

7. Sheet and Plate

Introduction

Section 7 of Aluminum Standards and Data covers the mechanical property limits and product dimensional tolerance limits for aluminum alloy sheet and plate. These limits are statistically based guaranteed limits, and may be used as the basis of design. Note that the limits applicable in any specific situation are those for the specific size of product ordered.

Product Property Limits for Aluminum Alloy Sheet and Plate

Tables 7.1 through 7.6 provide the specified aluminum industry product limits for aluminum alloy sheet and plate products, as follows:

- Table 7.1 - Mechanical Property Limits - Non-Heat-Treatable Alloys
- Table 7.2 - Mechanical Property Limits - Heat-Treatable Alloys
- Table 7.3 - Mechanical Property Limits - Brazing Sheet
- Table 7.4 - Weights per Square Foot
- Table 7.5 - Weight Conversion Factors
- Table 7.6 - Recommended Minimum Bend Radii for 90-Degree Cold forming

Note that the product limits shown above are statistically-based guaranteed limits, and are thus suitable for the design of aluminum alloy products.

Special Note: The applicable limits for any individual product are those that apply to the specified (ordered) dimension.

Dimensional Tolerance Limits for Aluminum Alloy Sheet and Plate

Specific aluminum industry guaranteed tolerance limits for aluminum alloy sheet and plate are shown in Tables 7.7 through 7.18, as listed below:

- Table 7.7a - Sheet and Plate Thickness Tolerances (Non-Aerospace Applications)
- Table 7.7b - Sheet and Plate Thickness Tolerances (Aerospace Applications)
- Table 7.8 - Width Tolerances for Sheared Flat Sheet and Plate
- Table 7.9 - Length Tolerances for Sheared Flat Sheet and Plate
- Table 7.10 - Width and Length Tolerances for Sawed Flat Sheet and Plate
- Table 7.11 - Width Tolerances for Slit Coiled Sheet
- Table 7.12 - Lateral Bow Tolerances for Coiled Sheet
- Table 7.13 - Lateral Bow Tolerances for Flat Sheet and Plate
- Table 7.14 - Squareness Tolerances for Flat Sheet and Plate
- Table 7.15 - Diameter Tolerances for Sheared or

Blanked Circles

Table 7.16 - Diameter Tolerances for Sawed Circles

Table 7.17 - Flatness Tolerances for Flat Sheet

Table 7.18 - Flatness Tolerances for Sawed or Sheared Plate

Some general comments on the applicability and methods for calculating tolerances from these tables are given on p. 4-18 of Aluminum Standards and Data. For sheet and plate products, it is appropriate to note that these published tolerance limits represent industry standards that are agreed to and capable of being met by all members of the industry. Thus they represent the maximum tolerances that can be provided by any producer; in no case should tolerance ranges larger than these values be provided.

In some cases, substantially tighter limits (i.e., smaller ranges of thickness, width and/or length) may be obtained from individual producers upon special order. In this regard, for example, it is broadly understood in the industry that it is possible to order sheet and plate from many suppliers to thickness tolerances that are one-half those in the limit Table 7.7a, as illustrated in Table 4.1 in the blue pages.

For additional information of specific tolerance ranges available, contact producers directly.

Product Limits for Special Finished Sheet and Plate Products

The guaranteed mechanical, dimensional and finish characteristics of special aluminum alloy sheet and plate products are shown in Tables 7.19 through 7.43, as follows:

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Table 7.19 - Recommended Minimum Bend Radii

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Table 7.22 - Designed Dimensions and Weights for Corrugated Siding

Table 7.23 - Designed Dimensions and Weights for V-Beam Roofing and Siding

Table 7.24 - Designed Dimensions and Weights for Ribbed Roofing

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TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ^{① ⑩}

