

ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

New and Revised Registrations											
Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
2013-T4511	Sumitomo	08/01/2012	Drawn Tube	3.00	10.00	*Min ⁶	275	145	20	-	* Tentative
2013-T6511	Sumitomo	12/15/2011	Drawn Tube	3.00	10.00	*Min ⁶	415	385	7	-	* Tentative
2624-T351	Alcoa	06/22/2011 Revised 10/22/2013	Plate	12.50	25.00	Min ⁶ Min ⁹	435 450	330 305	- -	14 13	<u>Fracture Toughness</u> ¹⁴ – Min K _{IC} or K _Q For thicknesses 20.00 through 40.00 mm L-T direction 46 MPa √m T-L direction 45 MPa √m
2624-T39	Alcoa	01/28/2011	Plate	20.00	40.00	Min ⁶ Min ⁹	470 490	425 400	- -	10 8	Cold rolled ~10% and stretched ~1% after solution heat treating. <u>Fracture Toughness</u> ¹⁴ – K _{IC} or K _Q For thicknesses 20.00-40.00 mm L-T direction 43 MPa √m T-L direction 36 MPa √m
2824-T3511	Universal Alloy	06/25/2014	Extrusion	6.30	12.50	*Min ⁶ *Min ⁹	490 470	370 330	12 -	- -	*Tentative Cross-sectional area less than or equal to 16,000 mm ²
				12.50	20.00	*Min ⁶ *Min ⁹	505 470	380 325	- -	10 7	
				20.00	25.00	*Min ⁶ *Min ⁹	505 460	380 325	- -	10 7	
				25.00	40.00	*Min ⁶ *Min ⁹	510 455	385 325	- -	10 7	
				40.00	50.00	*Min ⁶ *Min ⁹	510 450	385 315	- -	10 7	
				50.00	60.00	*Min ⁶ *Min ⁹	510 440	385 315	- -	9 7	

Unless specified below, for all referenced footnotes refer to the Yellow and/or Tan Sheets as applicable.

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Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A		
2029-T8	Alcoa	05/12/2015	Sheet & Plate	1.60	4.00	*Min ⁶	420	380	8	-	*Tentative	
						*Min ⁹	420	370	9	-		
				4.00	6.30	*Min ⁶	420	380	10	-		
						*Min ⁹	420	370	10	-		
			6.30	12.50	*Min ⁶	420	385	11	-			
					*Min ⁹	420	370	10	-			
			12.50	16.00	*Min ⁶	435	400	-	11			
					*Min ⁹	440	385	-	10			
2139-T84	Alcan Global ATI	03/23/2011	Plate	25.00	40.00	*Min ⁶	450	425	-	10	* Tentative Material is cold worked in the range of 3-6% after solution heat treatment <u>Stress Corrosion Resistance</u> For thicknesses 25.00 through 120.00 mm. C-rings and tensile specimens machined and tested in accordance with ASTM G47 shall show no evidence of stress corrosion failure when tested in the short transverse direction at 275 MPa and exposed for 30 days. <u>Fracture Toughness¹⁴ – *M_{in} K_{IC}</u> For thicknesses 25.00 through 95.00 mm L-T direction 38 MPa √m T-L direction 35 MPa √m S-L direction 30 MPa √m (from 50.00 mm) For thicknesses over 95.00 through 120.00 mm L-T direction 35 MPa √m T-L direction 33 MPa √m S-L direction 30 MPa √m	
						*Min ⁹	460	420	-	7		
						*Min ¹⁰	435	380	-	4		
					40.00	95.00	*Min ⁶	455	425	-		8
				*Min ⁹			470	420	-	6		
				*Min ¹⁰			425	380	-	3		
					95.00	120.00	*Min ⁶	450	405	-		7
				*Min ⁹			460	405	-	5		
				*Min ¹⁰			420	365	-	3		

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Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
2050-T34	Constellium	01/25/2016	Plate	50.00	165.00	*Min ⁹	360	235	-	15	*Tentative Solution heat treated and cold worked 3-4.5%
2050-T84	Constellium	01/20/2014	Extruded Bar	40.00	150.00	*Min ⁶ *Min ⁹	585 490	565 440	- -	8 3	*Tentative Solution heat treated, cold worked approximately 4% and artificially aged. <u>Stress Corrosion Resistance</u> For thicknesses over 40.00 thru 150.00 mm Tensile specimens machined and tested in accordance with ASTM G47 shall show no evidence of stress corrosion failure when tested in the short transverse direction at 400 MPa and exposed for 30 days.
2050-T84	Alcan Revised Constellium	03/23/2007 Revised 03/09/2012	Plate	12.50	40.00	Min ⁶ Min ⁹	505 510	475 460	- -	8 6	<u>Stress Corrosion Resistance</u> For thicknesses 20.00 – 165.00 mm Direct C-rings and Tensile specimens machined and tested in accordance with ASTM G47 shall show no evidence of stress corrosion failure when tested in the short transverse direction at 310 Mpa and exposed for 30 days. <u>Fracture Toughness</u> ¹⁴ – Min K _{IC} For thicknesses over 12.50 thru 40.00 mm L-T direction 36 MPa √m T-L direction 32 MPa √m S-L direction 27 MPa √m For thicknesses over 40.00 thru 50.00 mm L-T direction 34 MPa √m T-L direction 30 MPa √m S-L direction 25 MPa √m
				40.00	50.00	Min ⁶ Min ⁹ Min ¹⁰	495 505 490	460 450 420	- - -	8 6 2	
				50.00	80.00	Min ⁶ Min ⁹ Min ¹⁰	495 495 490	460 450 420	- - -	7 5 2	
				80.00	100.00	Min ⁶ Min ⁹ Min ¹⁰	490 495 485	460 450 415	- - -	6 3 1.5	
				100.00	125.00	Min ⁶ Min ⁹ Min ¹⁰	490 490 475	455 440 405	- - -	5 3 1.5	

