

# Stainless Steel Alloys

Gas Metal Arc Welding  
(GMAW) MIG Wires

Gas Tungsten Arc Welding  
(GTAW) TIG Alloys

Shielded Metal Arc Welding  
(SMAW) Stick Electrode



"The Royal Line"

**CROWN ALLOYS COMPANY**

30105 Stephenson Hwy, Madison Heights, MI 48071  
(248) 588-3790 (800) 521-7878 [www.crownalloys.com](http://www.crownalloys.com)

## Cut length - (TIG) or (GTAW) Spooled Wire - (MIG) or (GMAW)

**AWS A5.9/A5.9M**

### ER 309

TIG Diameter	Part Numbers	
	1# Package	10# Package
.030 x 36"	ST309/TE-BP	ST309/TE
.035 x 36"	ST309/TF-BP	ST309/TF
.045 x 36"	ST309/TG-BP	ST309/TG
1/16 x 36"	ST309/TL-BP	ST309/TL
3/32 x 36"	ST309/TN-BP	ST309/TN
1/8 x 36"	ST309/TO-BP	ST309/TO

MIG Diameter	Part Numbers		
	2 lb Spools	8" Spools	33 lb Spools
.030	SS309/1E	SS309/2E	SS309/3E
.035	SS309/1F	SS309/2F	SS309/3F
.045	SS309/1G	SS309/2G	SS309/3G

See next page for MIG and TIG welding procedures.

## Coated Electrodes (SMAW)

**AWS A5.4/A5.4M**

### E 309-16

Electrode Diameter	Part Numbers	
	1# Package	5# Package* or 10# Package
3/32	SE309/EN-BP	SE309/EN*
1/8	SE309/EO-BP	SE309/EO
5/32	SE309/EP-BP	SE309/EP
3/16	SE309/EQ-BP	SE309/EQ

## TYPICAL APPLICATIONS

Used for welding type 309 wrought alloys and CH-20 cast alloys. Also used for welding dissimilar stainless steels and stainless to carbon steel.

Tensile strength:  
80,000 psi (min.)

### ER 309L

TIG Diameter	Part Numbers	
	1# Package	10# Package
.030 x 36"	ST309/TXE-BP	ST309/TXE
.035 x 36"	ST309/TF-BP	ST309/TF
.045 x 36"	ST309/TXG-BP	ST309/TXG
1/16 x 36"	ST309/TXL-BP	ST309/TXL
3/32 x 36"	ST309/TXN-BP	ST309/TXN
1/8 x 36"	ST309/TXO-BP	ST309/TXO
5/32 x 36"	ST309/TXP-BP	ST309/TXP
3/16 x 36"	ST309/TXQ-BP	ST309/TXQ

MIG Diameter	Part Numbers		
	2 lb Spools	8" Spools	33 lb Spools
.030	SS309/1XE	SS309/2XE	SS309/3XE
.035	SS309/1XF	SS309/2XF	SS309/3XF
.045	SS309/1XG	SS309/2XG	SS309/3XG

See next page for MIG and TIG welding procedures.

### E 309L-16

Electrode Diameter	Part Numbers	
	1# Package	5# Package* or 10# Package
3/32	SE309/EXN-BP	SE309/EXN*
1/8	SE309/EXO-BP	SE309/EXO
5/32	SE309/EXP-BP	SE309/EXP
3/16	SE309/EXQ-BP	SE309/EXQ

Similar usage as above, ↑ except the lower carbon content increases resistance to intergranular corrosion and helps to inhibit weld cracking.

Tensile strength:  
79,000 psi (min.)

### ER 309LSi

TIG Diameter	Part Numbers	
	1# Package	10# Package
.030 x 36"	ST309/TZE-BP	ST309/TZE
.035 x 36"	ST309/TZF-BP	ST309/TZF
.045 x 36"	ST309/TZG-BP	ST309/TZG
1/16 x 36"	ST309/TZL-BP	ST309/TZL
3/32 x 36"	ST309/TZN-BP	ST309/TZN
1/8 x 36"	ST309/TZO-BP	ST309/TZO

MIG Diameter	Part Numbers		
	2 lb Spools	8" Spools	33 lb Spools
.023	SS309/1ZD	SS309/2ZD	SS309/3ZD
.030	SS309/1ZE	SS309/2ZE	SS309/3ZE
.035	SS309/1ZF	SS309/2ZF	SS309/3ZF
.045	SS309/1ZG	SS309/2ZG	SS309/3ZG

See next page for MIG and TIG welding procedures.

Similar usage as above, ↑ except the higher silicon content (0.65 – 1.00%) improves wash and wetting behavior.

Tensile strength:  
79,000 psi (min.)

# Stainless Steel MIG & TIG Welding Procedure



## MIG (GMAW) and TIG (GTAW) Welding Parameters for 300 series Stainless Steel

### MIG – Gas Metal Arc Welding (GMAW)

- Spray Transfer**

A 99% argon/1% oxygen gas mixture is predominantly used. This mixture improves arc stability and produces a more fluid and controllable weld puddle with good bead contour. Undercutting is minimized on heavier sections.