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
1060						
1060-O	0.006–0.019	8.0	14.0	2.5	..	15
	0.020–0.050	8.0	14.0	2.5	..	22
	0.051–3.000	8.0	14.0	2.5	..	25
1060-H12 ③	0.017–0.050	11.0	16.0	9.0	..	6
	0.051–2.000	11.0	16.0	9.0	..	12
1060-H14 ③	0.009–0.019	12.0	17.0	10.0	..	1
	0.020–0.050	12.0	17.0	10.0	..	5
	0.051–1.000	12.0	17.0	10.0	..	10
1060-H16 ③	0.006–0.019	14.0	19.0	11.0	..	1
	0.020–0.050	14.0	19.0	11.0	..	4
	0.051–0.162	14.0	19.0	11.0	..	5
1060-H18 ③	0.006–0.019	16.0	..	12.0	..	1
	0.020–0.050	16.0	..	12.0	..	3
	0.051–0.128	16.0	..	12.0	..	4
1060-H112	0.250–0.499	11.0	..	..	..	10
	0.500–1.000	10.0	..	..	..	20
	1.001–3.000	9.0	..	..	..	25
1100						
1100-O	0.006–0.019	11.0	15.50	3.5	..	15
	0.020–0.031	11.0	15.50	3.5	..	20
	0.032–0.050	11.0	15.50	3.5	..	25
	0.051–0.249	11.0	15.50	3.5	..	30
	0.250–3.000	11.0	15.50	3.5	..	28
1100-H12 ③	0.017–0.019	14.0	19.00	11.0	..	3
	0.020–0.031	14.0	19.00	11.0	..	4
	0.032–0.050	14.0	19.00	11.0	..	6
	0.051–0.113	14.0	19.00	11.0	..	8
	0.114–0.499	14.0	19.00	11.0	..	9
	0.500–2.000	14.0	19.00	11.0	..	12
1100-H14 ③	0.009–0.012	16.0	21.00	14.0	..	1
	0.013–0.019	16.0	21.00	14.0	..	2
	0.020–0.031	16.0	21.00	14.0	..	3
	0.032–0.050	16.0	21.00	14.0	..	4
	0.051–0.113	16.0	21.00	14.0	..	5
	0.114–0.499	16.0	21.00	14.0	..	6
	0.500–1.000	16.0	21.00	14.0	..	10
1100-H16 ③	0.006–0.019	19.0	24.00	17.0	..	1
	0.020–0.031	19.0	24.00	17.0	..	2
	0.032–0.050	19.0	24.00	17.0	..	3
	0.051–0.162	19.0	24.00	17.0	..	4
1100-H18	0.006–0.019	22.0	..	..	..	1
	0.020–0.031	22.0	..	..	..	2
	0.032–0.050	22.0	..	..	..	3
	0.051–0.128	22.0	..	..	..	4
1100-H19	0.006–0.063	24.0	..	..	..	1
1100-H112	0.250–0.499	13.0	..	7.0	..	9
	0.500–2.000	12.0	..	5.0	..	14
	2.001–3.000	11.5	..	4.0	..	20
1350						
1350-O	0.006–0.019	8.0	14.0	..	..	15
	0.020–0.031	8.0	14.0	..	..	20
	0.032–0.050	8.0	14.0	..	..	25
	0.051–0.249	8.0	14.0	..	..	30
	0.250–3.000	8.0	14.0	..	..	28
1350-H12	0.017–0.019	12.0	17.0	..	..	3
	0.020–0.031	12.0	17.0	..	..	4
	0.032–0.050	12.0	17.0	..	..	6
	0.051–0.113	12.0	17.0	..	..	8
	0.114–0.499	12.0	17.0	..	..	9
	0.500–2.000	12.0	17.0	..	..	12
1350-H14	0.009–0.012	14.0	19.0	..	..	1
	0.013–0.019	14.0	19.0	..	..	2
	0.020–0.031	14.0	19.0	..	..	3
	0.032–0.050	14.0	19.0	..	..	4
	0.051–0.113	14.0	19.0	..	..	5
	0.114–0.499	14.0	19.0	..	..	6
	0.500–1.000	14.0	19.0	..	..	10

