

# Premium Aluminum Welding Consumables



## NEXALLOY

Premium Aluminum Welding Consumables

Nexal Aluminum Inc.

5938 Ambler Drive - Mississauga, ON L4W 2N3 Canada  
 Phone: 1-905-629-8282 Fax: 1-905-629-8532  
 www.nexalloy.com  
 An ISO 9001-2008 Company

## NEXALLOY

Aluminum Manufacturing  
Since 1973



### NEXAL ALUMINUM PRODUCTS

NEXAL is an independent manufacturer of aluminum welding wire and the only manufacturer of NEXALLOY products, a full range of superior aluminum welding alloys. NEXAL serves the needs of national distributors and fabricators in major international markets.

### MANUFACTURING EXPERTISE AND QUALITY CONSISTENCY

NEXALLOY product quality is the preferred choice of welding electrodes in high volume fabrication operations. They are the combined result of global knowledge, experience and new production technology.

### ALUMINUM MANUFACTURING SINCE 1973

NEXAL has the full understanding of the aluminum manufacturing technology and also of the complex metallurgy of aluminum alloys from smelting, casting, rolling, and production of welding electrodes. NEXAL state of the art manufacturing processes preserve the soundness of the electrode from beginning to the end and prevent detrimental high temperature contamination of aluminum, typical with standard technologies.

### LAST BUT NOT LEAST

NEXALLOY GREENER PRODUCTS CONTRIBUTE TO THE BETTERMENT OF THE WELDER WORKING ENVIRONMENT.

Produced from superior materials, NEXALLOY greener products contribute to the betterment of the welder environment in high volume fabrication operations due to the elimination of the use of detrimental chemical elements. NEXALLOY welding products are becoming the preferred choice of welding electrodes in welding operations.

We believe we offer the best quality, service, technical support and value available. Try us today and see why NEXAL is one of the preferred names in the aluminum welding industry.

## NEXALLOY

### TABLE OF CONTENTS

- Introduction.....2
- Alloys for MIG & TIG.....3
- MIG joints and parameters.....4
- Basic Welding Tips.....5
- TIG Parameters, Trouble Shooting.....6
- Trouble Shooting (continued).....7

NEXAL products meet or exceed AWS/CWB and ABS approvals.  
 An ISO 9001 Company

### TROUBLESHOOTING continued

Problem	TIG Welding	MIG Welding	Solution
Lack of fusion or penetration	Welding current too low Travel speed too fast Arc length too long Contaminated weld joint Wrong groove shape	Welding current too low Travel speed too fast Arc length too long Contaminated weld joint Wrong groove shape	Increase welding current. Slow travel speed, allow puddle to penetrate. Reduce arc length or increase wire feed speed. Perform proper metal cleaning. Reconfigure joint (see Fig. A thru G in joint design section). Perform proper metal cleaning.
Weld Cracking	Wrong filler metal Voltage too high Too little filler metal in joint Contaminated weld joint Shrinkage due to joint design Wrong welding technique	Wrong filler metal Voltage too high Too little filler metal in joint Contaminated weld joint Shrinkage due to joint design Wrong welding technique	Re-check Alloy selection chart and sub notes. Check parameter chart and adjust voltage. Slow travel speed, allow puddle to form. Perform proper metal cleaning. Narrow joint gap or increase bevel angle. Pre-heat heavy sections. Clamp parts to minimize stress. Reduce heat zone with higher traverse speed. Match correct bevel, not concave. Make sure weld puddle is not too small. Minimize super-heated molten metal.
Burn back	Tungsten touches puddle	Contact tip to chutes puddle Wire feed too slow	Adjust arc length or recess contact tip. Increase feed speed for C.C. and decrease voltage on C.V. Reduce Run-in feed speed for C.V. Contact Nexal or your supplier. Replace contact and consider a push-pull gun if shortening the conduit is not feasible. Lower duty cycle or replace gun with a water cooled model. Match the tip size with wire diameter. Clean or replace tip. Use "U" shaped drive roll. Properly align with input guide, drive roll tension should be just enough to prevent slipping. Make sure you are using a teflon liner. Change polarity. Use line voltage control.
Color mis-match	Wrong filler metal	Wrong filler metal	Consult alloy selection chart and foot notes.