A 98% argon/2% oxygen mix provides better arc stability and welding speed than the 1% oxygen mixture for thinner stainless steel materials.

Wire Diameter (inches)	Use DC reverse polarity (DCEP) Settings based on 99% argon + 1% oxygen mix			Gas Flow (cfh)
	Welding Current (amperage)	Arc Voltage (volts)	Wire Feed Speed (ipm)	
.030	160 – 225	24 – 28	440 – 650	21 – 34
.035	180 – 300	24 – 29	430 – 500	24 – 36
.045	200 – 450	24 – 30	220 – 400	24 – 36
1/16	220 – 500	24 – 32	110 – 210	24 – 36

- Short Circuit Transfer**

A 90% helium + 7.5% argon + 2.5% CO<sub>2</sub> (helium tri-mix) has no effect on corrosion resistance; provides a small heat-affected zone with no under-cutting and minimum distortion. Another acceptable shielding gas mix for single-pass welds is 98% argon/2% CO<sub>2</sub>, however, this mix produces a colder weld than the helium tri-mix and therefore the weld puddle does not wet out as well. Do NOT use more than 5% CO<sub>2</sub> in the gas mix. Too much CO<sub>2</sub> and/or multipass welds (with Ar/CO<sub>2</sub> blends) can result in oxidization and a reduction in corrosion resistance.

Wire Diameter (inches)	Use DC reverse polarity (DCEP) Settings based on 90% helium + 7.5% argon + 2.5% CO <sub>2</sub> mix			Gas Flow (cfh)
	Welding Current (amperage)	Arc Voltage (volts)	Wire Feed Speed (ipm)	
.023	25 – 65	14 – 18	120 – 280	21 – 25
.030	35 – 110	15 – 17	130 – 250	21 – 27
.035	50 – 160	17 – 22	105 – 330	21 – 27
.045	80 – 180	17 – 22	90 – 190	21 – 27

### TIG – Gas Tungsten Arc Welding (GTAW)

Pure argon is suggested for thickness up to approximately 1/2". For thicker sections, argon-helium mixtures or pure helium may be used for deeper penetration. Argon-hydrogen mixtures are occasionally used to improve bead shape and wettability.

**Manual Welding – DC straight polarity DCEN – See above for recommended gas**

**Tungsten:** Traditional choice is a 2% thoriated tungsten (Red Band), however, the more recent and safer introductions of 2% ceriated tungsten (Orange Band) or 1.5% lanthanated tungsten (Gold Band) have demonstrated superior performance in most applications. Safety note: Thorium is radioactive & may present risks which are negligible under normal conditions of use.

Metal Thickness	Joint Type	Tungsten Diameter	Filler Rod Diameter	Arc Voltage (volts)	Welding Current (amperage)	Gas Flow (cfh)
.045"	All	.040	.045	5 – 10	30 – 50	10 – 15
1/16"	Butt/Corner	1/16	1/16	9 – 16	50 – 70	15
1/16"	Lap/Fillet	1/16	1/16	10 – 16	60 – 80	15
1/8"	Butt/Corner	1/16 to 3/32	3/32	12 – 18	70 – 90	15
1/8"	Lap/Fillet	1/16 to 3/32	3/32	12 – 18	90 – 115	15
3/16"	Butt/Corner	3/32	1/8	14 – 20	105 – 130	20
3/16"	Lap/Fillet	3/32	1/8	14 – 20	130 – 160	20
1/4"	Butt/Corner	1/8	5/32	15 – 22	140 – 170	20
1/4"	Lap/Fillet	1/8	5/32	15 – 22	165 – 210	20

All suggested settings are approximate. Inverter-based welders generally require less heat input (lower amps). Welds should be tested to comply to your specifications.

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30105 STEPHENSON HWY.  
MADISON HEIGHTS, MI. 48071  
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## Filler Metal Selector Guide for Stainless Steels (page 1)

