# SELECTION GUIDE Stick Electrodes





Flectrode Name	General	Recm'd	Diameter & Current Ranges (Amps)				
& AWS Class	Description	Polarity	3/32"	1/8"	5/32"	3/16"	
Cellulosic All P	<b>Osition</b>			65-130	00_175	140-225	
E6010	pass welding. This electrode is based on a long-time favorite among cross-country pipeline welders.	DOT		00-100	30-175	140-223	
Pipeliner 8P+	Here's an electrode that makes short work of even the most challenging high silicon pipe applica-		2.5 mm	3.2 mm	4.0 mm	4.5 mm	
E0010-F1	features high stacking efficiency – formulated to carry and deposit weld metal in difficult vertical down out-of-position applications.	DC+	—	75-130	100-185	140-225	
Low Hydrogen							
Pipeliner 16P	We designed this quality electrode for optimum performance for vertical up welding of pipe up to	DC+	55-80	75-120	120-160	—	
E7016 H4	API 5L-X65 – especially where a low hydrogen deposit is desired. Obtain Charpy V-Notch impact values down to temperatures of -20°F (-29°C).	AC	60-80	80-120	120-160	—	
Pipeliner 18P	A real workhorse for vertical up welding jobs up to X80 pipe! Lincoln 18P offers low temperature	DC+	—	90-140	130-170	—	
E8018-G H4	impact properties down to -50°F (-46°C).	AC		100-140	140-180		
Pipeliner Lincoln	Choose Pipeliner Lincoln LH-D80 electrode when you need a dependable stick (SMAW) electrode for	DC±	80-110	125-155	170-215	200-260	
<b>LH-D80</b> E8018-G	vertical down low hydrogen welding on pipe up to X70. Operators appreciate the unique slag system that facilitates easy puddle control with virtually no slag interference.	AC	90-120	135-165	180-225	210-220	
Pipeliner Lincoln	The product of choice for vertical down, low hydrogen pipe welding for fill and cap passes of high	DC±	80-110	125-155	170-215	200-260	
<b>LH-D90</b> E9018-G	strength pipe up to X80. Operators will appreciate this electrode's unique "hot start" tip with out- standing puddle control.	AC	90-120	135-165	180-225	210-220	

## HARDFACING

	General	Hardness Bockwell C	Recm'd	d Diameter & Current Ranges (Am		ps)		
Electrode Name	Description	(as deposited)	Polarity	3/32"	1/8"	5/32"	3/16"	1/4"
Build-Up								
Wearshield® BU	For carbon and low alloy steels. Builds up worn steel parts to produce tough, forgeable, machinable surfaces of moderate hardness.	23-28	DC+ AC	_	_	145-210 155-225	180-280 200-290	230-360 255-375
Wearshield BU-30	Moderate hardness to resist shock. Used as final overlay on parts which must be machine or forged. For mild, medium carbon, low alloy and high tensile steels.	31-38	DC+ AC		90-130 100-140	140-180 150-200	170-220 190-240	