#### Equipment check for MIG welding:

For optimum performance when MIG welding, the following equipment should be used: "U"-shaped drive rolls with proper tension (Aluminum can easily be deformed by over-tightening or by using "V" or louvered drive rolls), teflon or nylon liners and guides, make sure contact tips and nozzles are free of damage or spatter build-up. See that drive rollers are aligned properly with input and output guides. Check all gas connections and water cooling system for leaks, and make sure contact tips are the correct size for your wire dia. It is best to use a MIG gun with a straight or slightly curved neck (sharp bends can cause binding). Check all electrical connections and replace worn or damaged components or tighten where necessary (C.V. power supply relies on good electrical connections in order to send the proper signal back to the machine).

#### Tungsten choices:

The standard tungsten electrode for aluminum welding is the Pure Tungsten, EVP (green tip). It produces a stable arc once the ball is formed. Although it's high purity somewhat diminishes its current carrying capacity, pure tungsten is generally more obtainable and has long been the industry standard. The Zirconated Tungsten, EVZr (Brown tip) is similar to the Pure but with better current carrying capacity. EVZr-I is more resistant to contamination than pure tungsten and has good radiographic-quality welding properties.

#### DC TIG welding:

Nearly all aluminum TIG welding is done with AC current (high frequency), and is the only recommended way to TIG weld aluminum. However, the question comes up regularly if DCTIG will work on aluminum. The principal factor here are the oxides that form on the surface of aluminum. Aluminum melts at approx. 1200°F, while aluminum oxides melt at approx. 3,700°F. These oxides form almost instantly once aluminum is clean and unprotected. DC current simply does not have the "bite" necessary to cut through the oxides as high frequency AC current does. While DC TIG can be performed with the use of pharmaceutical grade High Purity Helium and a powerful etching solution, it is usually not worth the effort and expense.

## TIG Welding Parameters for Lap and Fillet Welds

Power source: AC or DC GTAW  
 Shielding Gas: 100% Argon (recommended)  
 Tungsten: Pure or Zirconated

Parameters are provided for welding with pure tungsten.  
 Zirconated tungsten may require slight adjustments.  
 F, flat, H, horizontal, V, vertical, O, overhead

Material Thickness, in.	Welding position	Wire Dia. in.	Tungsten Size, in.	Gas cap I.D., in.	Gas flow cfm	Amps at 100% AC	Travel speed in./min.	Filler consumption lb./100 ft
1/16	F,H,V	3/32	1/16-3/32	3/8	16	70-110	8-10	.50
	O	3/32	1/16-3/32	3/8	20	65-90	8-10	.50
3/32	F	3/32-1/8	1/8-5/32	3/8	18	110-145	8-10	1.00
	H,V	3/32	3/32-1/8	3/8	18	90-125	8-10	1.00
	O	3/32	3/32-1/8	3/8	20	110-135	8-10	1.00
1/8	F	1/8	1/8-5/32	7/16	20	135-175	10-12	2.00
	H,V	1/8	3/32-1/8	3/8	20	115-145	8-10	2.50
	O	1/8	3/32-1/8	7/16	25	125-155	8-10	2.00
3/16	F	5/32	5/32-3/16	1/2	25	190-245	8-10	4.50
	H,V	5/32	5/32-3/16	1/2	25	175-210	8-10	5.50
	O	5/32	5/32-3/16	1/2	30	185-225	8-10	4.50
1/4	F	3/16	3/16-1/4	1/2	30	240-295	8-10	7.00
	H,V	3/16	3/16	1/2	30	220-265	8-10	9.00
	O	3/16	3/16	1/2	30	230-275	8-10	7.00

