Recommended Welding Parameters

Square - Groove Weld

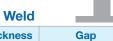
Nominal Plate in.		e Thickness Gap		ар	Filler Wire Diameter				Wire Speed		Travel	Speed	Wire Consumption	
		mm	in.	mm	in.	mm	Amps	Volts	ipm	m/min	ipm	cm/min	lbs/100 ft.	kg/m
5/64	(.078)	2	0	0	.030	0.8	80	18-21	460	11.7	40	102	0.67	.01
1/8	(.125)	3	0-1/32	0-0.5	.035	0.9	130	19-22	480	12.2	40	102	0.75	.01
5/32	(.156)	4	0-3/64	0-1	.040	1.0	160	20-23	450	11.4	40	102	1.25	.02

Single V-Groove

(typical included groove angle = 60°)

Nomi	Nominal Plate Thickness Gap		ар	Filler Wire	e Diameter			Wire Speed		Travel	Speed	Wire Consumption		
in.		mm	in. mm		in. mm		Amps	Volts	ipm m/min		ipm cm/mi		lbs/100 ft.	kg/m
3/16	(.187)	5 0 0 .035		0.9	175	19-23	750	19.1	40	102	2.6	.04		
1/4	(.250)	6	0	0	.047	1.2	195	20-24	430	10.9	40	102	4.6	.07
5/16	(.313)	8	0	0	.047	1.2	220	21-25	465	11.8	35	89 7.2	.11	
3/8	(.375)	10	0-1/16	0-1	.062	1.6	240	22-26	320	8.1	35	89	10.3	.15
1/2	(.500)	12	0-1/16	0-1	.062	1.6	275	23-27	380	9.7	30	76	18.3	.27
3/4	(.750)	19	0-3/32	0-2	.071	1.8	290	24-28	335	8.5	24	61	41.3	.61
1 (1.00)		25	0-3/32	0-2	.094	2.4	330	26-32	180	4.6	18	46	73.4	1.09

Horizontal Fillet Weld



Nominal Plate Thickness in. mm		ness Gap		Filler Wire	Filler Wire Diameter			Wire	Speed	Travel	Speed	Wire Consumption		
		mm	in. mm		in.	in. mm		Volts	ipm	m/min	ipm cm/mi		lbs/100 ft.	kg/m
5/64	(.078)	2	N	I/A	.030	0.8	100	18-20	500	12.7	41	104	0.4	.01
1/8	(.125)	3	N/A		.035	0.9	140	19-21	580	14.7	31	78	0.6	.01
5/32	(.156)	4	N	I/A	.040	1.0	150	20-22	425	10.8	20	51	1.6	.02
5/32	(.156)	4	N/A		.047	1.2	180	20-22	410	10.4	25	64	1.6	.02
3/16	(.187)	5	N	I/A	.047	1.2	190	21-23	425	10.8	22	56	2.2	.03
3/16	(.187)	5	N	I/A	.062	1.6	220	21-23	285	7.2	26	66	2.2	.03
1/4	(.250)	6	N	I/A	.047	1.2	210	22-24	480	12.2	20	51	4.0	.06
1/4	(.250)	6	N	N/A		1.6	230	22-25	300	7.6	25	64	4.0	.06
5/16	(.313)	8	N/A		.062	1.6	230	23-26	300	7.6	20	51	6.2	.09
3/8	(.375)	10	N	N/A		1.6	240	23-26	325	8.3	18	46	8.9	.13
1/2	(.500)	12	N	N/A		1.8	280	24-28	335	8.5	24	61	15.9	.24

NOTE: Welding parameters were developed utilizing the GMAW process with 100% argon shielding gas under laboratory conditions and are provided as guidelines only. For 5XXX series electrodes use a welding amperage on the high side of the range and an arc voltage on the lower end of the range. For 1XXX, 2XXX and 4XXX series electrodes use the lower amperage and higher arc voltage.

Typical Shear Strength - Fillet Welds

Filler Alloy	Longitudinal Shear Strength (KSI)	Transverse Shear Strength (KSI)
1100	7.5	7.5
2319	16.0	18.0
4043	11.5	15.0
4643	13.5	20.0
5183	18.5	28.0
5356	17.0	26.0
5554	15.0	23.0
5556	20.0	30.0
5654	12.0	18.0

Welded Joint Strength - Fillet welds are usually not diluted significantly by the base material. Therefore, the shear strengths of fillet welds are largely determined by the properties of the filler alloy and not necessarily by the condition of the heat-affected zone (HAZ) of the base material.

