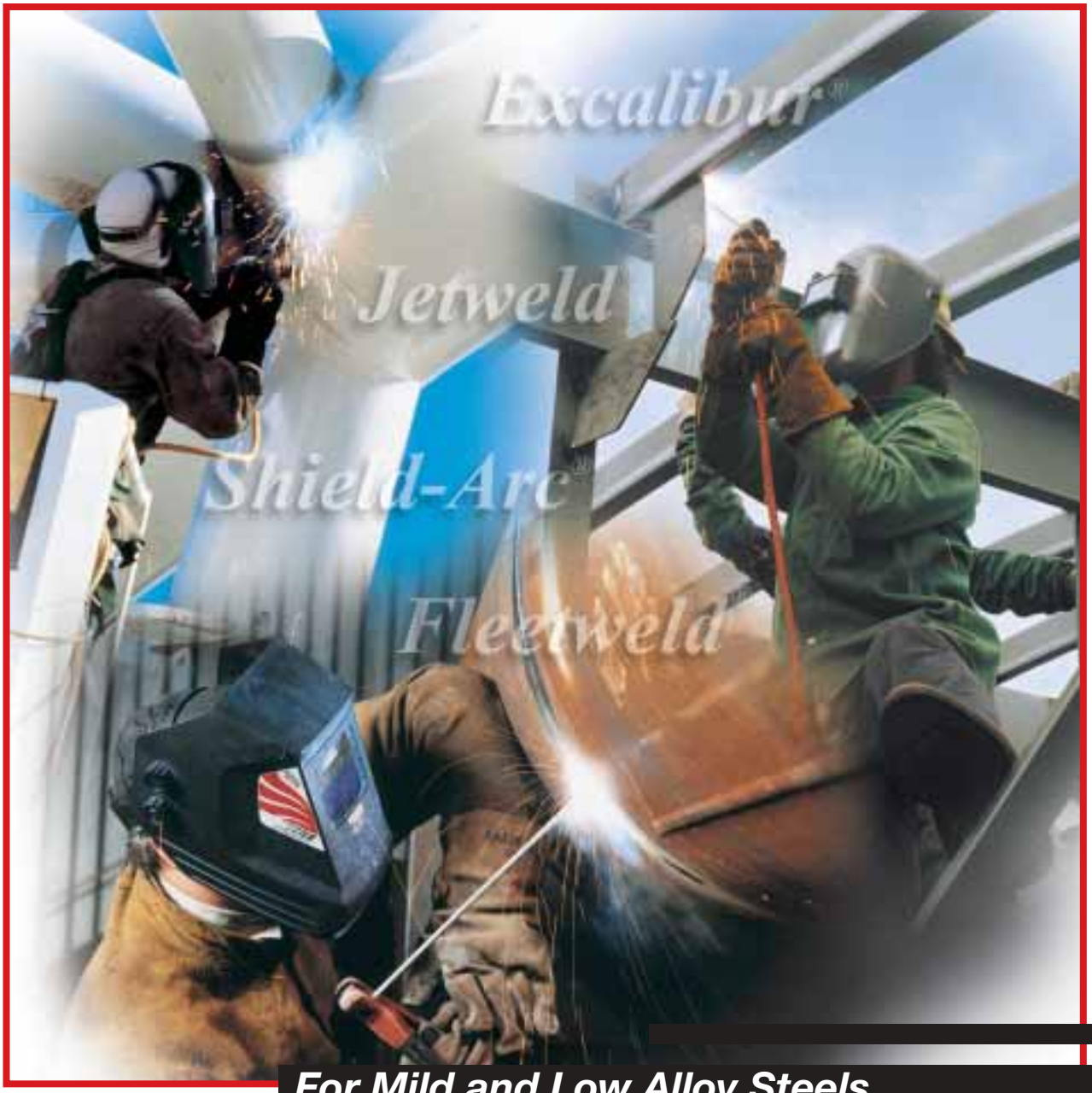
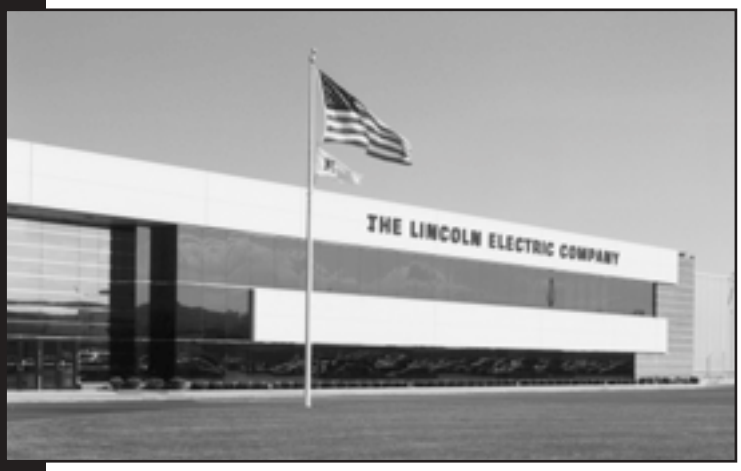
STICK ELECTRODE PRODUCT CATALOG