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ^① ^⑩ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
1350 (Continued)						
1350-H16	0.006–0.019	16.0	21.0	..	..	1
	0.020–0.031	16.0	21.0	..	..	2
	0.032–0.050	16.0	21.0	..	..	3
	0.051–0.162	16.0	21.0	..	..	4
1350-H18	0.006–0.019	18.0	..	..	..	1
	0.020–0.031	18.0	..	..	..	2
	0.032–0.050	18.0	..	..	..	3
	0.051–0.128	18.0	..	..	..	4
1350-H112	0.250–0.499	11.0	..	..	..	10
	0.500–1.000	10.0	..	..	..	16
	1.001–1.500	9.0	..	..	..	22
3003						
3003-O	0.006–0.007	14.0	19.0	5.0	..	14
	0.008–0.012	14.0	19.0	5.0	..	18
	0.013–0.031	14.0	19.0	5.0	..	20
	0.032–0.050	14.0	19.0	5.0	..	23
	0.051–0.249	14.0	19.0	5.0	..	25
	0.250–3.000	14.0	19.0	5.0	..	23
3003-H12 ③	0.017–0.019	17.0	23.0	12.0	..	3
	0.020–0.031	17.0	23.0	12.0	..	4
	0.032–0.050	17.0	23.0	12.0	..	5
	0.051–0.113	17.0	23.0	12.0	..	6
	0.114–0.161	17.0	23.0	12.0	..	7
	0.162–0.249	17.0	23.0	12.0	..	8
	0.250–0.499	17.0	23.0	12.0	..	9
	0.500–2.000	17.0	23.0	12.0	..	10
3003-H14 ③	0.009–0.012	20.0	26.0	17.0	..	1
	0.013–0.019	20.0	26.0	17.0	..	2
	0.020–0.031	20.0	26.0	17.0	..	3
	0.032–0.050	20.0	26.0	17.0	..	4
	0.051–0.113	20.0	26.0	17.0	..	5
	0.114–0.161	20.0	26.0	17.0	..	6
	0.162–0.249	20.0	26.0	17.0	..	7
	0.250–0.499	20.0	26.0	17.0	..	8
	0.500–1.000	20.0	26.0	17.0	..	10
3003-H16 ③	0.006–0.019	24.0	30.0	21.0	..	1
	0.020–0.031	24.0	30.0	21.0	..	2
	0.032–0.050	24.0	30.0	21.0	..	3
	0.051–0.162	24.0	30.0	21.0	..	4
3003-H18 ③	0.006–0.019	27.0	..	24.0	..	1
	0.020–0.031	27.0	..	24.0	..	2
	0.032–0.050	27.0	..	24.0	..	3
	0.051–0.128	27.0	..	24.0	..	4
3003-H19	0.006–0.063	29.0	..	..	..	1
3003-H112	0.250–0.499	17.0	..	10.0	..	8
	0.500–2.000	15.0	..	6.0	..	12
	2.001–3.000	14.5	..	6.0	..	18
ALCLAD 3003 ⑧						
Alclad 3003-O	0.006–0.007	13.0	18.0	4.5	..	14
	0.008–0.012	13.0	18.0	4.5	..	18
	0.013–0.031	13.0	18.0	4.5	..	20
	0.032–0.050	13.0	18.0	4.5	..	23
	0.051–0.249	13.0	18.0	4.5	..	25
	0.250–0.499	13.0	18.0	4.5	..	23
	0.500–3.000	14.0 ④	19.0 ④	5.0 ④	..	23
Alclad 3003-H12 ③	0.017–0.031	16.0	22.0	11.0	..	4
	0.032–0.050	16.0	22.0	11.0	..	5
	0.051–0.113	16.0	22.0	11.0	..	6
	0.114–0.161	16.0	22.0	11.0	..	7
	0.162–0.249	16.0	22.0	11.0	..	8
	0.250–0.499	16.0	22.0	11.0	..	9
	0.500–2.000	17.0 ④	23.0 ④	12.0 ④	..	10

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ^① ^⑩ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
ALCLAD 3003 ⑧ (Continued)						
Alclad 3003-H14 ③	0.009–0.012	19.0	25.0	16.0	..	1
	0.013–0.019	19.0	25.0	16.0	..	2
	0.020–0.031	19.0	25.0	16.0	..	3
	0.032–0.050	19.0	25.0	16.0	..	4
	0.051–0.113	19.0	25.0	16.0	..	5
	0.114–0.161	19.0	25.0	16.0	..	6
	0.162–0.249	19.0	25.0	16.0	..	7
	0.250–0.499	19.0	25.0	16.0	..	8
	0.500–1.000	20.0 ④	26.0 ④	17.0 ④	..	10
Alclad 3003-H16 ③	0.006–0.019	23.0	29.0	20.0	..	1
	0.020–0.031	23.0	29.0	20.0	..	2
	0.032–0.050	23.0	29.0	20.0	..	3
	0.051–0.162	23.0	29.0	20.0	..	4
Alclad 3003-H18	0.006–0.019	26.0	..	..	..	1
	0.020–0.031	26.0	..	..	..	2
	0.032–0.050	26.0	..	..	..	3
	0.051–0.128	26.0	..	..	..	4
Alclad 3003-H112	0.250–0.499	16.0	..	9.0	..	8
	0.500–2.000	15.0 ④	..	6.0 ④	..	12
	2.001–3.000	14.5 ④	..	6.0 ④	..	18
3004						
3004-O	0.006–0.007	22.0	29.0	8.5	..	..
	0.008–0.019	22.0	29.0	8.5	..	10
	0.020–0.031	22.0	29.0	8.5	..	14
	0.032–0.050	22.0	29.0	8.5	..	16
	0.051–0.249	22.0	29.0	8.5	..	18
	0.250–3.000	22.0	29.0	8.5	..	16
3004-H32 ③	0.017–0.019	28.0	35.0	21.0	..	1
	0.020–0.031	28.0	35.0	21.0	..	3
	0.032–0.050	28.0	35.0	21.0	..	4
	0.051–0.113	28.0	35.0	21.0	..	5
	0.114–2.000	28.0	35.0	21.0	..	6
3004-H34 ③	0.009–0.019	32.0	38.0	25.0	..	1
	0.020–0.050	32.0	38.0	25.0	..	3
	0.051–0.113	32.0	38.0	25.0	..	4
	0.114–1.000	32.0	38.0	25.0	..	5
3004-H36 ③	0.006–0.007	35.0	41.0	28.0	..	..
	0.008–0.019	35.0	41.0	28.0	..	1
	0.020–0.031	35.0	41.0	28.0	..	2
	0.032–0.050	35.0	41.0	28.0	..	3
	0.051–0.162	35.0	41.0	28.0	..	4
3004-H38 ③	0.006–0.007	38.0	..	31.0	..	..
	0.008–0.019	38.0	..	31.0	..	1
	0.020–0.031	38.0	..	31.0	..	2
	0.032–0.050	38.0	..	31.0	..	3
	0.051–0.128	38.0	..	31.0	..	4
3004-H112	0.250–3.000	23.0	..	9.0	..	7
ALCLAD 3004 ⑧						
Alclad 3004-O	0.006–0.007	21.0	28.0	8.0	..	..
	0.008–0.019	21.0	28.0	8.0	..	10
	0.020–0.031	21.0	28.0	8.0	..	14
	0.032–0.050	21.0	28.0	8.0	..	16
	0.051–0.249	21.0	28.0	8.0	..	18
	0.250–0.499	21.0	28.0	8.0	..	16
	0.500–3.000	22.0 ④	29.0 ④	8.5 ④	..	16
Alclad 3004-H32 ③	0.017–0.019	27.0	34.0	20.0	..	1
	0.020–0.031	27.0	34.0	20.0	..	3
	0.032–0.050	27.0	34.0	20.0	..	4
	0.051–0.113	27.0	34.0	20.0	..	5
	0.114–0.249	27.0	34.0	20.0	..	6
	0.250–0.499	27.0	34.0	20.0	..	6
	0.500–2.000	28.0 ④	35.0 ④	21.0 ④	..	6
Alclad 3004-H34 ③	0.009–0.019	31.0	37.0	24.0	..	1
	0.020–0.050	31.0	37.0	24.0	..	3
	0.051–0.113	31.0	37.0	24.0	..	4
	0.114–0.249	31.0	37.0	24.0	..	5
	0.250–0.499	31.0	37.0	24.0	..	5
	0.500–1.000	32.0 ④	38.0 ④	25.0 ④	..	5