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Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
				125.00	165.00	Min ⁶	490	455	-	4	For thicknesses over 50.00 thru 80.00 mm L-T direction 31 MPa √m T-L direction 27 MPa √m S-L direction 25 MPa √m
						Min ⁹	490	440	-	3	For thicknesses over 80.00 thru 100.00 mm L-T direction 29 MPa √m T-L direction 25 MPa √m S-L direction 23 MPa √m
						Min ¹⁰	475	405	-	1.5	For thicknesses over 100.00 thru 125.00 mm L-T direction 27 MPa √m T-L direction 23 MPa √m S-L direction 23 MPa √m
											For thicknesses over 125.00 thru 150.00 mm L-T direction 24 MPa √m T-L direction 22 MPa √m S-L direction 20 MPa √m
											For thicknesses over 150.00 thru 165.00 mm L-T direction 24 MPa √m T-L direction 21 MPa √m S-L direction 18 MPa √m
2050-T852	Aubert & Duval	01/21/2014 Revised 10/02/2015	Die Forging	6.35	38.10	Min ⁶	515	475	-	8	Fracture Toughness ¹⁴ – K _{IC} or K _Q
						Min ⁹	525	485	-	7	For thicknesses 6.35-38.10 mm L-T direction 35 MPa √m T-L direction 32 MPa √m
				38.10	50.80	Min ⁶	515	475	-	8	For thicknesses 38.10-50.80 mm L-T direction 35 MPa √m T-L direction 32 MPa √m
						Min ⁹	525	485	-	7	
						Min ¹⁰	515	440	-	4	
				50.80	76.20	Min ⁶	510	470	-	7	For thicknesses 50.80-76.20 mm L-T direction 32 MPa √m T-L direction 29 MPa √m S-L direction 22 MPa √m
						Min ⁹	510	470	-	5	
						Min ¹⁰	505	440	-	3	

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Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
				76.20	101.60	Min ⁶	510	470	-	6	For thicknesses 76.20-101.60 mm L-T direction 29 MPa √m T-L direction 25 MPa √m S-L direction 22 MPa √m
						Min ⁹	505	460	-	5	
						Min ¹⁰	505	435	-	3	
				101.60	127.00	Min ⁶	510	460	-	5	For thicknesses 101.60-127.00 mm L-T direction 27 MPa √m T-L direction 23 MPa √m S-L direction 21 MPa √m
						Min ⁹	505	455	-	5	
						Min ¹⁰	495	425	-	2	
				127.00	152.40	Min ⁶	505	460	-	5	For thicknesses 127.00-152.40 mm L-T direction 25 MPa √m T-L direction 22 MPa √m S-L direction 21 MPa √m
						Min ⁹	495	450	-	5	
						Min ¹⁰	490	420	-	2	
				152.40	177.80	Min ⁶	505	455	-	4	For thicknesses 152.40-177.80 mm L-T direction 24 MPa √m T-L direction 21 MPa √m S-L direction 20 MPa √m
						Min ⁹	490	440	-	4	
						Min ¹⁰	490	420	-	2	
				177.80	203.10	Min ⁶	495	455	-	4	For thicknesses 177.80-203.10 mm L-T direction 23 MPa √m T-L direction 20 MPa √m S-L direction 19 MPa √m
						Min ⁹	490	435	-	4	
						Min ¹⁰	485	415	-	2	
				203.10	228.60	Min ⁶	495	450	-	4	For thicknesses 203.10-228.60 mm L-T direction 23 MPa √m T-L direction 20 MPa √m S-L direction 19 MPa √m
						Min ⁹	485	435	-	4	
						Min ¹⁰	485	415	-	2	
				228.60	254.00	Min ⁶	490	440	-	4	For thicknesses 228.60-254.00 mm L-T direction 22 MPa √m T-L direction 20 MPa √m S-L direction 18 MPa √m
						Min ⁹	475	425	-	4	
						Min ¹⁰	475	405	-	1.5	