## **STEEL - CARBON & LOW ALLOY**

First First Pace 1         Other Difference 1         Other D	Electrode Name & AWS Class	General Description	Recm'd Polarity	3/32"	Diamete	er & Curre 5/32"	nt Range: 3/16"	s (Amps) 7/32"	1/4"	
M         Company many and provide distance andedistance and provide distance and provide distance ande	Fast Freeze, Ou Fleetweld® 35	<b>t-Of-Position, Mild Steel</b> Operators consistently give this electrode high marks. This quality Lincoln product is a	AC	50-85	75-120	90-160	120-200	150-260	190-300	
Model       Model <th< td=""><td>E6011 Fleetweld 35LS</td><td>proven performer for sheet metal welding applications and AC pipe welding. Fleetweld 35 is a great electrode to use on jobs where the steel isn't clean. Great for making tack welds under Innershield® deposits. Use Fleetweld 35LS with confidence on plated, dirty, painted, or greasy steel. It's an outstanding stick choice for</td><td>AC</td><td>40-75</td><td>70-110 80-130 70-120</td><td>80-145 120-160 110-150</td><td>110-180 </td><td>135-235 </td><td>170-270</td></th<>	E6011 Fleetweld 35LS	proven performer for sheet metal welding applications and AC pipe welding. Fleetweld 35 is a great electrode to use on jobs where the steel isn't clean. Great for making tack welds under Innershield® deposits. Use Fleetweld 35LS with confidence on plated, dirty, painted, or greasy steel. It's an outstanding stick choice for	AC	40-75	70-110 80-130 70-120	80-145 120-160 110-150	110-180 	135-235 	170-270	
columner       priorital or density of information register or density of informa	Eleetweld 180	AC pipe welding, for applications that require deep penetration, and in jobs where x-ray quality welds are required.	AC	40-90	60-120	115-150				
Barbon       State Performance       Barbon       Distance       Distance <thdistance< th=""> <thdistance< th=""></thdistance<></thdistance<>	E6011	for excellent performance with power sources as low as 50V open-circuit voltage (OCV). A great stick electrode with the ability to start easily on low open circuit voltage welders.	DC±	40-80	55-110	105-135	_			
Fact-Fatt, High Organition, Mild Statel       Sec.       Sin Mild Statel       Sin Mild Statel <td>E6022</td> <td>welding on sheet metal is required. Fleetweld 22 is great for galvanized or plated sheet steel, as well as on steel that is painted or dirty.</td> <td>AC</td> <td>_</td> <td>110-150</td> <td>150-180</td> <td></td> <td></td> <td></td>	E6022	welding on sheet metal is required. Fleetweld 22 is great for galvanized or plated sheet steel, as well as on steel that is painted or dirty.	AC	_	110-150	150-180				
Interline         Description         Description <thdescription< th=""> <thdescription< th="">         &lt;</thdescription<></thdescription<>	Fast-Fill, High I Jetweld® 1 E7024-1	<b>Deposition, Mild Steel</b> When the project involves large welds, you can't pick a more user-friendly electrode! Operators appreciate Jetweld 1's smooth bead and high deposition rates. A great general	AC DC±	65-120 60-110	115-175 100-160	180-240 160-215	240-300 220-280	300-380 270-340	340-440 320-400	
International and the second	<b>Jetweld 2</b> E6027	Purpose electrode for single or multi-pass applications. When the job demands x-ray quality welds, high deposition rates, and excellent wash-in, reach for Jetweld 2. We've designed the Jetweld 2 for peak performance on multiple pass	AC DC±			190-240 175-215	250-300 230-270		350-450 315-405	
III. France 100 - Speed. Hill Steel.       Circle       Circl	<b>Jetweld 3</b> 57024	Jetweld 3's high deposition rates, and smooth bead make it a great choice for welding on mild steel. It is especially effective for multipass welds and fast-fill single pass welds.	AC DC±	65-120 60-110	115-175 100-160	180-240 160-215	240-315 215-288	300-380 270-340	350-450 315-405	
Prepresent 37         Present 37         Pres	<b>Fill Freeze, Higl</b> Fleetweld® 7 E6012	<b>Speed, Mild Steel</b> Got a variety of jobs that a single all-position electrode has to handle? Choose Lincoln Electric's Fleetweld 7. This versatile, high-speed electrode is a real workhorse on sheet metal lap joints and fillet welds. It's also a great choice for poor fit-up welding jobs	DC- AC		80-135 90-150	110-180 120-200	155-250 170-275	225-295 250-325	245-325 275-360	
Partner 40         Control         Contro         Control         Control	Fleetweld 37 E6013	Here's a terrific all-position electrode for low amperage welding on sheet metal – especially in applications where appearance is important. We've designed Fleetweld 37 for excellent performance with smaller AC welders with low open-circuit voltages. It's an excellent choice for jobs involving irregular or short welds that require a change in	AC DC±	75-105 70-95	110-150 100-135	160-200 145-180	205-260 190-235			