Typical Tensile Properties - Groove Welds

Typical Tollone Freperitor all core troids														
Base Alloy & Temper	Base Tensile (KSI) (1)	Filler Alloy	As-Welded Tensile (KSI) (1)	PWHT* Tensile (KSI) (1)										
5052-H32	33	ER 5356	28	N/A										
5083-H116	46	ER 5183	43	N/A										
5086-H34	47	ER 5356	39	N/A										
5454-H32	39	ER 5554	35	N/A										
6061-T4	35	ER 4043	27	35 (3) (4)										
6061-T6	45	ER 4043	27	44 (4)										
6061-T6	45	ER 5356	30	36 (2)										

Note: Typical properties of GMAW welded groove joints in aluminum alloys.

(1) Reduced section tensile strength (3) Postweld aged only

(2) Filler alloy will not respond to heat treatment (4) Data assumes sufficient dilution of base alloy

Welded Joint Strength - Typically, the as-welded tensile strength of a groove weld is determined by the condition of the heat-affected zone (HAZ) of the base material.

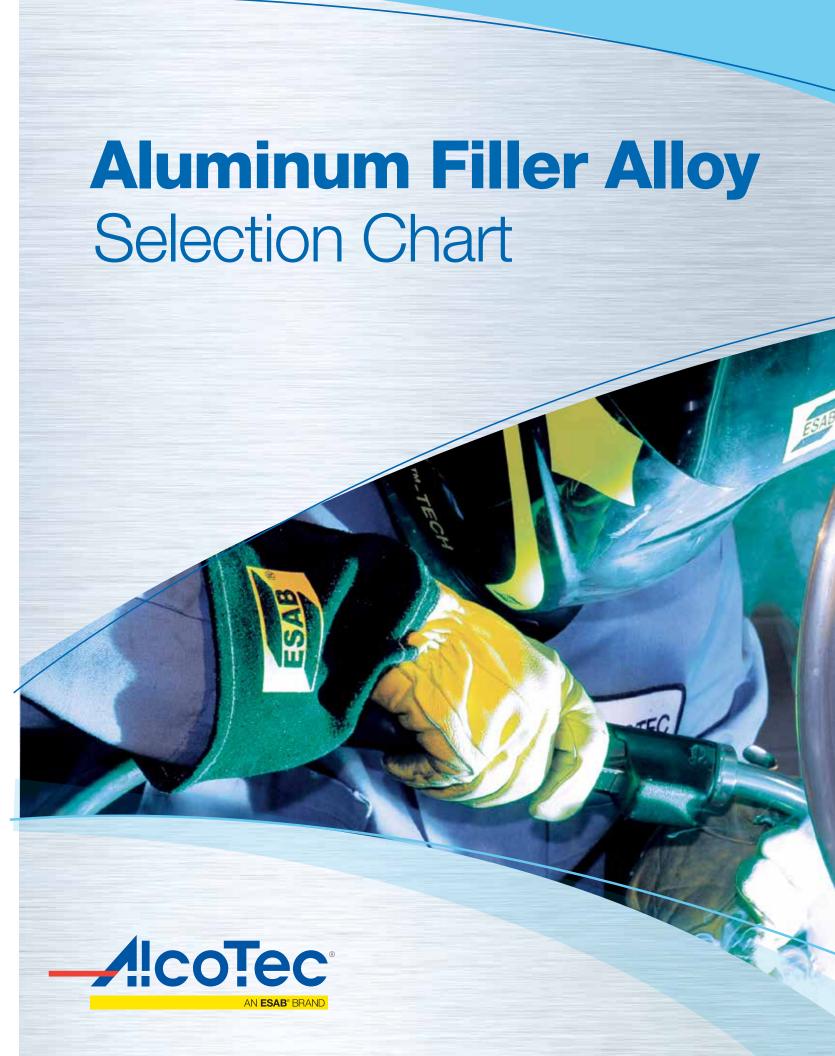
*Post Weld Heat Treated and Aged



AlcoTec Wire Corporation / alcotec.com / 1.800.228.0750

2750 Aero Park Drive, Traverse City, MI 49686-9263





Base Alloys	Filler Alloys	1060 1070 1080 1350	1100	2014 2036	2219	3003	3004	5005 5050	5052	5083 5456	5086 5056	511.0 512.0 513.0 514.0 5154 5254	5454	6005 6060 6063 6101 6151 6351 6951	6061 6070	7005 7021 7039 7046 710.0 711.0	444.0 356.0 A356.0 A357.0	319.0 333.0 54.0 355.0 355.0 380.0
319.0 333.0 354.0 355.0 C355.0 380.0	2319* 4043/4047* 4009* 4145* 5554	A C B A A B B A A A A A A B A A B A A	A C B A A B B A A A A A B A A		B A A A A A C D C D A B C B C A A B C B A	A C B A A B B A B A A A B B A	A C B A A B B A B A A A B B A	A C B A A B B A B A A A B B A	A C B A A B B A B A			A A A A	A C B A A B B A A A	A C B A A B B A B A	A C B A A A B B A B A B	A B A A B B A B A	A C B A A C B B A A A B A A B A A B A A B A	2319* 4043/404 B A A A A 4009*
413.0 443.0 444.0 356.0 A356.0 A357.0 359.0	4043/4047* 4145* 4008* 5554	B B A A A A A B B A	B B A A A A A B B A	B B A A A A A B A A	B B A A A A A B A A	B B A A A A A B B A	A A A A A	AAAAA	A A A A A					B B A A A A A B B A		AABBA	A B A A B B A B A A A A A A A A A A A A	4043/4047* 4145* 4008* 5554
7005 7021 7039 7046	4043/4047* 4145* 5183 5356	B A B A A A			B B A A A A A B A A	A C C A A B A B A A A	A D C B A B A B A B B A A	A B A B A A A	B D C B A A A B A A	A A A B A A A A A A A B A A A	A A B A A B A A	A A A B A A A A A B A A A	A A B A A A B A A	A A A B A A A A B A A A	A A B A A A A	A A B A A A A A	4043/4047* 4145* 5183 5356	
710.0 711.0	5554 5556 5654 4043/4047*	B A B A A	A E C A A	A B B A A A	ВВААА	AECAA	B A B A C A A	BCCAA		A A A B A A	A A B A		A B C A A A A A A A A A A A A A A A A A		B C A A A A B A A B C A A A B C A A A A	4043/4047*	5554 5556 5654	
6061 6070	4145* 4643* 5183 5356 5554 5556 5654	B A B A A B C A B A	B A B B B A B B A B A B	A A B A A A A A A A A A A A A A A A A A	AABAA	B A B A A B C A B A	B B A B C A B	A B B A B A A A A B A A B A B A B			A A A B A A A B A A A B C A B A A A B A		B A A B B B A B B B A A B B B B B B B B	A D C A A B B A B B A A B C C A B B A A C C A B B	A C C A A B B B B B A B B B B B B B B B	4145* 4643* 5183 5356 5554 5556 5654		