For Mild and Low Alloy Steels

LINCOLN® ELECTRIC
THE WELDING EXPERTS



About The Lincoln Electric Company

Lincoln Electric is the world's premier manufacturer of welding equipment and consumables. No company on earth is more focused on the ever-changing needs of the welding professional. Our business is all about helping companies make their welding operations more effective, more efficient, more profitable.

Lincoln is truly your "One Source" when it comes to welding. We're a company that continually rededicates itself to the equally important goals of exceptional quality, and exceptional service. Our field support team — with hundreds of field sales engineers and thousands of knowledgeable and responsive Lincoln distributors in countries all over the world — is the largest in the industry.

Innovative thinking. A quality and service-first attitude. Fresh approaches to design, manufacturing, and packaging. Worldwide strength.

That's Lincoln Electric.

Lincoln's Stick Electrode

When great welders want great stick electrodes, they reach for Lincoln!

We know you're counting on your electrode. That's why we're so focused on making the welding industry's best-performing, most value-packed line of stick electrode products. Before Lincoln Electric's name goes onto it, Lincoln Electric's unparalleled welding expertise goes into it.

Better Performance

Great puddle control and puddle clarity. Excellent wash-in characteristics. Low spatter. Good restrikeability. Those are the qualities you want in your electrode. And when you choose Lincoln Electric stick products, those are the qualities you get.

Better Chemistry

At Lincoln, every bundle of incoming raw steel to be used in our electrode products is meticulously checked for nineteen different elements before it enters our manufacturing systems. Then, we verify the chemistry of our electrode at more than a dozen separate points during the manufacturing process.

Better Manufacturing Systems

Lincoln Electric's sophisticated ISO 9001 manufacturing systems and quality control systems are proven models of efficiency and control. The results is an electrode of consistently superior quality — stick electrode after stick electrode.

Better Product Breadth

With some forty distinct products to choose from, there's a great Lincoln Electric stick electrode for whatever your job demands. This catalog will help you choose the right electrode for your project. Your local Lincoln Distributor can also be an excellent resource for you as you match job characteristics with electrode qualities.

It All Adds Up To Better Value

Industry-leading engineering and performance with less waste equals improved productivity and higher product quality.

Built and Backed by the Best Welding Company on Earth

Lincoln Electric stick electrodes are engineered, manufactured and backed by the most respected welding company on the planet. When quality, consistency and value matter, the world's most demanding welding professionals demand products by Lincoln Electric.