Low Hydrogen.         Nild Steel           Strikter 7118         The set has the for forme wy porture are in yold better for your hydrogen in han yold better for your hydrogen in hydr	Fleetweld <b>47</b> E7014	Fleetweld 47 features high deposition rates for fast performance. Operators love this easy-to-use, all-position electrode! Choose Fleetweld 47 for sheet metal lap joints and fillet welds, general purpose plate welding and maintenance jobs.	AC DC-	80-100 75-95	110-160 100-145	150-225 135-200	200-280 185-235	260-340 235-305		
ethics: 0 = ethics:	Low Hydrogen, Excalibur® 7018 MR E7018 H4R	Mild Steel There's a long list of reasons why operators are so loyal to Excalibur 7018 MR. They tell us they love the clean puddle, the square coating burnoff, the easy all-position handling and the excellent wash-in characteristics. It's a terrific choice for iobs that involve steels	DC± AC	70-110 80-120	85-150 100-160	125-200 140-210	200-300 200-300	250-330 270-370	300-400 320-420	
matrix         matrix<	<b>Excalibur 7018-1 MR</b> E7018-1 H4R	with poor weldability. When the job involves critical, out-of-position welding, reach for Lincoln Electric's Excalibur 7018-1 MR. It offers a beautifully clean weld puddle, uniform slag follow, and superior wash-in with no undercutting. Also great for welding on steels with marginal	DC± AC	70-110 80-120	90-160 100-160	130-210 140-210	180-300 200-300	250-330 270-370	300-400 325-420	
Lingsh 201400 2015 Fig. 1 $427$ D2 The shorts between service and the right and the mass of the right and the mass of the right and the mass of the right and right and the right and the right and the right and the	<b>Excalibur 7018-A1 MR</b> E7018-1 H4R	weldability. Excalibur 7018-A1 MR low hydrogen electrode is an outstanding choice for all position welding of 0.50% molybdenum low alloy steels of 50 Ksi (345 MPa) minimum yield strength	DC± AC	70-110 80-120	90-160 100-160	130-210 140-210	_	_		
ethema (L+TP)         A to you be carefully in young on the incluses and examine public were valued were v	<b>Lincoln 7018AC</b> 7018 HB	AC? DC? This electrode performs beautifully either way! Lincoln 7018AC is a great choice for low open circuit voltage AC power sources. Cold restrikes are no problem with this versatile, all-position electrode.	AC DC+	75-120 70-115	105-150 100-140	130-200 120-185	_	_		
Bits - LF 20 MR         Const or pit do or mit set and or your high-regression (webs) is also berress.         DC         6.110         111-160         110-200         200	<b>letweld LH-70</b> 7018 H4R	A top-choice electrode for welding on thick sections and restrained joints when cracking is an issue. It's also a good call when the project involves hard-to-weld steels. Jetweld LH-70 also offers high deposition rates.	DC+ AC	70-100 80-120	90-150 110-170	120-190 135-225	170-280 200-300	210-330 260-380	290-430 325-440	
Interact IL-127 0716 His         Absord IL-123 defines say relating to poss the model skip and be departed and incredent and by the post departed and incredent and by the post departed in statement of an other post depar	<b>let®-LH-78 MR</b> 7018 H4R	Great for jobs on mild steel and some high-strength low-alloy steels. It also tolerates high sulfur and high silicon steels. Jet-LH 78 MR features higher tensile strength for stress-relieved properties	DC+ AC	85-110	110-160 120-170	130-200 140-230	180-270 210-290	250-330 270-370	300-400 325-420	
Injury 11.4.300 bit interval 14.4.301 bit interval 14.4.301 bit interval 14.4.301 bit interval 14.4.301 bit interval 14.4.301 bit interval 14.4.3.3.3.3.3.4.3.3.4.3.3.4.3.3.4.3.4.3	<b>Jetweld LH-73</b> E7018 H8	Jetweld LH-73 delivers easy restriking for jobs that involve skip and tack welding. This dependable electrode is a favorite of operators who weld on AC. It's designed for optimum performance on machines that use low open circuit AC voltage.	AC DC+	70-100 65-95	95-135 90-130	140-200 130-190	_	_	_	
Low Hydrogen, Low Alloy Steel December 2019-C1 IM Examine 2019-C1	<b>letweld LH-3800</b> 7028 H8	If high production and low hydrogen deposits matter, count on Jetweld LH-3800. This electrode's fast, easy restriking characteristics make it great for skip and tack welding. Good notch toughness down to 0°F (-18°C).	AC DC+	_	_	180-270 170-240	240-330 210-300	275-410 260-380		
Intersection         Intersection<	Low Hydrogen, Excalibur 8018-C1 MR E8018-C1 H4R	<b>Low Alloy Steel</b> Excalibur 8018-C1 MR is the ideal moisture resistant electrode for welding on equipment and pipe that transport liquid ammonia, propane and other gases. An excellent all posi-	DC± AC	70-110 80-120	90-160 100-160	130-210 140-210	180-300 200-300	250-330 270-370	300-400 325-430	