6005 6060 6063 6101 6151 6351 6951	4043/4047* 4145* 4643* 5183 5356 5554 5556	B A B A A B C A B A	A E C A A A A D D B A B B A B B A B B A B B A B B A B B A B B A B B A B B A B B A B B A B B A B B A B B A B B B A B B B A B B B A B B B A B B B A B B B B A B	B B A A A A A A A A A A A A A A A A A A	B B A A A A A B A A	B A B A A B C A B A	B B A B C A B	A B A B A A A A A B C A B A B A B A B A	A B A B A A B A B B A B B A B B A B B A B B A B B A B B A B B A B B B A B	A A A B A A A A A A B C A B A A A A B A A B A	A A A B A A A B A A A B C A B A A A B A	A B A B B A A A B A A B A B B A B A A B A B B A B A B A B B A A B A B B A A B	A B A B B A B B A B A C C A A A A B A B B	A D C A A A B A B A B A A A C C A B B A A B A B B A B A A B B A B B A	4043/4047* 4145* 4643* 5183 5356 5554 5556			
5454	5654 5183 5356 5554		A A B B A B A B B C A A A	A A A		A A B B A A B A B A B C A A A A	A A B B A B A B B C A A A	A A B B A A A A A A A	A	A B C A B A A A B B A A A B A B A A A B A B	A B C A B A A A B B A C C A A	A C C A A E A A A B A A B C A A A A A A A A A A A A	A A A B B A A B A B A B C A A A	B C C A B B A 5183 A 5356 A 5554	5654	Alumi		Alloy Char
	5556 5654 5183		A A B B	A			A A B B	A A A B B A	A A A B B B A A A B B B	A A A B B A A B A A A A A A A A A A A A	A A A B B A B C A B A A A B A	A A A B B A A A A B B B A A A A B B B B	A A A B B A B C A B B 5183	A 5556 A 5654		W	Ease	of welding
511.0 512.0 513.0 514.0 5154 5254	5356 5554 5556 5654	B C A A A A A B C A A B	A B A B B C A A A A B B B C A A	A A B			B C A A A B B B C A A	A B C A A A A A A A A A A A A B B C A A B B	A C C A A A A A B B B C A A	B B C A A A A A A A A A A A A A A A A A	A A B A A A B C A A A A A B A B C A A	A B C A A E A A A B B C A A A	5356 5554 5556 5654				Strength of welded	m from weld cracking. I joint (as-welded condition)
5086 5056	5183 5356 5554 5556	A A B A A A A A A A B A A B A A		A A					CCAA		A A B A A A A A A A A A A A A B A	A 5183 A 5356 5554 A 5556				S	All rods & electrodes ra	articularly to fillet welds. ated should develop presently a strengths for butt welds.
5083 5456	5654 5183 5356 5554		A A B A A B A A	A A			A A B A A B A A			B	A 5183 A 5356 5554		Use This Ch			D	Rating is based upo	Ductility on the free bend elongation the weld.
	5556 5654 4043/4047* 5183	A C C A A	A A B A A C C A A B A B	Α		A C C A A	A A B A A C C A A B A B	A C C A A	A A B A B A B C A A A A A B C	A A A B A A B B B 4043/4047* B 5183	5556 5654	blue	column, the ot	o be joined (one find the food the food the food the foolemn and result the column and result in the foolemn and result in	olue row).	С		ce in continuous or alternate n fresh or salt water.
5052	5356 5554 5556 5654	В В А А	B B A	A		в в А А	ВВА	A B B A	A A B A C C C A A A A A A A A B C B C A B	A 5356 B 5554		3. This (A, B	block contains , C or D) repres	horizontal rows o sentative of the all		т	sustained to	nded for service at emperatures above PF (65.5°C).
5005 5050	1100 4043/4047* 4145* 5183 5356	B C E B A C B B B	A D D A A B C E B A C A C C B B	B B		B C E B A C B B B C B	A C C A A B A B B B A	A B A C E A B B B E	4043/4047* 4145* 3 5183 5356			chara S, D,	acteristics listed	line give the A-to- d at the top of eac ee Legend at right	ch column – W,	M		ch after anodizing.
3004	5556 1100 4043/4047* 4145* 5183 5356	D E A A A A A A A D D A A B C E B A C A C B	ADDAA	B B		D A A A A A A A A D D A A B C E B A C A C B		A B A C E 1100 4043/4047* 4145* A 5183 A 5356	3 5556			filler a	alloy. You will fir acteristic for an	naracteristics affor nd that you can "t nother until you fin eds.	rade off" one		B, C, & D are relative rat order of merit. The rating meaning only within a	gs have relative
	5554 5556		C A C	В			C C A B A B A C C	A 5554				Example	best meets your needs. Example If joining base alloys 6061 and 5086; first find the box					e not usually recommended