Contents **Page**

Product Introduction 2-3

Electrode Selection Guide 4-7

Fast Freeze, Out-of-position Stick Electrodes 8-11

Fast Fill, High Deposition Stick Electrodes 12-14

Fill Freeze, High Speed Stick Electrodes 15-17

Low Hydrogen, Mild Steel Stick Electrodes 18-25

Low Hydrogen, Low Alloy Steel Stick Electrodes 26-35

Pipe Welding Electrodes:

Fast Freeze, Out-of-position Pipe Welding Stick Electrodes 36-41

Packaging 42

Approvals..... 43

AWS Classifications 44-45

Storing and Re-drying Stick Electrodes 46-47

STICK ELECTRODE SELECTION GUIDE

Electrode Name	AWS Number	Recommended Polarity	General Description	Page No.
Fast Freeze, Out-of-Position, Mild Steel Stick Electrodes				
Fleetweld® 35	E6011	AC DC±	**Operators consistently give this electrode high marks.** This quality Lincoln product is a 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.	8
Fleetweld 35LS	E6011	AC DC±	**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 pipe welding, for applications that require deep penetration, and in jobs where x-ray quality welds are required.	9
Fleetweld 180	E6011	AC DC±	**Got a small AC welder? Here's your electrode!** Fleetweld 180 offers excellent arc stability 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.	10
Fleetweld 22	E6022	DC- AC	**Developed specifically for floor decking and other applications where burnthrough spot 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.	11
Fast-Fill, High Deposition, Mild Steel Stick Electrodes				
Jetweld® 1	E7024-1	AC DC±	**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 purpose electrode for single or multi-pass applications.	12
Jetweld 2	E6027	AC DC±	**When the job demands x-ray quality welds, high deposition rates, and excellent wash-in, reach for Jetweld 2.** We've designed Jetweld 2 for peak performance on multiple pass welds, and fast-fill single pass welds.	13
Jetweld 3	E7024	AC DC±	**Jetweld 3's high deposition rates, and smooth bead make it a great choice for welding on mild steel.** It is especially effective for multi-pass welds and fast-fill single pass welds.	14
Fill Freeze, High Speed, Mild Steel Stick Electrodes				
Fleetweld 7	E6012	DC- AC	**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.	15
Fleetweld 37	E6013	AC DC±	**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 position.	16

STICK ELECTRODE SELECTION GUIDE

Electrode Name	AWS Number	Recommended Polarity	General Description	Page No.
Fill Freeze, High Speed Mild Steel Stick Electrodes **(continued)**				
Fleetweld® 47	E7014	AC DC±	**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.	17
Low Hydrogen, Mild Steel Stick Electrodes				
Excalibur® 7018 MR	E7018 H4R	DC+ AC	**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 jobs that involve steels with poor weldability.	18
Excalibur 7018-1 MR	E7018-1 H4R	DC+ AC	**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 weldability.	19
Excalibur 7018-A1 MR	E7018-A1 H4R	DC+ AC	**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.	20
Lincoln 7018AC	E7018 H8	AC DC±	**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.	21
Jetweld® LH®-70	E7018 H4R	DC+ AC	**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.	22
Jet-LH® 78 MR	E7018 H4R	DC+ AC	**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.	23
Jetweld LH-73	E7018 H8	AC DC+	**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.	24
Jetweld® LH-3800	E7028 H8	AC DC+	**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).	25

Electrode Name	AWS Number	Recommended Polarity	General Description	Page No.
Low Hydrogen, Low Alloy Steel Stick Electrodes				
Excalibur® 8018-C1 MR	E8018-C1 H4R	DC+ AC	**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 position electrode for applications requiring a nominal 2-1/4% nickel deposit.	26
Excalibur 8018-C3 MR	E8018-C3 H4R	DC+ AC	**Excalibur 8018-C3 MR is a 1% nickel all position electrode for fabrication or repair** of 1% nickel steels, as well as a wide variety of other low alloy and carbon steels.	27
Excalibur 9018M MR	E9018-M H4R	DC+	**Excalibur 9018M MR is intended for welding high strength steels** of 90,000 psi (620 MPa) tensile strength and higher.	28
Jetweld LH-90 MR	E8018-B2 H4R E9018-G H4R	DC+ AC	**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% molybdenum deposit and meets the requirements of high tensile (90,000 psi) steels.	29
Jet-LH® 8018-B2 MR	E8018-B2 H4R	DC+ AC	**If your welding involves 1-1/4% chromium and 1/2% moly power pipe, tubes, boilers or casting, you'll want Jet-LH 8018-B2 MR as your welding partner.** It offers a 1-1/4% chromium and 1/2% molybdenum deposit. Reach for this electrode when operating temperatures exceed 850°F (450°C).	30
Jet-LH 8018-C1 MR	E8018-C1 H4R	DC+ AC	**Jet-LH 8018-C1 MR has outstanding impact properties.** This is 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% nickel deposit.	31
Jet-LH 8018-C3 MR	E8018-C3 H4R	DC+ AC	**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 applications. A good choice for welding on weathering type steels.	32
Jet-LH 9018-B3 MR	E9018-B3 H4R	DC+ AC	**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 850°F (450°C).	33
Jetweld® LH-110M MR	E11018-M H4R	DC+ AC	**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.	34