Sub 8-H48         Mate brails except and higher         Herein H4-B00 M2         DF-40 M3 Rescale designed to met the ruporous demands of high temperature, high possible (AH M1 mode)         DC-4         -         101-150         130-150         130-120         -	Excalibur 8018-C3 MR E8018-C3 H4R Excalibur 9018-M MR	Excalibur 8018-C3 MR is a 1% nickel all position electrode for fabrication or repair of 1% nickel steels, as well as a wider variety of other low alloy and carbon steels. Excalibur 9018-M MR is intended for welding high strength steels of 90,000 psi (620	DC± AC DC+	70-110 80-120 70-110	90-160 100-160 90-160	130-210 140-210 130-210	180-300 200-300 180-300	250-330 270-370 —	300-400 325-420 —	
9018-6 H48       midpletarum digost and metals the regularizations (0,000 ps) states.         9018-6 H48       If your welding incrives 1-1/45, commium and 12% more defining extended in lifers at 1-14%       DC-       70-110       100-441       20-150            8018-82 H48       Restings, you'll eval, LeH 6018-B2M Ras your welding electrode in this sile chards when operating temperatures exceed 8007 (45°°C).       Bit LH 8018 C1 M41       20-150   10-150       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120       180-120	E9018-M H4R Ietweld L <b>H-90 MR</b> E8018-B2 H4R	Mpa) tensile strength and higher. LH-90 MR was designed to meet the rigorous demands of high temperature, high pressure piping assignments. This electrode offers a nominal 1-1/4% chromium, 1/2%	DC+ AC		110-150 120-170	130-190 140-225	180-270 210-290			
bit	9018-G H4R Iet-LH 8018-B2 MR 8018-B2 H4R	molybdenum deposit and meets the requirements of high tensile (90,000 psi) steels. If your welding involves 1-1/4% chromium and 1/2% moly pipe, tubes, boilers or castings, you'll want Jet-LH 8018-B2 MR as your welding electrode. It offers a 1-1/4%	DC+ AC	70-110 85-120	100-140 110-150	120-190 135-200				
Inckel deposit.         Inckel dep	let-LH 8018-C1 MR E8018-C1 H4R	temperatures exceed 850°F (450°C). Jet-LH 8018-C1 MR has outstanding impact properties. This is the the ideal electrode for welding on equipment and pipe that will transport liquid ammonia, propane and other gases. An excellent all-position electrode for applications requiring a nominal 2-1/4%	DC+ AC		90-150 110-160	120-180 140-200	180-270 200-300		250-350 300-400	
applications. A good choice for welding on weathering type steels. det-LH 9018-B3 MR Signa C and the served and stress relieved condition. A great choice when temperatures exceed SSOF (4Go <sup>+</sup> C). detweld LH-110M MR yeneral diabrication or regari when he welding chi stread for welding high tensile steels such as 1-1 steel and H-80. Jetweld LH-110M MR is also a great match for any general diabrication or regari when the welde deposit inst must meet AWS E11018-M. FILI Freeze, Out: Of-Position Pipe Welding, Mild Steel & Low Alloy Fileetweld SP Eicetweld SP Eicetwe	Jet-LH 8018-C3 MR E8018-C3 H4R	nickel deposit. An excellent stick electrode with excellent impact properties. Jet-LH 8018-C3 MR produces a nominal 1% nickel deposit that is a great fit for a wide range of welding	DC+ AC		110-150 120-170	130-190 140-225	180-270 210-290	250-330 270-370	300-400 325-420	
BSDP (450°C).BSDP	let-LH 9018-B3 MR 9018-B3 H4R	applications. A good choice for welding on weathering type steels. Great low hydrogen stick electrode. For welding 2-1/4% chromium and 1% molybdenum steels when heat treating is required. Good mechanical properties in the as-welded and stress relieved condition. A great choice when temperatures exceed	DC+ AC	70-100 85-120	100-140 110-150	120-190 135-200	_			
Fill Freeze, Out-Of-Position Pipe Welding, Mild Steel & Low Alloy         Fleetweld 5P       Fleetweld 5P is a great choice for welding on dirty, rusty, greasy or painted steel —       DC+       40-70       75-130       90-175       140-225       200-275       220-325         Fleetweld 5P- 6010       Lincoln's Fleetweld 5P+ is ideal for steel that's less than clean. It's a first choice for pipe welding, and vertical-up and overhead plate welding. This electrode is a long-time favorite among operators who handle cross-country and in-plant pipe welding.       DC+       40-70       65-130       90-175       140-225       —       —         Shield-Arc 69       85       Need a reliable, all-position stick electrode for high tensile steel pipe? Here's your electrode 1/2% molybdenum pipe steels and API 5LX-42 through X-56 line pipe.       