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ^{① ⑩} (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
ALCLAD 3004 ⑧ (Continued)						
Alclad 3004-H36 ③	0.006–0.007	34.0	40.0	27.0	..	..
	0.008–0.019	34.0	40.0	27.0	..	1
	0.020–0.031	34.0	40.0	27.0	..	2
	0.032–0.050	34.0	40.0	27.0	..	3
	0.051–0.162	34.0	40.0	27.0	..	4
Alclad 3004-H38	0.006–0.007	37.0	..	..	..	..
	0.008–0.019	37.0	..	..	..	1
	0.020–0.031	37.0	..	..	..	2
	0.032–0.050	37.0	..	..	..	3
	0.051–0.128	37.0	..	..	..	4
Alclad 3004-H112	0.250–0.499	22.0	..	8.5	..	7
	0.500–3.000	23.0 ④	..	9.0 ④	..	7
3005						
3005-O	0.006–0.007	17.0	24.0	6.5	..	10
	0.008–0.012	17.0	24.0	6.5	..	12
	0.013–0.019	17.0	24.0	6.5	..	14
	0.020–0.031	17.0	24.0	6.5	..	16
	0.032–0.050	17.0	24.0	6.5	..	18
	0.051–0.249	17.0	24.0	6.5	..	20
3005-H12	0.017–0.019	20.0	27.0	17.0	..	1
	0.020–0.050	20.0	27.0	17.0	..	2
	0.051–0.113	20.0	27.0	17.0	..	3
	0.114–0.161	20.0	27.0	17.0	..	4
	0.162–0.249	20.0	27.0	17.0	..	5
3005-H14	0.009–0.031	24.0	31.0	21.0	..	1
	0.032–0.050	24.0	31.0	21.0	..	2
	0.051–0.113	24.0	31.0	21.0	..	3
	0.114–0.249	24.0	31.0	21.0	..	4
3005-H16	0.006–0.031	28.0	35.0	25.0	..	1
	0.032–0.113	28.0	35.0	25.0	..	2
	0.114–0.162	28.0	35.0	25.0	..	3
3005-H18	0.006–0.031	32.0	..	29.0	..	1
	0.032–0.128	32.0	..	29.0	..	2
3005-H19	0.006–0.012	34.0	..	..	..	..
	0.013–0.063	34.0	..	..	..	1
3005-H25	0.006–0.019	26.0	34.0	22.0	..	1
	0.020–0.031	26.0	34.0	22.0	..	2
	0.032–0.050	26.0	34.0	22.0	..	3
	0.051–0.080	26.0	34.0	22.0	..	4
3005-H26	0.006–0.019	28.0	36.0	24.0	..	1
	0.020–0.031	28.0	36.0	24.0	..	2
	0.032–0.050	28.0	36.0	24.0	..	3
	0.051–0.080	28.0	36.0	24.0	..	4
3005-H27	0.006–0.019	29.5	37.5	25.5	..	1
	0.020–0.031	29.5	37.5	25.5	..	2
	0.032–0.050	29.5	37.5	25.5	..	3
	0.051–0.080	29.5	37.5	25.5	..	4
3005-H28	0.006–0.019	31.0	..	27.0	..	1
	0.020–0.031	31.0	..	27.0	..	2
	0.032–0.050	31.0	..	27.0	..	3
	0.051–0.080	31.0	..	27.0	..	4
3105						
3105-O	0.013–0.019	14.0	21.0	5.0	..	16
	0.020–0.031	14.0	21.0	5.0	..	18
	0.032–0.080	14.0	21.0	5.0	..	20
3105-H12	0.017–0.019	19.0	26.0	15.0	..	1
	0.020–0.031	19.0	26.0	15.0	..	1
	0.032–0.050	19.0	26.0	15.0	..	2
	0.051–0.080	19.0	26.0	15.0	..	3
3105-H14	0.013–0.019	22.0	29.0	18.0	..	1
	0.020–0.031	22.0	29.0	18.0	..	1
	0.032–0.050	22.0	29.0	18.0	..	2
	0.051–0.080	22.0	29.0	18.0	..	2
3105-H16	0.013–0.031	25.0	32.0	21.0	..	1
	0.032–0.050	25.0	32.0	21.0	..	2
	0.051–0.080	25.0	32.0	21.0	..	2