### TROUBLESHOOTING

Problem	TIG Welding	MIG Welding	Solution
Poor Arc Starting	Broken circuit - bad ground No shielding gas  Wrong polarity Anodizing or coating on metal Defective cooling system	Broken circuit - bad ground No shielding gas  Wrong polarity Anodizing or coating on metal Improper wire feed rate	Check connections and re-ground. Check gas supply and regulator pressure, pre-purge. Change polarity. Perform proper metal cleaning. Repair cooling system or dial in wire feed rate.
Unstable Arc	Inconsistent voltage flow Contaminated joint area Arc blow (strong magnetic field)  Oversized electrode diameter Workpiece is too cold	Inconsistent voltage flow Contaminated joint area Arc blow  Conduit angle too high Workpiece is too cold	Check or repair electrical connections. Perform proper metal cleaning. Stop welding, adjust ground clamp position to eliminate magnetic field. Reduce electrode size or adjust angle. Let stand at room temperature for 24 hours or preheat to 150°F.
Porosity	Hydrogen contamination on wire or base metal Base metal cooling too fast  Wet or dirty gas shield Insufficient or interrupted gas flow Current setting too low	Hydrogen contamination on wire or base metal Base metal cooling too fast  Wet or dirty gas shield Insufficient or interrupted gas flow Current setting too low	Keep wire in a low humidity container and perform proper metal cleaning. Pre-heat heavy sections or slow travel speed. Replace gas supply. Increase flow rate or block cross wind. Increase welding current.
Dirty welds	Inadequate gas shield  Contaminated filler metal  Contamination/oxides in joint area	Inadequate gas shield  Contaminated filler metal  Contamination/oxides in joint area	Increase gas flow rate, block cross wind, change gun angle, replace clogged or damaged gas nozzle, hold nozzle closer to work. If wire was stored and handled properly, contact Washington Alloy. Perform proper metal cleaning.

continued...

#### ER1100 AWS/SFA 5.10, AMS 4180

##### Nexalloy ER1100

is a 99% aluminum filler metal available in spools and cut length for MIG and TIG welding processes. ER1100 is a filler alloy that is commonly used in architectural and decorative applications on furniture and piping, thin gauge materials and foil products. Its softness makes it easy to shape and form giving it an advantage in decorative work and where attractive weld appearance is critical. ER1100 is used on 1100, 3003 and A/C 3003 to similar base metals or on 1060, 1070, 1080 and 1350. It is also used extensively as low strength wire in chemical baths due to its resistance to weathering and chemical attack.  
 Its melting range is 1190-1215°F with a density of .098 lbs/in<sup>3</sup>. Its post anodized color is slightly golden. Typical tensile strength is 13,500 psi.

Typical Weld Metal Chemistry (%)

Si	.....0.45 - 0.6
Fe	.....0.80 max.
Cu	.....0.30 max.
Mn	.....0.05 max.
Mg	.....0.05 max.
Zn	.....0.10 max.
Al	.....99.0 min.
Other*	.....0.15 total max.

\*See chart not shown 0.0000%

#### ER4043 AWS/SFA 5.10, AMS 4190

##### Nexalloy 4043

is a 5% Silicon aluminum filler metal that is one of the most widely used aluminum welding alloys for general repair and fabrication. The smoother running ER4043 is often preferred because of its flowing characteristics and its reduced crack sensitivity over other aluminum welding wires. ER4043 is available in spools and cut lengths for both MIG and TIG welding and is recommended for base metals 3003, 3004, 5052, 6061, 6063 and casting alloys 43, 355, 356 and 214. ER4043 has a melting range of 1065-1170°F and a density of .097 lbs/in<sup>3</sup>. Its post anodized color is grey. ER4043 has a typical Tensile strength of 29,000 psi.

Typical Weld Metal Chemistry (%)

Si	.....4.5 - 6.0
Fe	.....0.80 max.
Cu	.....0.30 max.
Mn	.....0.05 max.
Mg	.....0.05 max.
Zn	.....0.10 max.
Al	.....0.20 max.
Al	.....Balance
Other*	.....0.15 total max.