DC+       50-90       75-130       90-175       140-225       —       —         Shield-Arc 709- 7010-A1       me are aliable, all-position stick electrode for high tensile steel pipe? Here's your use on 1/2% molybdenum pipe steels and API 5LX-52 through X-56 line pipe.       DC+       -       75-130       90-185       140-225       -       -         Shield-Arc 70+ electrode.       Tendency for "fingernaling" and electrode sticking have been virtually eliminated! rouse on 1/2% molybdenum pipe steels and API 5LX-52 through X-76 line pipe.       DC+       -       75-130       90-185       140-225       -       -         Shield-Arc	<b>Jetweld LH-110M MR</b> E11018-M H4R	You'll especially like this all-position electrode for jobs that call for welding high tensile steels such as T-1 steel and HY-80. Jetweld LH-110M MR is also a great match for any general fabrication or repair where the weld deposit must meet AWS E11018-M.	DC+ AC	70-100 80-110	90-155 100-170	120-190 135-225	160-280 200-310	190-310 240-350	230-360 290-410	
debut       especially in vertical or overhead applications.         Heteweld 5P+ 6010       Lincoln's Fleetweld 5P + is ideal for steel that's less than clean. It's a first choice for pipe favorite among operators who handle cross-country and in-plant pipe welding.       DC+       40-70       65-130       90-175       140-225       —       —         Shield-Arc 69       85       Need a reliable, all-position stick electrode for high tensile steel pipe? Here's your electrode! Shield-Arc 85 produces a 70,000 psi, 1/2% molybdenum weld deposit for use on 1/2% molybdenum pipe steels and API 5LX-42 through X-56 line pipe.       DC+       50-90       75-130       90-175       140-225       —       —         Shield-Arc 60       Shield-Arc 70+ and plications! Shield Arc 70 + is an outstanding choice for API 5LX-52 through X-56 line pipe.       DC+       —       75-130       90-185       140-225       —       —         Shield-Arc 70+ a8010-G       aplications! Shield Arc 70- grade pipe, as well as for a wide range of sheet metal welding assignments.       DC+       —       75-130       90-185       140-225       —       —         Shield-Arc 80       When your job involves vertical down welding on high strength pipe. Provides the welder with a clean, visible weld puddle and superior puddle control. A true E7010-P1 electrode.       DC+       —       75-130       90-185       140-225       —       —         Shield-Arc 80       When your job involves vertical do	Fill Freeze, Out	-Of-Position Pipe Welding, Mild Steel & Low Alloy Fleetweld 5P is a great choice for welding on dirty, rusty, greasy or painted steel —	DC+	40-70	75-130	90-175	140-225	200-275	220-325	
tavorite among operators who handle cross-country and in-plant pipe welding.Shield-Arc® 85Need a reliable, all-position stick electrode for high tensile steel pipe? Here's your electrode! Shield-Arc 85 produces a 70,000 psi, 1/2% molybdenum weld deposit for use on 1/2% molybdenum pipe steels and API 5LX-42 through X-56 line pipe.DC+50-9075-13090-175140-225——Shield-Arc HYP+ 7010-P1Tendency for "fingernailing" and electrode sticking have been virtually eliminated! electrode.DC+—75-13090-185140-225———Shield-Arc 70+ electrode.Tendency for "fingernailing" and electrode sticking have been virtually eliminated! electrode.DC+—75-13090-185140-225———Shield-Arc 70+ electrode.Tendency for "fingernailing" and electrode that makes short work of even the most challenging high silicon pipe applications! Shield Arc 70+ is an outstanding choice for API 5LX-56 through X-70 grade pipe, as well as for a wide range of sheet metal welding assignments.DC+—75-13090-185140-225——Shield-Arc 80 8010-GWhen your job involves vertical down welding on high strength pipe, reach for Lincoln's Shield-Arc 80 electrode. This dependable stick electrode offers the perfect combination of low temperature impact properties and deep penetration. It handles all passes on API 5LX-56 through X-70 pipe. Excellent "stacking" ability is a feature of Shield-Arc 80, that maximizes productivity on the job site. Also meets AWS E8010-P1 requirements.DC+—75-13090-185140-225——Shield-Arc 90 of low tempera	Eleetweld 5P+ E6010	especially in vertical or overhead applications. Lincoln's Fleetweld 5P+ is ideal for steel that's less than clean. It's a first choice for pipe welding, and vertical-up and overhead plate welding. This electrode is a long-time	DC+	40-70	65-130	90-175	140-225	_		