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ^① ^⑩ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
3105 (Continued)						
3105-H18	0.013–0.031	28.0	..	24.0	..	1
	0.032–0.050	28.0	..	24.0	..	1
	0.051–0.080	28.0	..	24.0	..	2
3105-H22	0.013–0.019	19.0	..	15.0	..	3
	0.020–0.031	19.0	..	15.0	..	4
	0.032–0.050	19.0	..	15.0	..	5
	0.051–0.080	19.0	..	15.0	..	6
3105-H24	0.013–0.019	22.0	..	18.0	..	2
	0.020–0.031	22.0	..	18.0	..	3
	0.032–0.050	22.0	..	18.0	..	4
	0.051–0.080	22.0	..	18.0	..	6
3105-H25	0.013–0.019	23.0	..	19.0	..	2
	0.020–0.031	23.0	..	19.0	..	3
	0.032–0.050	23.0	..	19.0	..	4
	0.051–0.080	23.0	..	19.0	..	6
3105-H26	0.013–0.031	25.0	..	21.0	..	3
	0.032–0.050	25.0	..	21.0	..	4
	0.051–0.080	25.0	..	21.0	..	5
3105-H28	0.013–0.031	28.0	..	24.0	..	2
	0.032–0.050	28.0	..	24.0	..	3
	0.051–0.080	28.0	..	24.0	..	4
5005						
5005-O	0.006–0.007	15.0	21.0	5.0	..	12
	0.008–0.012	15.0	21.0	5.0	..	14
	0.013–0.019	15.0	21.0	5.0	..	16
	0.020–0.031	15.0	21.0	5.0	..	18
	0.032–0.050	15.0	21.0	5.0	..	20
	0.051–0.113	15.0	21.0	5.0	..	21
	0.114–0.249	15.0	21.0	5.0	..	22
	0.250–3.000	15.0	21.0	5.0	..	22
5005-H12	0.017–0.019	18.0	24.0	14.0	..	2
	0.020–0.031	18.0	24.0	14.0	..	3
	0.032–0.050	18.0	24.0	14.0	..	4
	0.051–0.113	18.0	24.0	14.0	..	6
	0.114–0.161	18.0	24.0	14.0	..	7
	0.162–0.249	18.0	24.0	14.0	..	8
	0.250–0.499	18.0	24.0	14.0	..	9
	0.500–2.000	18.0	24.0	14.0	..	10
5005-H14	0.009–0.031	21.0	27.0	17.0	..	1
	0.032–0.050	21.0	27.0	17.0	..	2
	0.051–0.113	21.0	27.0	17.0	..	3
	0.114–0.161	21.0	27.0	17.0	..	5
	0.162–0.249	21.0	27.0	17.0	..	6
	0.250–0.499	21.0	27.0	17.0	..	8
	0.500–1.000	21.0	27.0	17.0	..	10
5005-H16	0.006–0.031	24.0	30.0	20.0	..	1
	0.032–0.050	24.0	30.0	20.0	..	2
	0.051–0.162	24.0	30.0	20.0	..	3
5005-H18	0.006–0.031	27.0	..	..	..	1
	0.032–0.050	27.0	..	..	..	2
	0.051–0.128	27.0	..	..	..	3
5005-H32 ③	0.017–0.019	17.0	23.0	12.0	..	3
	0.020–0.031	17.0	23.0	12.0	..	4
	0.032–0.050	17.0	23.0	12.0	..	5
	0.051–0.113	17.0	23.0	12.0	..	7
	0.114–0.161	17.0	23.0	12.0	..	8
	0.162–0.249	17.0	23.0	12.0	..	9
	0.250–2.000	17.0	23.0	12.0	..	10
5005-H34 ③	0.009–0.012	20.0	26.0	15.0	..	2
	0.013–0.031	20.0	26.0	15.0	..	3
	0.032–0.050	20.0	26.0	15.0	..	4
	0.051–0.113	20.0	26.0	15.0	..	5
	0.114–0.161	20.0	26.0	15.0	..	6
	0.162–0.249	20.0	26.0	15.0	..	7
	0.250–0.499	20.0	26.0	15.0	..	8
	0.500–1.000	20.0	26.0	15.0	..	10
5005-H36 ③	0.006–0.007	23.0	29.0	18.0	..	1
	0.008–0.019	23.0	29.0	18.0	..	2
	0.020–0.031	23.0	29.0	18.0	..	3
	0.032–0.162	23.0	29.0	18.0	..	4