\*See chart not shown 0.0000%

#### ER4047 (718) AWS/SFA 5.10, AMS A5.8 BA151-4, AMS 4185

##### Nexalloy 4047 (718)

is an aluminum welding alloy with a 12% silicon content. Originally formulated for brazing, its features are high fluidity, narrow freeze range, low melting range and low shrinkage. ER4047 is a good general purpose, flow filling filler metal with good corrosion and hot cracking resistance when welded. It can also be used in sustained elevated temperatures.  
 It comes in spools and cut length for MIG, TIG and brazing applications on 1060, 1350, 3003, 3004, 3005, 5005, 5052, 6053, 6061, 6951, 7005 and cast alloys 71.0 and 71.5.  
 ER4047 has a melting range of 1070-1080°F and a density of 0.96 lbs/in<sup>3</sup>. Its typical tensile strength is 27,500 psi and its post anodized color is grey-black.

Typical Weld Metal Chemistry (%)

Si	.....11.0-13.0
Fe	.....0.80 max.
Cu	.....0.10 max.
Cu	.....0.30 max.
Mg	.....0.10 max.
Zn	.....0.20 max.
Al	.....Balance
Other*	.....0.15 total max.

\*See chart not shown 0.0000%

#### ER5183 AWS/SFA 5.10

##### Nexalloy ER5183

is an aluminum filler metal containing higher levels of manganese, magnesium and chrome. ER5183 is formulated to provide the highest possible "as-welded" strength in high magnesium alloys. Available in spools and cut length for MIG and TIG applications. ER5183 is known for its high fracture and impact toughness and exposure to corrosive elements. Applications include marine components, drilling rigs, cranes, etc. Base metals include 5083, 5086 and 5456 to similar base metals or to 5052, 5652 and 5656. Its melting range is 1075-1180°F, its density is 0.96 lbs/in<sup>3</sup>. The typical tensile strength is 41,000 psi and the post anodizing color is white.

Typical Weld Metal Chemistry (%)

Si	.....0.40 max.
Fe	.....0.40 max.
Cu	.....0.10 max.
Mn	.....0.5-1.0
Mg	.....4.3-5.2
Cr	.....0.5-0.25
Zn	.....0.25 max.
Tl	.....0.15 max.
Al	.....Balance
Other*	.....0.15 total max.

\*See chart not shown 0.0000%

#### ER5356 AWS/SFA 5.10

##### Nexalloy ER5356

is a 5% Silicon aluminum filler metal, available in spools and cut length for both MIG and TIG applications. ER5356 has increased levels of Mg, Ti and Mn along with the addition of chrome and a slight reduction in silicon. These changes work together to increase its corrosion resistance, making it the best aluminum for use in or near saltwater. ER5356 is commonly used on 5050, 5052, 5083, 5356, 5454 and 5456 and is the second most widely used aluminum filler metal. ER5356 has a melting range of 1060-1175°F, a density of 0.96 lbs/in<sup>3</sup> and a typical tensile strength of 38,000 psi. Its post anodizing color is white.

Typical Weld Metal Chemistry (%)

Si	.....0.25 max.
Fe	.....0.40 max.
Cu	.....0.10 max.
Mn	.....0.50-1.00
Mg	.....4.70-5.50
Cr	.....0.05-0.20
Zn	.....0.25 max.
Tl	.....0.05-0.20
Al	.....Balance
Other*	.....0.15 total max.

\*See chart not shown 0.0000%

#### ER5556 AWS/SFA 5.10

##### Nexalloy ER5556

is an aluminum filler metal with higher levels of manganese, zinc and magnesium than ER5356, giving ER5556 increased crack resistance and good ductility. Available in MIG and TIG forms. While tensile strengths are among the highest in aluminum filler metals, the higher magnesium content can decrease its resistance to stress corrosion cracking in prolonged temperatures above 150°F. Commonly used on 5154, 5354, 5454 and 5456.  
 ER5556 has a melting range of 1065-1175°F and a density of 0.96 lbs/in<sup>3</sup>. Its typical tensile strength is 42,000 psi and the post anodizing color is white.