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Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
2055-T84	Alcoa	01/14/2014	Extrusion	1.00	3.00	*Min ⁶	565	540	5	-	*Tentative
				3.00	6.00	*Min ⁶ *Min ⁹	575 580	545 540	6 5	- -	Solution heat treated and cold worked in the range 2-5% and artificially aged.
				6.00	12.50	*Min ⁶ *Min ⁹	585 580	550 540	7 5	- -	Cross Sectional Area less than or equal to 11900 mm ² and Circle Size less than or equal to 370 mm.
				12.50	20.00	*Min ⁶ *Min ⁹	600 580	565 540	- -	7 4	<u>Fracture Toughness</u> ¹⁴ – Min. K _{IC} or K _Q For thicknesses over 20.00 through 40.00 mm L-T direction 24 MPa√m T-L direction 21 MPa√m
				20.00	30.00	*Min ⁶ *Min ⁹	605 580	580 540	- -	7 4	
				30.00	40.00	*Min ⁶ *Min ⁹	620 580	595 540	- -	7 4	
2060-T86	Alcoa	06/03/2013	Plate	20.00	40.00	*Min ⁶ *Min ⁹	505 505	470 435	- -	8 5	*Tentative Solution heat treated, cold worked approximately 6% and artificially aged. <u>Fracture Toughness</u> ¹⁴ – Min K _{IC} or K _Q For thicknesses over 20.00 thru 40.00 mm L-T direction 42 MPa√m T-L direction 36 MPa√m
2065-T84	Constellium	04/16/2014	Extrusion	1.00	6.00	*Min ⁶	600	570	6	-	*Tentative
				6.00	12.50	*Min ⁶	600	580	6	-	Solution heat treated, cold worked approximately 3-4% and artificially aged.
2195-T8	Constellium	03/09/2012 Revised 01/20/2015	Sheet & Plate	3.20	12.70	Min ⁶ Min ⁹	565 550	540 525	6 6	- -	

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Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
2195-T841	Constellium	06/24/2011	Plate	12.50	60.00	*Min ⁹	490	435	-	8	*Tentative Developed to meet armor plate requirements of Mil-STD-32341. Material is solution heat treated, cold worked in the range 3-5%, and under-aged.
2395-T84	Universal Alloy	02/10/2016	Extrusion	1.00	3.20	*Min ⁶ *Min ⁹	580 585	540 540	6 5	- -	*Tentative Cross-sectional area less than or equal to 15000 mm ² and circle size less than or equal to 410 mm. Solution heat treated and cold worked in the range 2-5% and artificially aged.
				3.20	6.30	*Min ⁶ *Min ⁹	585 585	540 540	6 5	- -	
				6.30	12.50	*Min ⁶ *Min ⁹	585 585	545 540	6 5	- -	
				12.50	40.00	*Min ⁶ *Min ⁹	620 585	570 540	- -	6 4	
2196-T8511	Alcan Constellium	10/04/2007 Revised 03/29/2012	Extrusion	1.60	3.20	*Min ⁶	525	475	6	-	*Tentative
				3.20	6.30	*Min ⁶	525	490	7	-	
				6.30	25.00	*Min ⁶	540	490	5	4	
2196-T8511	Constellium	10/27/2016	Extrusion	1.00	1.60	*Min⁶	515	475	6	-	*Tentative
2099-T81	Alcoa	08/01/2011	Extrusion	10.00	35.00	Min ⁵ Min ⁹	505 435	405 350	- -	6 6	Stretched approximately 1-3 % and underaged. <u>Stress Corrosion Resistance</u> Material shall be capable of passing the stress corrosion cracking test described in ASTM G47 when tested in the LT direction at a stress of 265 MPa for 30 days. <u>Exfoliation Corrosion Resistance</u> Specimens shall not exhibit exfoliation corrosion At a T/2 plane greater than that illustrated by Photo 2 (EB) from Figure 2 of ASTM G34 when specimens are exposed for 2 weeks according to the procedures in ASTM G85 Annex A2, using the dry-bottom MASTMAASIS Test Method.

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Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
											Fracture Toughness ¹⁴ – Min K _{IC} or K _Q For thicknesses 12.50-35.00 mm L-T direction 49 MPa √m
2199-T86	Alcoa	06/16/2011	Plate	20.00	30.00	*Min ⁶ *Min ⁹	440 455	400 400	- -	8 7	* Tentative Solution heat treated, cold worked approximately 6% and artificially aged. <u>Exfoliation Corrosion Resistance</u> Specimens shall not exhibit exfoliation corrosion at a T/10 plane greater than that illustrated by Photo 2 (EA) from Figure 2 of ASTM G34 when specimens are exposed for 2 weeks according to the procedures in ASTM B85 Annex A2, using the dry-bottom MASTMAASIS Test Method. <u>Fracture Toughness</u> ¹⁴ – Min K _{IC} or K _Q For thicknesses 20.00 through 30.00 mm L-T direction 53 MPa √m T-L direction 47 MPa √m
3003-H22	Alcoa	04/12/2011	Sheet	1.10 1.60	1.60 6.30	Min ⁶ Min ⁶	115 115	85 85	5 7	- -	Used for tread plate applications.
5454-H114	Alcoa	11/24/2012	Sheet	3.00	5.00	Min ⁶ Max ⁶	215 285	95 -	10 -	- -	Used for tread plate applications
5456-H151	Alcoa	03/22/2012	Plate	6.30	12.50	*Min ⁶ *Max ⁶	370 425	325 -	6 -	- -	*Tentative Developed to meet armor plate requirements of MIL-DTL-46027K
				12.50	50.00	*Min ⁶ *Max ⁶	345 420	310 -	- -	5 -	
				50.00	75.00	*Min ⁶ *Max ⁶	345 415	305 -	- -	7 -	