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ^① ^⑩ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
5005 (Continued)						
5005-H38	0.006–0.012	26.0	..	..	..	1
	0.013–0.019	26.0	..	..	..	2
	0.020–0.031	26.0	..	..	..	3
	0.032–0.128	26.0	..	..	..	4
5005-H39	0.006–0.063	28.0	..	..	..	1
5005-H112	0.250–0.499	17.0	..	..	..	8
	0.500–2.000	15.0	..	..	..	12
	2.001–3.000	14.5	..	..	..	18
5050						
5050-O	0.006–0.007	18.0	24.0	6.0	..	..
	0.008–0.019	18.0	24.0	6.0	..	16
	0.020–0.031	18.0	24.0	6.0	..	18
	0.032–0.113	18.0	24.0	6.0	..	20
	0.114–0.249	18.0	24.0	6.0	..	22
	0.250–3.000	18.0	24.0	6.0	..	20
5050-H32 ③	0.017–0.050	22.0	28.0	16.0	..	4
	0.051–0.249	22.0	28.0	16.0	..	6
5050-H34 ③	0.009–0.031	25.0	31.0	20.0	..	3
	0.032–0.050	25.0	31.0	20.0	..	4
	0.051–0.249	25.0	31.0	20.0	..	5
5050-H36 ③	0.006–0.019	27.0	33.0	22.0	..	2
	0.020–0.050	27.0	33.0	22.0	..	3
	0.051–0.162	27.0	33.0	22.0	..	4
5050-H38	0.006–0.007	29.0	..	..	..	..
	0.008–0.031	29.0	..	..	..	2
	0.032–0.050	29.0	..	..	..	3
	0.051–0.128	29.0	..	..	..	4
5050-H39	0.006–0.063	31.0	..	..	..	1
5050-H112	0.250–3.000	20.0	..	8.0	..	12
5052						
5052-O	0.006–0.007	25.0	31.0	9.5	..	..
	0.008–0.012	25.0	31.0	9.5	..	14
	0.013–0.019	25.0	31.0	9.5	..	15
	0.020–0.031	25.0	31.0	9.5	..	16
	0.032–0.050	25.0	31.0	9.5	..	18
	0.051–0.113	25.0	31.0	9.5	..	19
	0.114–0.249	25.0	31.0	9.5	..	20
	0.250–3.000	25.0	31.0	9.5	..	18
5052-H32 ③	0.017–0.019	31.0	38.0	23.0	..	4
	0.020–0.050	31.0	38.0	23.0	..	5
	0.051–0.113	31.0	38.0	23.0	..	7
	0.114–0.249	31.0	38.0	23.0	..	9
	0.250–0.499	31.0	38.0	23.0	..	11
	0.500–2.000	31.0	38.0	23.0	..	12
5052-H34 ③	0.009–0.019	34.0	41.0	26.0	..	3
	0.020–0.050	34.0	41.0	26.0	..	4
	0.051–0.113	34.0	41.0	26.0	..	6
	0.114–0.249	34.0	41.0	26.0	..	7
	0.250–1.000	34.0	41.0	26.0	..	10
5052-H36 ③	0.006–0.007	37.0	44.0	29.0	..	2
	0.008–0.031	37.0	44.0	29.0	..	3
	0.032–0.162	37.0	44.0	29.0	..	4
5052-H38 ③	0.006–0.007	39.0	..	32.0	..	2
	0.008–0.031	39.0	..	32.0	..	3
	0.032–0.128	39.0	..	32.0	..	4
5052-H39	0.006–0.063	41.0	..	..	..	1
5052-H112	0.250–0.499	28.0	..	16.0	..	7
	0.500–2.000	25.0	..	9.5	..	12
	2.001–3.000	25.0	..	9.5	..	16
5052-H391	0.008–0.125	42.0	..	35.0	..	3
5083						
5083-O	0.051–1.500	40.0	51.0	18.0	29.0	16
	1.501–3.000	39.0	50.0	17.0	29.0	16
	3.001–4.000	38.0	..	16.0	..	16
	4.001–5.000	38.0	..	16.0	..	14
	5.001–7.000	37.0	..	15.0	..	14
	7.001–8.000	36.0	..	14.0	..	12

