

6.1 Sheet, Not Stretcher Levelled: The following table does not apply to cold worked tempers of austenitic grades:

TABLE XIV

Specified Thickness Millimetres	Specified Width Millimetres	Variation from Flat Millimetres	
		1/4 Hard	1/2 Hard
Up to 1.6, excl	Up to 910, incl	12.5	
	Over 910 to 1525, incl	19.0	
	Over 1525	25.5	
1.6 to 5.0 excl	Up to 1525, incl	12.5	
	Over 1525 to 1825, incl	19.0	
	Over 1825	25.5	

6.2 Cold Worked Austenitic Sheet, 1/4 and 1/2 Hard Tempers:

TABLE XV

Specified Thickness Millimetres	Specified Width Millimetres	Variation from Flat, Millimetres	
		1/4 Hard	1/2 Hard
Up to 0.40, incl Over 0.40 to 0.75, incl Over 0.75 to 5.00, excl	600 to	12.5	19.0
	910, excl	16.0	22.0
		19.0	22.0
Up to 0.40, incl Over 0.40 to 0.75, incl Over 0.75 to 5.00, excl	910 to	16.0	25.5
	1220, excl	19.0	28.5
		25.5	28.5