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Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
5083-H116	Alcan Revised Alcoa	08/18/05 Revised 12/09/14	Sheet & Plate	3.00	6.00	Min ⁹ Max ⁹	305 380	215 -	10 -	- -	<u>Exfoliation Corrosion Resistance</u> This material shall be capable of exhibiting no evidence of exfoliation corrosion and a pitting rating of PB or better, when subjected to the test described in ASTM Test Method G 66 (ASSET). <u>Intergranular Corrosion Resistance</u> This material shall be capable of exhibiting resistance to intergranular corrosion as required by ASTM B928 when subjected to the test described in ASTM Test Method ASTM G 67 (NAMLT).
				6.00	12.50	Min ⁹ Max ⁹	305 380	215 -	10 -	- -	
5083-H128	Alcoa	11/15/2012 Revised 10/07/2013	Sheet & Plate	4.00	8.00	*Min ^{6,9} *Max ^{6,9}	305 385	215 -	10 -	- -	*Tentative <u>Exfoliation Corrosion Resistance</u> After a post-production thermal treatment of 100°C (212°F) for 1 week, this material shall be capable of exhibiting no evidence of exfoliation corrosion and a pitting rating of PB or better, when subjected to the test described in ASTM Test Method G 66 (ASSET). <u>Intergranular Corrosion Resistance</u> After a post-production thermal treatment of 100°C (212°F) for 1 week, this material shall be capable of exhibiting mass-loss no greater than 15 mg/cm ² [100 mg/in. ²] when tested in accordance with ASTM Test Method G67 (NAMLT).
				8.00	12.50	*Min ^{6,9} *Max ^{6,9}	305 385	215 -	10 -	- -	
				12.50	40.00	*Min ^{6,9} *Max ^{6,9}	305 385	215 -	- -	10 -	
				40.00	80.00	*Min ^{6,9} *Max ^{6,9}	285 385	200 -	- -	10 -	
5383-H321	Constellium	02/10/2012	Sheet & Plate	3.00	12.50	Max ⁶	400	-	-	-	<u>Exfoliation Corrosion Resistance</u> This material shall be capable of exhibiting no evidence of exfoliation corrosion and a pitting rating of PB or better, when subjected to the test described in ASTM Test Method G 66 (ASSET). <u>Intergranular Corrosion Resistance</u> This material shall be capable of exhibiting resistance to intergranular corrosion as required by ASTM B 928 when subjected to the test described in ASTM Test Method G 67 (NAMLT).
				12.50	50.00	Max ⁶	400	-	-	-	

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5086-H321	Alcoa	03/21/2006 Revised 06/01/2012	Sheet	1.60	6.30	*Min ⁶ *Max ⁶	275 360	195 -	8 -	- -	* Tentative <u>Exfoliation Corrosion Resistance</u> This material shall be capable of exhibiting no evidence of exfoliation corrosion and a pitting rating of PB or better, when subjected to the test described in ASTM Test Method G 66 (ASSET). <u>Intergranular Corrosion Resistance</u> This material shall be capable of exhibiting resistance to intergranular corrosion as required by ASTM B 928 when subjected to the test described in ASTM Test Method G 67 (NAMLT).
5086-H321	Alcoa	04/04/2006 Revised 06/01/2012	Plate	6.30	8.00	*Min ⁶ *Max ⁶ *Min ⁶ *Max ⁶	275 360 275 360	195 - 195 -	9 - 10 -	- - - -	* Tentative <u>Exfoliation Corrosion Resistance</u> This material shall be capable of exhibiting no evidence of exfoliation corrosion and a pitting rating of PB or better, when subjected to the test described in ASTM Test Method G 66 (ASSET). <u>Intergranular Corrosion Resistance</u> This material shall be capable of exhibiting resistance to intergranular corrosion as required by ASTM B 928 when subjected to the test described in ASTM Test Method G 67 (NAMLT).
6105-T6	Werner	01/23/2012	Extrusion	-	12.50	Min ⁵	260	240	8	-	The registered properties for this material are calculated in accordance with the procedure described under 3.c.1 of page ii of the Tan Sheets.
6013-T6, & -T6511	Alcoa	03/11/2012	Extrusion, Rod & Seamless Tube	5.00 12.50 20.00	12.50 20.00 50.00	Min ⁶ Min ⁶ Min ⁶	340 340 340	315 315 310	8 - -	- 7 7	
6013-T62	Alcoa	08/17/2011	Sheet	0.50	3.20	Min ⁹	360	315	8	-	

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6026-T6	Eural GNUTTI S.p.A.	09/25/2015	Bar, Rod and Wire	5.00	80.00	Min ⁶	370	300	6	8	Cold Finished
6026-T6 &-T6510 &-T6511	Eural GNUTTI S.p.A.	09/25/2015	Extruded Bar, Rod and Wire	30.00	140.00	Min ⁶	370	300	6	8	
				140.00	200.00	Min ⁶	340	250	6	8	
				200.00	250.00	Min ⁶	300	200	6	8	
6026-T6 &-T6510 &-T6511	Eural GNUTTI S.p.A.	09/25/2015	Extruded Profile	5.00	40.00	Min ⁶	340	260	6	8	
6026-T6 &-T6510 &-T6511	Eural GNUTTI S.p.A.	09/25/2015	Extruded Tube	10.00	30.00	Min ⁶	340	260	6	8	
6026-T8	Eural GNUTTI S.p.A.	09/25/2015	Bar, Rod and Wire	5.00	80.00	Min ⁶	345	315	3	4	Cold Finished
6026-T9	Eural GNUTTI S.p.A.	09/25/2015	Bar, Rod and Wire	5.00	80.00	Min ⁶	360	330	3	4	Cold Finished
6063-T65	Rio Tinto Alcan	02/25/2011	Extrusion	-	5.00	Min ⁶	250	230	7	-	6063-T65 signifies higher mechanical properties than 6063-T6. The registered properties for the material are calculated in accordance with the procedure described under 3.c.1. on page ii of the Tan Sheets.
6064-T6, &-T6511	Kaiser	12/21/2007 Revised 12/15/2011	Extruded Rod, Bar, and Profiles	5.00	80.00	Min ⁶	290	260	10	9	The registered properties for this material are calculated in accordance with the procedure described under 3.c.1 on page ii of the Tan Sheets.
6082-T5, &-T5511	Alcoa Revised SAPA	06/11/2005 Revised 12/05/2013	Extrusion	2.00	12.50	Min ⁶	270	230	8	-	
7010-T7451	Constellium	07/07/2015	Plate	-	50.80	Min ⁶	490	425	-	8	Solution heat-treated, stress relieved by stretching to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%, and precipitation heat treated to the T7451 temper.
				50.80	63.50	Min ⁹	495	425	-	5	
						Min ¹⁰	460	395	-	1.5	