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ^{① ⑩} (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
5083 (Continued)						
5083-H32	0.125-0.187	44.0	56.0	31.0	..	10
	0.188-1.500	44.0	56.0	31.0	..	12
	1.501-3.000	41.0	56.0	29.0	..	12
5083-H112	0.250–1.500	40.0	..	18.0	..	12
	1.501–3.000	39.0	..	17.0	..	12
5083-H116 ⑥ ⑨	0.063–0.499	44.0	56.0	31.0	..	10
	0.500–1.250	44.0	56.0	31.0	..	12
	1.251–1.500	44.0	56.0	31.0	..	12
	1.501–3.000	41.0	56.0	29.0	..	12
5083-H321⑨	0.125–0.187	44.0	56.0	31.0	..	10
	0.188–1.500	44.0	56.0	31.0	..	12
	1.501–3.000	41.0	56.0	29.0	..	12
5086						
5086-O	0.020–0.050	35.0	44.0	14.0	..	15
	0.051–0.249	35.0	44.0	14.0	..	18
	0.250–2.000	35.0	44.0	14.0	..	16
5086-H32 ③	0.020–0.050	40.0	47.0	28.0	..	6
	0.051–0.249	40.0	47.0	28.0	..	8
	0.250–2.000	40.0	47.0	28.0	..	12
5086-H34 ③	0.009–0.019	44.0	51.0	34.0	..	4
	0.020–0.050	44.0	51.0	34.0	..	5
	0.051–0.249	44.0	51.0	34.0	..	6
	0.250–1.000	44.0	51.0	34.0	..	10
5086-H36 ③	0.006–0.019	47.0	54.0	38.0	..	3
	0.020–0.050	47.0	54.0	38.0	..	4
	0.051–0.162	47.0	54.0	38.0	..	6
5086-H38 ③	0.006–0.020	50.0	..	41.0	..	3
5086-H112	0.188–0.499	36.0	..	18.0	..	8
	0.500–1.000	35.0	..	16.0	..	10
	1.001–2.000	35.0	..	14.0	..	14
	2.001–3.000	34.0	..	14.0	..	14
5086-H116 ⑥ ⑨	0.063–0.249	40.0	52.0	28.0	..	8
	0.250–0.499	40.0	52.0	28.0	..	10
	0.500–1.250	40.0	52.0	28.0	..	10
	1.251–2.000	40.0	52.0	28.0	..	10
5154						
5154-O	0.020–0.031	30.0	41.0	11.0	..	12
	0.032–0.050	30.0	41.0	11.0	..	14
	0.051–0.113	30.0	41.0	11.0	..	16
	0.114–3.000	30.0	41.0	11.0	..	18
5154-H32 ③	0.020–0.050	36.0	43.0	26.0	..	5
	0.051–0.249	36.0	43.0	26.0	..	8
	0.250–2.000	36.0	43.0	26.0	..	12
5154-H34 ③	0.009–0.050	39.0	46.0	29.0	..	4
	0.051–0.161	39.0	46.0	29.0	..	6
	0.162–0.249	39.0	46.0	29.0	..	7
	0.250–1.000	39.0	46.0	29.0	..	10
5154-H36 ③	0.006–0.050	42.0	49.0	32.0	..	3
	0.051–0.113	42.0	49.0	32.0	..	4
	0.114–0.162	42.0	49.0	32.0	..	5
5154-H38 ③	0.006–0.050	45.0	..	35.0	..	3
	0.051–0.113	45.0	..	35.0	..	4
	0.114–0.128	45.0	..	35.0	..	5
5154-H112	0.250–0.499	32.0	..	18.0	..	8
	0.500–2.000	30.0	..	11.0	..	11
	2.001–3.000	30.0	..	11.0	..	15
5252						
5252-H24	0.030–0.090	30.0	38.0	..	..	10
5252-H25	0.030–0.090	31.0	39.0	..	..	9
5252-H28	0.030–0.090	38.0	..	..	..	3
5254						
5254-O	0.020–0.031	30.0	41.0	11.0	..	12
	0.032–0.050	30.0	41.0	11.0	..	14
	0.051–0.113	30.0	41.0	11.0	..	16
	0.114–3.000	30.0	41.0	11.0	..	18

For all numbered footnotes, see page 7-11.