Typical Weld Metal Chemistry (%)

Si	.....0.25 max.
Fe	.....0.40 max.
Cu	.....0.10 max.
Mn	.....0.50-1.00
Mg	.....4.70-5.50
Cr	.....0.05-0.20
Zn	.....0.25 max.
Tl	.....0.05-0.20
Al	.....Balance
Other*	.....0.15 total max.

\*See chart not shown 0.0000%

## MIG Welding Parameters by Joint Design

Base Metal Thickness	Welding position	Joint type	Joint gap	Welding passes	Electrode diameter	Welding current	Arc voltage	Travel speed	Gas flow rate cfm/hr
1/16"-14 Ga	F	A	0	1	.030	70-110	15-20	25-45	25
	F	F	3/32	1	.030	70-110	15-20	25-45	25
3/32"-11 Ga	F	A	0	1	.030-.047	90-150	18-22	25-45	30
	F,V,H,O	F	1/8	1	.030	110-130	18-23	23-30	30
1/8"-8 Ga	F,V,H	A	0-3/32	1	.030-.047	120-160	20-24	24-30	30
	F,V,H,O	F	3/16	1	.030-.047	110-135	19-23	18-28	30
3/16"-4.5 Ga	F,V,H	B	0-1/16	1f, 1b	.047	130-175	22-26	24-30	35
	F,V,H	E	0-1/16	1	.047	140-180	23-27	24-30	35
	O	E	0-1/16	2f	.047	140-175	23-27	24-30	60
	F,V	G	3/32-3/16	2	.047-.062	140-185	23-27	24-30	35
	H,O	G	3/16	3	.047	130-175	23-27	25-35	60
	F	B	0-3/32	1f, 1b	.047-.062	175-200	24-28	24-30	40
1/4"-2 Ga	F	B	0-3/32	2	.047-.062	185-225	24-29	24-30	40
	F	E	0-3/32	2f, 1b	.062	165-190	25-29	25-35	45
	V,H	O	0-3/32	3f, 1b	.047	180-200	25-29	25-35	60
	O	E	0-3/32	3f, 1b	.047-.062	175-225	25-29	24-30	40
	F,V	G	1/8-1/4	2-3	.047-.062	170-200	25-29	25-40	60
	O,H	G	1/4	4-6	.047-.062	170-200	25-29	25-40	60
3/8"	F	C-90°	0-3/32	1f, 1b	.062	225-290	26-29	20-30	50
	F	E	0-3/32	2f, 1b	.062	185-225	26-29	25-35	50
	V,H	O	0-3/32	3f, 1b	.062	190-220	26-29	24-30	55
	O	E	0-3/32	5f, 1b	.062	200-250	26-29	25-40	80
	F,V	G	1/4-3/8	4	.062	210-290	26-29	24-30	50
	H,O	G	3/8	6-10	.062	190-260	26-29	25-40	80
3/4"	F	C-60°	0-3/32	3f, 1b	.062-3/32	340-400	26-31	14-20	60
	F	E	0-1/8	4f, 1b	3/32	325-375	26-31	16-20	60
	V,H	O	0-1/16	8f, 1b	.062	270-330	26-30	14-20	80
	F	D	0-1/16	3f, 3b	.062	270-330	26-30	16-24	80
	V,H,O	D	0-1/16	6f, 6b	.062	230-280	26-30	16-24	80
	V,H,O	D	0-1/16	6f, 6b	.062	230-280	26-30	16-24	80

Weld Positions: F, flat, V, vertical, H, horizontal, O, overhead Weld Passes: f, front, b, back

### Joint Designs for Metal, Inert Gas (MIG) Welding