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ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

New and Revised Registrations											
Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
				63.50	101.60	Min ⁶ Min ⁹ Min ¹⁰	485 490 455	420 420 385	- - -	8 5 1	<u>Stress Corrosion Resistance</u> Specimens from plate, 19.05 mm and over in nominal thickness, shall show no evidence of stress-corrosion cracking when tested in accordance with ASTM G47 and stressed in the short-transverse direction to 50% of the specified minimum long-transverse yield strength for plate 76 mm and under in nominal thickness and to 241 MPa for plate over 76 mm in nominal thickness. <u>Exfoliation Corrosion Resistance</u> Plate shall achieve an exfoliation rating of EA or better, as illustrated in ASTM G34 at the T/10 plane. <u>Fracture Toughness¹⁴ – Min K_{IC}</u> For thicknesses 50.80 to 139.70 mm, incl L-T direction 26 MPa √mm T-L direction 24 MPa √mm For thicknesses over 50.80 to 139.70 mm, incl S-L direction 22 MPa √mm
				101.60	127.00	Min ⁶ Min ⁹ Min ¹⁰	470 475 450	405 405 370	- - -	8 4 1	
				127.00	152.40	Min ⁶ Min ⁹ Min ¹⁰	455 460 435	395 395 365	- - -	7 4 1	
7136-T73511	Universal Alloy	02/10/2016	Extrusion	1.00	6.30	*Min ⁶ *Min ⁹	550 545	505 490	7 4	- -	*Tentative Cross-sectional area less than or equal to 36000 mm ² and circle size less than or equal to 510 mm. <u>Stress Corrosion Resistance</u> For products with thickness 20.00 mm and higher when tested in ST orientation see footnote 4e. <u>Exfoliation Corrosion Resistance</u> See footnote 15b.
				6.30	12.50	*Min ⁶ *Min ⁹	550 540	505 490	7 4	- -	
				12.50	25.00	*Min ⁶ *Min ⁹	550 530	505 475	- -	6 3	
				25.00	40.00	*Min ⁶ *Min ⁹	550 525	505 470	- -	6 3	
				40.00	50.00	*Min ⁶ *Min ⁹ *Min ¹⁰	550 515 510	505 460 450	- - -	6 3 2	
				50.00	80.00	*Min ⁶ *Min ⁹ *Min ¹⁰	550 510 510	505 455 450	- - -	6 3 2	
				80.00	100.00	*Min ⁶	550	505	- -	6 3	

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ADDENDUM TO 2011 TAN SHEETS
Temper For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

New and Revised Registrations											
Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
				100.00	120.00	*Min ⁹ *Min ¹⁰	510 510	455 450	- -	2 6	
						*Min ⁶ *Min ⁹ *Min ⁹ *Min ¹⁰	550 510 455 510	505 455 450	- - -	3 2	
7136-T74511	Universal Alloy	02/11/2016	Extrusion	1.00	6.30	*Min ⁶ *Min ⁹	585 565	550 525	7 4	- -	*Tentative
				6.30	12.50	*Min ⁶ *Min ⁹	585 565	550 515	7 4	- -	Cross-sectional area less than or equal to 36000 mm ² and circle size less than or equal to 610 mm.
				12.50	25.00	*Min ⁶ *Min ⁹	585 560	550 515	- -	6 3	<u>Stress Corrosion Resistance</u>
				25.00	40.00	*Min ⁶ *Min ⁹	585 560	550 510	- -	6 3	For products with thickness 20.00 mm and higher when tested in ST orientation see footnote 4b.
				40.00	50.00	*Min ⁶ *Min ⁹ *Min ¹⁰	585 550 530	550 510 485	- - -	6 3 2	<u>Exfoliation Corrosion Resistance</u> See footnote 15b.
				50.00	80.00	*Min ⁶ *Min ⁹ *Min ¹⁰	585 545 530	550 495 485	- - -	6 3 2	
				80.00	100.00	*Min ⁶ *Min ⁹ *Min ¹⁰	585 530 530	550 490 485	- - -	6 3 2	
				100.00	120.00	*Min ⁶ *Min ⁹ *Min ¹⁰	585 530 530	550 485 485	- - -	6 3 2	
7037-T7452	Otto-Fuchs	07/04/2011	Hand Forging	60.00	100.00	Min ⁶ Min ⁹ Min ¹⁰	490 495 495	440 440 415	- - -	9 9 5	<u>Stress Corrosion Resistance</u> See footnote 4.b.