TABLE 7.1 Mechanical Property Limits—Non-Heat-Treatable Alloys ^① ^⑩ (continued)

ALLOY AND TEMPER	SPECIFIED THICKNESS ② in.	TENSILE STRENGTHS—ksi				ELONGATION PERCENT MIN. in 2 in. or 4D ⑤
		ULTIMATE		YIELD		
		min.	max.	min.	max.	
5254 (Continued)						
5254-H32 ③	0.020–0.050	36.0	43.0	26.0	..	5
	0.051-0.249	36.0	43.0	26.0	..	8
	0.250-2.000	36.0	43.0	26.0	..	12
5254-H34 ③	0.009–0.050	39.0	46.0	29.0	..	4
	0.051–0.161	39.0	46.0	29.0	..	6
	0.162–0.249	39.0	46.0	29.0	..	7
	0.250–1.000	39.0	46.0	29.0	..	10
5254-H36 ③	0.006–0.050	42.0	49.0	32.0	..	3
	0.051–0.113	42.0	49.0	32.0	..	4
	0.114–0.162	42.0	49.0	32.0	..	5
5254-H38 ③	0.006–0.050	45.0	..	35.0	..	3
	0.051–0.113	45.0	..	35.0	..	4
	0.114–0.128	45.0	..	35.0	..	5
5254-H112	0.250–0.499	32.0	..	18.0	..	8
	0.500–2.000	30.0	..	11.0	..	11
	2.001–3.000	30.0	..	11.0	..	15
5454						
5454-O	0.020–0.031	31.0	41.0	12.0	..	12
	0.032–0.050	31.0	41.0	12.0	..	14
	0.051–0.113	31.0	41.0	12.0	..	16
	0.114–3.000	31.0	41.0	12.0	..	18
5454-H32 ③	0.020–0.050	36.0	44.0	26.0	..	5
	0.051–0.249	36.0	44.0	26.0	..	8
	0.250–2.000	36.0	44.0	26.0	..	12
5454-H34 ③	0.020–0.050	39.0	47.0	29.0	..	4
	0.051–0.161	39.0	47.0	29.0	..	6
	0.162–0.249	39.0	47.0	29.0	..	7
	0.250–1.000	39.0	47.0	29.0	..	10
5454-H112	0.250–0.499	32.0	..	18.0	..	8
	0.500–2.000	31.0	..	12.0	..	11
	2.001–3.000	31.0	..	12.0	..	15
5456						
5456-O	0.051–1.500	42.0	53.0	19.0	30.0	16
	1.501–3.000	41.0	52.0	18.0	30.0	16
	3.001–5.000	40.0	..	17.0	..	14
	5.001–7.000	39.0	..	16.0	..	14
	7.001–8.000	38.0	..	15.0	..	12
5456-H32	0.188-0.499	46.0	59.0	33.0	..	12
	0.500-1.500	44.0	56.0	31.0	..	12
	1.501-3.000	41.0	54.0	29.0	..	12
5456-H112	0.250–1.500	42.0	..	19.0	..	12
	1.501–3.000	41.0	..	18.0	..	12
5456-H116 ⑥ ⑨	0.063–0.499	46.0	59.0	33.0	..	10
	0.500–1.250	46.0	56.0	33.0	..	12
	1.251–1.500	44.0	56.0	31.0	..	12
	1.501–3.000	41.0	54.0	29.0	..	12
	3.001–4.000	40.0	54.0	25.0	..	12
5456-H321⑨	0.100-0.187	48.0	59.0	34.0	..	10
	0.188–0.499	46.0	59.0	33.0	..	12
	0.500–1.500	44.0	56.0	31.0	..	12
	1.501–3.000	41.0	54.0	29.0	..	12
5457						
5457-O	0.030–0.090	16.0	22.0	..	..	20
5657						
5657-H241 ⑦	0.030–0.090	18.0	26.0	..	..	13
5657-H25	0.030–0.090	20.0	28.0	..	..	8
5657-H26	0.030–0.090	22.0	30.0	..	..	7
5657-H28	0.030–0.090	25.0	..	..	..	5

For all numbered footnotes, see page 7-11.

Footnotes for Pages 7-3 through 7-10

- ① The data base and criteria upon which these mechanical property limits are established are outlined on page 6-1 under "Mechanical Properties."
- ② Type of test specimen used depends on thickness of material; see "Sampling and Testing," pages 4-1 through 4-5.
- ③ For the corresponding H2 temper, limits for maximum ultimate tensile strength and minimum yield strength do not apply.
- ④ This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during the preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of the cladding.
- ⑤ D represents specimen diameter.
- ⑥ Also applies to material previously designated H117.
- ⑦ This material is subject to some recrystallization and the attendant loss of brightness.
- ⑧ See page 6-4 for specific cladding thicknesses.
- ⑨ Materials in these tempers, when tested upon receipt by the purchaser are required to pass ASTM G 66 and ASTM G 67 tests as defined in ASTM B 928. The resistance to inter-granular corrosion of individual lots is determined by microscope examination to assure a microstructure that is predominately free of a continuous grain boundary network of aluminum-magnesium precipitate. The microstructure is compared to that in a previously established acceptable reference photomicrograph.
- ⑩ Processes such as flattening, leveling, or straightening coiled products subsequent to shipment by the producer may alter the mechanical properties of the metal (refer to Certification, Section 4).