<th and="" column="" produc<="" product="" provided="" td=""><td><b>Shield-Arc® 85</b> 7010-A1</td><td>tavorite among operators who handle cross-country and in-plant pipe welding. Need a reliable, all-position stick electrode for high tensile steel pipe? Here's your electrode! Shield-Arc 85 produces a 70,000 psi, 1/2% molybdenum weld deposit for use on 1/2% molybdenum pipe steels and API 51 X-42 through X-56 line pipe.</td><td>DC+</td><td>50-90</td><td>75-130</td><td>90-175</td><td>140-225</td><td>_</td><td>_</td></th>	<td><b>Shield-Arc® 85</b> 7010-A1</td> <td>tavorite among operators who handle cross-country and in-plant pipe welding. Need a reliable, all-position stick electrode for high tensile steel pipe? Here's your electrode! Shield-Arc 85 produces a 70,000 psi, 1/2% molybdenum weld deposit for use on 1/2% molybdenum pipe steels and API 51 X-42 through X-56 line pipe.</td> <td>DC+</td> <td>50-90</td> <td>75-130</td> <td>90-175</td> <td>140-225</td> <td>_</td> <td>_</td>	<b>Shield-Arc® 85</b> 7010-A1	tavorite among operators who handle cross-country and in-plant pipe welding. Need a reliable, all-position stick electrode for high tensile steel pipe? Here's your electrode! Shield-Arc 85 produces a 70,000 psi, 1/2% molybdenum weld deposit for use on 1/2% molybdenum pipe steels and API 51 X-42 through X-56 line pipe.	DC+	50-90	75-130	90-175	140-225	_	_
Shield-Arc 70+ applications! Shield Arc 70+ is an outstanding choice for API 5LX-56 through X-70 grade pipe, as well as for a wide range of sheet metal welding assignments.DC+—75-13090-185140-225——Shield-Arc 80 :8010-GWhen your job involves vertical down welding on high strength pipe, reach for Lincoln's Shield-Arc 80 electrode. This dependable stick electrode offers the perfect combination of low temperature impact properties and deep penetration. It handles all passes on API 5LX-56 through X-70 pipe. Excellent "stacking" ability is a feature of Shield-Arc 80, that maximizes productivity on the job site. Also meets AWS E8010-P1 requirements.DC+—75-13090-185140-225——Shield-Arc 90An all-position pipe electrode that's a great choice when the task is vertical down welding on API 5LX-70 through X-80 pipe. SA-90 also performs well in situations where low hydrogen processes are not practical, and when welding on dirty steels.DC+—75-13080-185140-225——	<b>Shield-Arc HYP+</b> 7010-P1	Tendency for "fingernailing" and electrode sticking have been virtually eliminated! Designed for all passes of API 5LX-52 through X-65 high strength pipe. Provides the welder with a clean, visible weld puddle and superior puddle control. A true E7010-P1 electrode.	DC+	_	75-130	90-185	140-225	_	_	
Shield-Arc 80When your job involves vertical down welding on high strength pipe, reach for Lincoln's Shield-Arc 80 electrode. This dependable stick electrode offers the perfect combination of low temperature impact properties and deep penetration. It handles all passes on API 5LX-56 through X-70 pipe. Excellent "stacking" ability is a feature of Shield-Arc 80, that maximizes productivity on the job site. Also meets AWS E8010-P1 requirements.DC+3.2 mm4.0 mm5.0 mmShield-Arc 90An all-position pipe electrode that's a great choice when the task is vertical down welding on API 5LX-70 through X-80 pipe. SA-90 also performs well in situations where low hydrogen processes are not practical, and when welding on dirty steels.DC+75-13080-185140-225	<b>Shield-Arc 70+</b> 8010-G	Here's an electrode that makes short work of even the most challenging high silicon pipe applications! Shield Arc 70+ is an outstanding choice for API 5LX-56 through X-70 grade pipe, as well as for a wide range of sheet metal welding assignments.	DC+	_	75-130	90-185	140-225	_	_	
maximizes productivity on the job site. Also meets AWS E8010-P1 requirements.Shield-Arc 90An all-position pipe electrode that's a great choice when the task is vertical down welding on API 5LX-70 through X-80 pipe. SA-90 also performs well in situations where low hydrogen processes are not practical, and when welding on dirty steels.3/32" 1/8"5/32" 3/16" 7/32" 1/4"DC+—75-13080-185140-225—	<b>Shield-Arc 80</b> E8010-G	When your job involves vertical down welding on high strength pipe, reach for Lincoln's Shield-Arc 80 electrode. This dependable stick electrode offers the perfect combination of low temperature impact properties and deep penetration. It handles all passes on API 5LX-56 through X-70 pipe. Excellent "stacking" ability is a feature of Shield-Arc 80, that	DC+	_	<b>3.2 mm</b> 75-130	<b>4.0 mm</b> 90-185	<b>5.0 mm</b> 140-225	-	_	
	Shield-Arc 90	An all-position pipe electrode that's a great choice when the task is vertical down welding on API 5LX-70 through X-80 pipe. SA-90 also performs well in situations where low hydrogen processes are not practical, and when welding on dirty steels	DC+	3/32"	<b>1/8"</b> 75-130	<b>5/32"</b> 80-185	<b>3/16"</b> 140-225	7/32"	1/4"	