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ADDENDUM TO 2011 TAN SHEETS
Temper For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

New and Revised Registrations											
Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
				100.00	150.00	Min ⁶ Min ⁹ Min ¹⁰	490 490 490	440 440 400	- - -	9 5 5	Fracture Toughness ¹⁴ – Min. K _{IC} or K _Q For thicknesses over 60.00 thru 100.00 mm L-T direction 33 MPa√m T-L direction 32 MPa√m S-L direction 23 MPa√m
				150.00	200.00	Min ⁶ Min ⁹ Min ¹⁰	485 485 475	435 425 395	- - -	9 3 5	For thicknesses over 100.00 thru 150.00 mm L-T direction 33 MPa√m T-L direction 26 MPa√m S-L direction 23 MPa√m
				200.00	280.00	Min ⁶ Min ⁹ Min ¹⁰	460 460 455	405 400 370	- - -	7 3 5	For thicknesses over 150.00 thru 200.00 mm L-T direction 33 MPa√m T-L direction 23 MPa√m S-L direction 23 MPa√m For thicknesses over 200.00 thru 280.00 mm L-T direction 33 MPa√m T-L direction 21 MPa√m S-L direction 23 MPa√m
7155-T76	Alcoa	08/07/2015	Drawn Tube	1.14	3.20	*Min. ⁶	585	565	7	-	*Tentative Elongation values shown are for Full-section specimens.
7255-T7751	Alcoa	03/11/2011 Revised 05/13/2013	Plate	20.00	40.00	Min ⁶ Min ⁹	625 625	605 595	- -	8 6	<u>Exfoliation Corrosion Resistance</u> See footnote 15.b. Fracture Toughness ¹⁴ – Min K _{IC} For thicknesses 20.00-40.00 mm L-T direction 24 MPa√mm L-T direction 23 MPa√mm Longitudinal Compressive Yield Strength for 20.00-40.00 mm thickness: 605 MPa minimum
7056-T721	Constellium	09/17/2015	Plate	25.00	80.00	*Min ⁹	440	385	-	10	*Tentative <u>Exfoliation Corrosion Resistance</u> See footnote 15.b. Solution heat treated, stretched 1.5 to 3%, and overaged.

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ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

New and Revised Registrations											
Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
											Developed to meet blast armor plate requirements of MIL-DTL-32375 (MR).
7056-T761	Constellium	09/17/2015	Plate	25.00	80.00	*Min ⁹	550	530	-	6	*Tentative <u>Stress Corrosion Cracking Resistance</u> See footnote 4a. Solution heat treated, stretched 1.5 to 3%, and overaged. Developed to meet ballistic armor plate requirements of MIL-DTL-32375 (MR).
7065-T7451	Alcoa	03/12/2014	Plate	25.00	40.00	*Min ⁶ *Min ⁹	530 530	490 485	- -	10 9	*Tentative <u>Stress Corrosion Resistance</u> See footnote 4b.
				40.00	50.00	*Min ⁶ *Min ⁹ *Min ¹⁰	525 530 520	485 475 440	- - -	10 8 5	<u>Fracture Toughness¹⁴ – Min K_{IC} or K_Q</u>
				50.00	80.00	*Min ⁶ *Min ⁹ *Min ¹⁰	525 525 510	485 470 440	- - -	9 7 4	For thicknesses 25.00 thru 40.00 mm L-T direction 43 MPaV/m T-L direction 33 MPaV/m
				80.00	100.00	*Min ⁶ *Min ⁹ *Min ¹⁰	520 520 505	475 470 435	- - -	8 6 3	For thicknesses 40.00 thru 50.00 mm L-T direction 40 MPaV/m T-L direction 32 MPaV/m
				100.00	120.00	*Min ⁶ *Min ⁹ *Min ¹⁰	520 520 505	475 470 435	- - -	8 5 3	For thicknesses 50.00 thru 80.00 mm L-T direction 35 MPaV/m T-L direction 30 MPaV/m S-L direction 27 MPaV/m
				120.00	150.00	*Min ⁶ *Min ⁹ *Min ¹⁰	510 520 505	475 460 435	- - -	7 4 3	For thicknesses 80.00 thru 100.00 mm L-T direction 32 MPaV/m T-L direction 26 MPaV/m S-L direction 25 MPaV/m

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ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

New and Revised Registrations											
Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
											For thicknesses 100.00 thru 120.00 mm L-T direction 29 MPa _v m T-L direction 24 MPa _v m S-L direction 23 MPa _v m For thicknesses 120.00 thru 150.00 mm L-T direction 27 MPa _v m T-L direction 23 MPa _v m S-L direction 23 MPa _v m
7065-T7651	Alcoa	03/12/2014	Plate	25.00	40.00	*Min ⁶ *Min ⁹	550 550	525 505	- -	9 8	*Tentative <u>Stress Corrosion Resistance</u> See footnote 4a. <u>Fracture Toughness¹⁴ – Min K_{IC} or K_Q</u> For thicknesses 25.00 thru 40.00 mm L-T direction 38 MPa _v m T-L direction 30 MPa _v m For thicknesses 40.00 thru 50.00 mm L-T direction 35 MPa _v m T-L direction 30 MPa _v m For thicknesses 50.00 thru 80.00 mm L-T direction 32 MPa _v m T-L direction 27 MPa _v m S-L direction 25 MPa _v m For thicknesses 80.00 thru 100.00 mm L-T direction 27 MPa _v m T-L direction 25 MPa _v m S-L direction 24 MPa _v m For thicknesses 100.00 thru 120.00 mm L-T direction 26 MPa _v m T-L direction 23 MPa _v m S-L direction 23 MPa _v m
				40.00	50.00	*Min ⁶ *Min ⁹ *Min ¹⁰	545 550 540	515 505 470	- - -	9 8 5	
				50.00	80.000	*Min ⁶ *Min ⁹ *Min ¹⁰	540 545 530	510 500 470	- - -	8 7 3	
				80.000	100.00	*Min ⁶ *Min ⁹ *Min ¹⁰	540 540 530	510 490 460	- - -	8 5 3	
				100.00	120.00	*Min ⁶ *Min ⁹ *Min ¹⁰	530 540 525	510 490 460	- - -	4 3 7	
				120.00	150.00	*Min ⁶ *Min ⁹ *Min ¹⁰	525 530 515	510 490 460	- - -	6 4 3	