Stainless Steel or Steel Base Alloy	442	430F	430	501	416	403	321	317	316L	316	314	310	309	304L	303	201	MILD STEEL				
	446	430FSE	431	502	416SE	405	348					310S	309S	304L	303SE	202		301	302	302B	304
201-202	310	310	310	310	309	309	347	308	308	308	308,	308	308	308	308	308	312				
301-302	312	312	312	312	310	310	308	316	316	316	309					310					
302B-304	309	309	309	309	312	312		317			310					309					
305-308																					
303	310	310	310	310	309	309	347	308	308	308	308,	308	308	308	308-15	308	312				
303SE	309	309	309	309	310	310	308	316	316	316	309					310					
	312	312	312	312	312	312	317	317			310					309					
304L	310	310	310	310	309	309	347	308	308L	308	308,	308	309	308L	308	308	312				
	309	309	309	309	310	310	308L	316		316	309		308			310					
	312	312	312	312	312	312	317	317		310	310		308			309					
309	310	310	310	310	309	309	347	317	316	316	309	309	309	309	308	308	309				
309S	309	309	309	309	310	310	308	316	309	309	310	310	310	308		310					
	312	312	312	312	312	312	309	309		310						312					
310	310	310	310	310	310	310	347	317	310	316	310	310	309	308	308	308	310				
310S	309	309	309	309	309	309	308	316	316	310			310			309					
	312	312	312	312	312	312	309	309	309	309						312					
314	310	310	310	310	310	310	309	309	309	309	310-15	310	309	308,	308,	308,	310				
	312	312	312	312	312	309	310	310	310	310			310	309	309	309	309				
	309	309	309	309	309	312	347	317	316	316				310	310	310	312				
316	310	310	310	310	309	309	347	316	316	316	309	316	316	308	308	308	309				
	309	309	309	309	310	310	308	308			310	310	309	316	316	316	310				
	312	312	312	312	312	312					316	309	310	316	316	316	312				
316L	310	310	310	310	309	309	347	316	316L	316	309	310	316	308L	308	308	309				
	309	309	309	309	310	310	308	317			310	316	309	316	316	316	310				
	312	312	312	312	312	312	308	308			316	309				316	312				

Bold numbers indicate first choice, light numbers indicate second and third choice. This choice can vary with specific applications and individual job requirements.

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## Filler Metal Selector Guide for Stainless Steels (page 2)

Stainless Steel or Steel Base Alloy	442	430F	430	501	416	403	321	317	316L	316	314	310	309	304L	303	201	MILD STEEL
	446	430FSE	431	502	416SE	405	348									410	
317	310	310	310	310	309	309	308	317	316	316	309	317	317	308	308	308	309
	309	309	309	309	310	310	347		317	308	310	316	316	316	316	316	310
	312	312	312	312	312	312			308		317	309	309	317	317	317	312
321	310	310	310	310	309	309	347	308	347	347	309	347	347	347	347	347	309
348	309	309	309	309	310	310		347	308	308	310	308	308	308L	308	308	310
347	312	312	312	312	312	312					347					312	312
403-405	310	310	310	310	410-15*	410*	309	309	309	309	310	310	309	309	309	309	309
410-420	309	309	309	309	309**	309**	310	310	310	310	309	309	310	310	310	310	310
414	312	312	312	312	310**	310**	312	312	312	312	312	312	312	312	312	312	312
416	310	310	310	310	410-15*	410-15*	309	309	309	309	310	310	309	309	309	309	309
416SE	309	309	309			309**	310	310	310	310	312	309	310	310	310	310	310
						310**	312	312	312	312	309	312	312	312	312	312	312
501	310	310	310	502*	310	310	310	310	310	310	310	310	310	310	310	310	310
502				310**		309	309	309	309	309	312	309	309	309	309	312	312
						312	312	312	312	312	309	312	312	312	312	309	309
430	310	310	430-15*	310	310	310	310	310	310	310	310	310	310	310	310	310	310
431	309	309	310**		309	309	309	309	309	309	312	309	309	309	309	312	309
			309**		312	312	312	312	312	312	309	312	312	312	312	309	312
430F	310	410-15*	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310
430FSE	309		309		309	309	309	309	309	309	312	309	309	309	309	312	309
						312	312	312	312	312	309	312	312	312	312	309	312
442	309	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310
446	310	309	309		309	309	309	309	309	309	312	309	309	309	309	312	309
						312	312	312	312	312	309	312	312	312	312	309	312

\*Preheat    \*\*No Preheat Necessary    Bold numbers indicate first choice, light numbers indicate second and third choice. This choice can vary with specific applications and individual job requirements.



**!!!! WARNING !!!!**



**WELDING FUMES AND GASES CAN BE DANGEROUS TO YOUR HEALTH.**

**BEFORE USING THIS PRODUCT THE WELDER (END-USER) MUST READ AND UNDERSTAND THE COMPLETE PRODUCT WARNING LABEL AND THE NEW 16 SECTION SAFETY DATA SHEET (SDS).**

**THE SAFETY DATA SHEET (SDS) WHICH OUTLINES THE POTENTIAL HEALTH HAZARDS AND SAFETY INFORMATION RELATED TO THIS PRODUCT CAN BE DOWNLOADED FROM THE SDS PORTION OF THIS WEBSITE. IT IS ALSO AVAILABLE FROM YOUR EMPLOYER AND WELDING SUPPLY DISTRIBUTOR.**

**DO NOT PROCEED WITH USE OF THIS PRODUCT UNTIL YOU READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) AND PRODUCT WARNING STATEMENT.**

**BE SURE TO CONSULT THE LATEST VERSION OF THE SDS.**

**SEE THE PRODUCT WARNING LABEL AND SDS FOR COMPLETE WARNING INFORMATION.**