#### Metal-To-Metal Wear

Wearshield MM	Martensitic deposit. Heat treatable weld metal. Can be tempered, annealed. Can be used on carbon and low alloy steels.	52-58	DC+ AC	_	90-130 90-130	140-180 140-180	170-220 170-220	
Wearshield T&D	Deposit similar to Type M-1 tool steel. Air hardening. Resists metal-to-metal wear up to 1000°F (538°C).	58-65	DC+ AC	80-100 80-100	110-130 110-130	130-160 130-160	_	_
Wearshield MI	Provides wear-resistant surface of martensite, with substantial retained austenite. Resists metal-to-metal wear, impact, mild abrasion. Can be used on carbon and low alloy steels.	50-58	DC+ AC	_	70-120 70-120	110-150 110-150	150-200 150-200	225-275 225-275
Wearshield Mangjet®	For building up austenitic manganese steel and cladding carbon steel. Pounding in service work hardens the deposit to develop maximum hardness and abrasion resistance (40-50 Rc).	17-20	DC± AC	_	_	120-180 125-210	160-260 175-275	200-350 225-375
Severe Impact								
Wearshield 15CrMn	For austenitic manganese steel to resist severe impact or gouging even in single layer over carbon steel, with excellent crack resistance. Joining of manganese steel to itself or carbon or low alloy steel. Work hardens to 40-50 Rc.	18-24	DC+ AC	_	140-160 140-160	190-210 190-210	220-250 220-250	_
Wearshield Frogmang®	Provides high alloy austenitic manganese steel buildup to resist severe impact. Specifically designed for rebuilding rail frogs and crossings. Work hardens to 44-55 Rc.	20-30	DC+ AC		110-140 120-150	140-175 150-180	125-225 185-213	235-280 235-270
Wearshield ABR	Versatile electrode producing good resistance to abrasion and moderate impact. Good hot-forging properties. Hardness will vary depending on cooling rate.	24-55	DC+ AC	_	40-150 50-165	75-200 80-220	110-250 120-275	150-375 165-410
<b>Abrasion Plus I</b>	mpact							
Wearshield 44	Moderate hardness to resist abrasion under impact at temperatures up to 1100°F (593°C). Good spalling resistance on two or more layers.	42-48	DC+ AC	_	120-160 130-160	150-220 180-220	190-270 220-260	_
Metal-To-Earth	Wear							
Wearshield ME	Use on carbon and low alloy steels, cast iron, austenitic manganese and austenitic stainless steels. Use BU or 15CrMn for preliminary layer(s).	49-59	DC± AC	_	125-175 130-170	175-250 180-220	220-300 230-270	_
Severe Abrasio	1							
Wearshield 60	Excellent abrasion resistance. Fuses to carbon, low alloy, stainless, manganese steel. Limit 2 layers. Use BU, Mangjet or 15CrMn for preliminary layer(s).	60-65	DC+ AC		100-140 110-150	130-180 140-200	210-250 230-270	
Wearshield 70	Resists very severe abrasion at temperatures up to 1400°F (760°C). Use with mild, low alloy, stainless and austenitic manganese steels. Limit 2 layers.	69	DC+ AC		125-165 120-160	160-230 160-210	220-300 230-300	
Wearshield SM80	Designed specifically for surfacing and resurfacing crushing rolls in the sugar cane industry.	45-60	DC± AC	_		150-240 160-250	210-270 220-280	
High Temperatu	re Non-Ferrous (Cobalt)							
Wearshield C1 & C1 Bare	Highest abrasion resistance of the cobalt alloys. Resists abrasion at room temperatures and when temperatures exceed the limits of iron base alloys [1,000-1,800°F (538-982°C)]. Can be used on screw conveyors moving hot materials (coke) in a corrosive environment. Available as a coated electrode for stick welding and bare rod for TIG or oxy-fuel applications.	50	DC+ AC	_	85-110 85-110	100-140 100-140	140-180 140-180	Ξ
Wearshield C6 & C6 Bare	Resists metal-to-metal wear with mild abrasion and erosion at room temperatures and when temperatures exceed the limits of iron base alloys [1,000-1,800°F (538-982°C)]. Used for valve seats and where galling is a problem. Coated electrode for arc welding or bare rod for TIG or oxy-fuel applications.	40	DC+ AC	_	85-110 85-110	100-140 100-140	140-180 140-180	_
Wearshield C21 & C21 Bare	Resists metal-to-metal wear in severe corrosive environments at room temperatures and when service temperatures exceed the limits of iron base alloys [1,000-1,800°F (538-982°C)]. Used for high temperature impact cavitation and galling resistance. Coated electrode for stick welding or bare electrode for TIG welding. Oxy-fuel is not recommended.	25	DC+ AC	_	85-110 85-110	100-140 100-140	140-180 140-180	_