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ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

New and Revised Registrations											
Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
											For thicknesses 120.00 thru 150.00 mm L-T direction 25 MPaV/m T-L direction 22 MPaV/m S-L direction 22 MPaV/m
7085-T711	Alcoa	10/25/2011	Plate	12.50	40.00	*Min ⁹	550	510	-	10	*Tentative
				40.00	50.00	*Min ⁹	540	505	-	10	Solution heat treated, stretched 1.5 to 3%, and overaged for ballistic performance.
				50.00	80.00	*Min ⁹	530	495	-	9	Developed to meet armor plate requirements of MIL-DTL-32375 (MR).
				80.00	100.00	*Min ⁹	525	485	-	6	<u>Exfoliation Corrosion Resistance</u> See footnote 15.b
7085-T721	Alcoa	10/27/2011	Plate	12.50	40.00	*Min ⁹	470	415	-	10	*Tentative
				40.00	50.00	*Min ⁹	460	405	-	10	Solution heat treated, stretched 1.5 to 3%, and overaged for blast performance.
				50.00	80.00	*Min ⁹	460	400	-	10	Developed to meet armor plate requirements of MIL-DTL-32375 (MR).
				80.00	100.00	*Min ⁹	455	395	-	9	<u>Exfoliation Corrosion Resistance</u> See footnote 15.b
7085-T7451	Alcoa	02/03/2009 Revised 07/09/2012	Plate	75.00	100.00	Min ⁶	505	470	-	10	<u>Stress Corrosion Resistance</u>
						Min ⁹	505	455	-	7	See footnote 4.b
						Min ¹⁰	495	420	-	4	<u>Fracture Toughness</u> -K _{IC} or K _{IC}
				100.00	120.00	Min ⁶	505	470	-	9	For Thicknesses 75.00-100.00 mm
						Min ⁹	505	455	-	6	L-T direction 40 MPaV m
						Min ¹⁰	490	420	-	4	T-L direction 30 MPaV m
				120.00	150.00	Min ⁶	495	470	-	8	S-L direction 30 MPaV m
						Min ⁹	505	450	-	5	
						Min ¹⁰	485	420	-	4	For thicknesses 100.00-120.00 mm
				150.00	180.00	Min ⁶	495	460	-	7	L-T direction 35 MPaV m
						Min ⁹	495	440	-	4	T-L direction 27 MPaV m
						Min ¹⁰	475	415	-	4	S-L direction 29 MPaV m

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ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

New and Revised Registrations											
Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
											For thicknesses 120.00-150.00 mm L-T direction 32 MPaV m T-L direction 25 MPaV m S-L direction 26 MPaV m For thicknesses 150.00-180.00 mm L-T direction 32 MPaV m T-L direction 24 MPaV m S-L direction 25 MPaV m
7097-T7651	Kaiser	12/30/2015	Plate	76.00	102.00	*Min ⁶ *Min ⁹ *Min ¹⁰	510 530 515	490 490 455	- - -	10 6 4	*Tentative <u>Exfoliation Corrosion Resistance</u> See Footnote 15.b.
				102.00	127.00	*Min ⁶ *Min ⁹ *Min ¹⁰	510 525 510	490 485 450	- - -	10 5 3	
				127.00	152.00	*Min ⁶ *Min ⁹ *Min ¹⁰	510 525 505	490 475 450	- - -	8 4 3	
				152.00	178.00	*Min ⁶ *Min ⁹ *Min ¹⁰	510 515 495	485 470 440	- - -	7 3 3	
				178.00	203.00	*Min ⁶ *Min ⁹ *Min ¹⁰	505 510 490	475 460 435	- - -	5 3 3	
7099-T7451	Kaiser	01/22/2013 Revised 04/07/2015	Plate	25.00	38.00	Min ⁶ Min ⁹	530 530	490 485	- -	10 9	<u>Stress Corrosion Cracking Resistance</u> See Footnote 4.b.
				38.00	51.00	Min ⁶ Min ⁹ Min ¹⁰	525 530 525	490 475 450	- - -	10 8 5	
				51.00	76.00	Min ⁶ Min ⁹ Min ¹⁰	525 525 510	485 470 440	- - -	9 7 4	

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ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