-/!coTec

4043/4047* B B A A A B B A A A B C B C A

4043/4047* B B A A A B B A A A B C B C A

1100

1188

A A B A A A A B A A

A A B A A A A B A A

BBAAAB

4043/4047* A A B A A 4043/4047*

CCAAAAA

B B A A A A B B A A A A

3003

2219

2014 2036

1100

1060 1070

4145*

2319*

4145*

4145*

1100

1100

1188

4043/4047* B B B A A B B B A A B B A A A B B B A A A

ABCBA

A B C B A

BAAAAAAAAAA

CBCA

всва

4043/4047*

4145*

A A C B A A A C B A A B A A A B A A

AACBA

4043/4047*

4145*

4043/4047*

If joining base alloys 6061 and 5086; first find the box

where the 6061 row and the 5086 column intersect.

4043/4047, 4145 or 4643 – this means they are not

Then notice that there are no ratings for filler alloys

usually recommended for this base combination.

Filler alloy 5356 has an "A" rating for ductility, but a

"B" rating for strength. However, alloy 5556 has an

"A" rating for strength, but a "B" rating for ductility.

Therefore, it must be decided which attribute has

the highest priority.

(2) The following filler alloys are heat-treatable and can produce higher strength weldments after postweld solution heat treatment and aging: 206, 357, 2319, 4008, 4009, 4145, and 4643.

(3) An "A" rating for alloy 5083 to 5083 and 5083 to 5456. No rating for alloy 5456 to 5456.

(4) 4047 can be used in lieu of 4043. Alloy 4047 provides increased fluidity for welding leak-tight joints, minimizes solidification cracking, and has a slightly higher fillet weld shear strength.