## **STAINLESS STEEL**

Flectrode Name	General	Recm'd	Diameter & Current Ranges (Amps)				
& AWS Class	& AWS Class Description		3/32"	1/8"	5/32"	3/16"	
<b>Red Baron</b> ®							
Red Baron 308L MR E308L-16	Red Baron 308L MR is a low carbon version of Red Baron 308/308H MR, which gives it better resistance to intergranular corrosion than the higher carbon deposits. A good all-position stick electrode, except vertical down.	DC+ AC	40-70 40-70	60-100 60-100	90-140 90-140	120-185 120-185	
Red Baron 308/ 308L-V MR E308-15/E308L-15	Slag control is second to none with this stick electrode. Designed specially for vertical down welding of 304 and 304L stainless steels. Can also be used on other common austenitic stainless steels referred to as "18-8" steels. Low heat input makes this stick electrode perfect for joining thin gauge materials and pipe.	DC+	60-70	90-100			
Red Baron 308/ 308H MR E308-16/E308H-16	Red Baron 308/308H MR is intended for joining 304 and 304L stainless steels. Can also be used on other common austenitic stainless steels referred to as "18-8" stainless. Improved high temperature strength and exceptional all-position welding capability, except vertical down.	DC+ AC	40-70 40-70	60-100 60-100	90-140 90-140	120-185 120-185	
Red Baron 309/ 309L MR E309-16/E309L-16	This stick electrode is designed for joining stainless steels to carbon steels or stainless steels to low alloy steels. All-position electrode, except vertical down.	DC+ AC	40-70 40-70	60-100 60-100	90-140 90-140	120-185 120-185	
Red Baron 309/ 309L-V MR E309-15/E309L-15	Slag control is second to none with this stick electrode, designed specially for vertical down welding of stainless steels to carbon steels or stainless steels to low alloy steels. Low heat input makes this stick electrode a great choice for joining thin gauge materials and pipe.	DC+	60-70	90-100		_	
<b>Red Baron 310 MR</b> E310-16	Red Baron 310 MR electrode has a very high alloy content consisting of 25% chromium and 20% nickel. Ideal for joining types 310S and 310H wrought and type CK-20 castings in all welding positions, except vertical down.	DC+ AC	40-70 40-70	60-100 60-100	90-140 90-140	120-185 120-185	
Red Baron 316/ 316L MR E316-16	Red Baron 316/316L is designed for welding extra low carbon molybdenum bearing austenitic stainless steels, such as type 316 and 316L. Welds in all positions, except vertical down.	DC+	40-70	60-100	90-140	120-185	
Red Baron 316/ 316L-V MR E316-15/E316L-15	Red Baron 316/316L-V MR is designed specially for vertical down welding of extra low carbon molybdenum bearing austenitic stainless steels, such as type 316 and 316L. The low heat input of this electrode makes it a great choice for joining thin gauge materials and pipe.	DC+	60-70	90-100	_	_	
<b>Red Baron 347 MR</b> E347-16	This stick electrode is great for joining type 347 or 321 wrought steel and CF-8C cast steel. Added niobium (columbium) provides increased protection against chromium carbide precipitation along grain boundaries. Exceptional all-position welding, except vertical down.	DC+ AC	40-70 40-70	60-100 60-100	90-140 90-140	120-185 120-185	
Blue Max®							
Blue Max 308/ 308L AC-DC E308-17/E308L-17	Blue Max 308/308L stick electrode is ideally suited for joining 304 and 304L stainless steels. Can also be used on other common austenitic stainless steels referred to as "18-8". Designed for all-position welding, except vertical down.	DC+ AC	40-80 40-80	75-110 75-110	95-150 95-150	130-200 130-200	
Blue Max 309/ 309L AC-DC E308-17/E308L-17	Blue Max 309/309L stick electrode is ideally suited for joining carbon steels or low alloy steels to stainless steels. Designed for all-position welding, except vertical down.	DC+ AC	40-80 40-80	75-110 75-110	95-150 95-150	130-200 130-200	
Blue Max 316/ 316L AC-DC E308-17/E308L-17	Blue Max 316/316L stick electrode, with its distinctive blue coating, is for joining 316 and 316L stainless steels. Designed for all-position welding, except vertical down.	DC+ AC	40-80 40-80	75-110 75-110	95-150 95-150	130-200 130-200	
<b>Blue Max 347 AC-DC</b> E347-17	Blue Max 347 stick electrode, with its distinctive blue coating, contains ample niobium (columbium), which provides added corrosion protection over and above the protection from the low carbon content. Designed for all-position welding, except vertical down.	DC+ AC	40-80 40-80	75-110 75-110	95-150 95-150	130-200 130-200	
Blue Max 2100 —	Blue Max 2100 is designed for "hard-to-weld" applications. It provides high resistance to cracking, yet high strength when joining steels that are normally difficult to weld. Designed for all-position welding, except vertical down.	DC+ AC	40-80	75-110	95-150	_	

USTOMER	ASSISTANCE	POLICY

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric is not in a position to warrant or guarantee such advice, and assumes no liability, with respect to such information or advice. We expressly disclaim any warranty of fintness for any customer's particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice to the sale of our products.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

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#### IMPORTANT

Arc Welding is safe when sufficient measures are taken to protect the welder from potential hazards. Recognize and safeguard yourself against these hazards, such as electric shock, overexposure to arc radiation, fumes and gases. Every welder should be familiar the ANSI Z49.1 documents, "Safety in Welding and Cutting", available from the American Welding Society, Miami, Florida. Also request bulletins E205 "Arc Welding Safety" and E201 "Arc Welding Safety Chart", available from The Lincoln Electric Company.

#### CERTIFICATIONS

ISO 14001 and 9001 certified – manufactured to standards for environmental and quality management systems.



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