New and Revised Registrations											
Registered			Product	Thickness, mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50 mm	5D or 5.65 √A	
				76.00	101.00	Min ⁶ Min ⁹ Min ¹⁰	515 525 510	475 470 435	- - -	8 6 4	
				101.00	127.00	Min ⁶ Min ⁹ Min ¹⁰	515 515 510	475 470 435	- - -	8 5 3	
				127.00	152.00	Min ⁶ Min ⁹ Min ¹⁰	510 515 505	470 460 425	- - -	7 4 3	
7099-T7651	Kaiser	01/22/2013 Revised 04/07/2015	Plate	25.00	38.00	Min ⁶ Min ⁹	545 550	515 510	- -	9 8	<u>Stress Corrosion Cracking Resistance</u> See Footnote 4.a.
				38.00	51.00	Min ⁶ Min ⁹ Min ¹⁰	545 550 530	515 510 470	- - -	9 8 4	
				51.00	76.00	Min ⁶ Min ⁹ Min ¹⁰	540 545 530	505 495 460	- - -	8 7 4	
				76.00	101.00	Min ⁶ Min ⁹ Min ¹⁰	530 545 530	495 490 460	- - -	8 5 3	
				101.00	127.00	Min ⁶ Min ⁹ Min ¹⁰	525 540 525	490 485 455	- - -	7 4 3	
				127.00	152.00	Min ⁶ Min ⁹ Min ¹⁰	525 530 510	485 485 450	- - -	6 4 3	

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ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

Tentative Removed			
Alloy Temper	Product	By	Revised Date
6064-T6 & -T6511	Extruded Rod, Bar, and Profiles	Kaiser	12/15/2011
7140-T7651	Plate	Constellium	03/27/2014
7150-T7751	Plate	Alcoa	07/27/2011
7055-O	Sheet	Alcoa	01/19/2011
7099-T7451	Plate	Kaiser	04/07/2015
7099-T7651	Plate	Kaiser	04/07/2015
2050-T852	Die Forging	Aubert & Duvall	10/02/2015

Reactivated Tempers													
Registered			Reactivated		Product	Thickness,mm		Tensile Strength, MPa			Elongation Percent in ²¹		Remarks ²
Alloy Temper	By	Date	By	Date		Over	Thru	Basis ¹	Ult.	Yield	50mm	5D or 5.65 A	
2090-T86	Alcoa	08/11/88	Alcoa	07/18/2012	Extrusion	-	3.20	Min ⁶	540	490	4	-	
		Revised 07/30/90				3.20	6.30	Min ⁶	540	490	5	-	
						6.30	12.50	Min ⁶ Min ⁹	550 525	505 470	5 -	- -	

Corrections to Table of Mechanical Property Limits		
Alloy Temper Designation	Product	Correction
5383-H116	Sheet and Plate	The maximum UTS limits for thickness ranges 3.00-12.50mm and 12.50-50.00mm are corrected to read 400 MPa.
5383-H116	Extrusion	Basis of Tensile Strength should read "Max ⁶ " for Ult. Of 365 MPa

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ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

Deactivated Registrations		
Alloy Temper	Product	Date Deactivated
2090-T86	Extrusion	03/07/2011
6111-T6	Sheet	12/21/2011
7055-T762	Sheet	05/04/2011
Alclad 2014-O**	Plate	06/28/2012
Alclad 2014-T42**	Plate	06/28/2012
Alclad 2014-T451**	Plate	06/28/2012
Alclad 2014-T62**	Plate	06/28/2012
Alclad 2014-T651**	Plate	06/28/2012
Alclad 2219-O**	Plate	06/28/2012
Alclad 2219-T62**	Plate	06/28/2012
Alclad 6061-O**	Plate	06/28/2012
Alclad 6061-T42**	Plate	06/28/2012
Alclad 6061-T451**	Plate	06/28/2012
Alclad 6061-T62**	Plate	06/28/2012
Alclad 6061-T651**	Plate	06/28/2012
Alclad 7075-O**	Plate	06/28/2012
Alclad 7075-T62**	Plate	06/28/2012
Alclad 7075-T651**	Plate	06/28/2012
Alclad 7075-T7351**	Plate	06/28/2012
Alclad 7075-T7651**	Plate	06/28/2012
2 ½% Alclad 7075-O**	Plate	06/28/2012
2 ½% Alclad 7075-T62**	Plate	06/28/2012
2 ½% Alclad 7075-T651**	Plate	06/28/2012
2 ½% Alclad 7075-T7351**	Plate	06/28/2012
2 ½% Alclad 7075-T7651**	Plate	06/28/2012
Alclad One Side 7075-O**	Plate	06/28/2012
Alclad One Side 7075-T62**	Plate	06/28/2012
Alclad One Side 7075-T651**	Plate	06/28/2012
2 ½% Alclad One Side 7075-O**	Plate	06/28/2012

**Deactivation is limited to specific gauge range(s) for the product indicated

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ADDENDUM TO 2011 TAN SHEETS
Tempers For Aluminum And Aluminum Alloy Products Metric Edition

January 31, 2017

Deactivated Registrations		
Alloy Temper	Product	Date Deactivated
2 ½% Alclad One Side 7075-T62**	Plate	06/28/2012
2 ½% Alclad One Side 7075-T651**	Plate	06/28/2012
7250-T7451	Plate	05/29/2014
6082-T5 & -T5511**	Extrusion	07/09/2014
2024-T72	Sheet	11/26/2014
Alclad 2024-T72	Sheet	11/25/2014
1½% Alclad 2024-T72	Sheet	11/25/2014
Alclad One Side 2024-T72	Sheet	11/25/2014
1½% Alclad One Side 2024-T72	Sheet	11/25/2014
7033-T6	Die Forging	12/02/2015

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