STICK ELECTRODE SELECTION GUIDE

Electrode Name	AWS Number	Recommended Polarity	General Description	Page No.
Fast Freeze, Out-of-Position Pipe Welding, Mild Steel and Low Alloy Steel Stick Electrodes				
Fleetweld® 5P	E6010	DC+	**Fleetweld 5P is a great choice for welding on dirty, rusty, greasy or painted steel** – especially in vertical or overhead applications.	35
Fleetweld 5P+	E6010	DC+	**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.	36
Shield-Arc® 85	E7010-A1	DC+	**Need a reliable, all-position stick electrode?** 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.	37
Shield-Arc HYP+	E7010-P1	DC+	**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.	38
Shield-Arc 70+	E8010-G	DC+	**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.	39
Shield-Arc 80	E8010-G	DC+	**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 maximizes productivity on the job site. Also meets AWS E8010-P1 requirements.	40
Shield-Arc 90	E9010-G	DC+	**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.	41

Operators consistently give this electrode high marks. This quality Lincoln product is a 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.

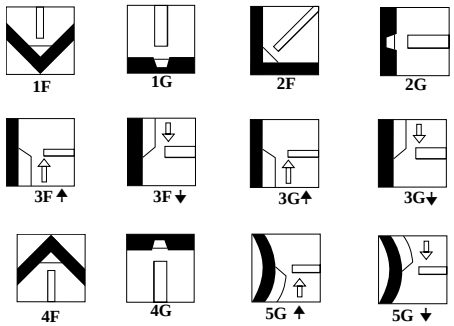
ADVANTAGE LINCOLN

- A general purpose electrode particularly good for vertical and overhead welding.
- Light slag with little slag interference for easy arc control.
- Deep penetration with high admixture.
- Capable of x-ray quality welds, even out-of-position.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Excellent for sheet metal welding on edge, corner and butt joints.
- Plated, dirty, painted or greasy steel which cannot be completely cleaned.
- Pipe welding — in-plant, and non-critical small pipe.
- All-position welding.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E6011[1]
ASME SFA-5.1: E6011
ABS: E6011
Lloyd's: Grade 3M

[1] *See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E6011	48,000 (331) min.	60,000 (414) min.	22 min.	20 (27) min.
Test Results				
As-welded	48,000 - 63,900 (331- 441)	60,000 - 78,000 (414 - 538)	22-34	20 - 76 (27 - 103)
Stress-relieved [2] 1 hr @ 1150°F (620°C)	46,000 - 56,000 (317 - 386)	60,000 - 66,000 (414 - 455)	28-36	—

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7kg) Carton
3/32 (2.4)	ED010128	ED028152
1/8 (3.2)	ED010122	ED028153
5/32 (4.0)	ED010131	ED028154
3/16 (4.8)		ED028155
7/32 (5.6)		ED028156
1/4 (6.4)		ED028157

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
AC	50-85	75-120	90-160	120-200	150-260	190-300
DC+	40-75	70-110	80-145	110-180	135-235	170-270
DC-	40-75	70-110	80-145	110-180	135-235	170-270

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1]

	%C	%Mn	%Si	%S	%P
Requirements AWS E6011	Not Specified				
Test Results	.12-.18	.45-.60	.14-.20	.003-.015	.005-.015

[1] Typical all weld metal.

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 pipe welding, for applications that require deep penetration, and in jobs where x-ray quality welds are required.

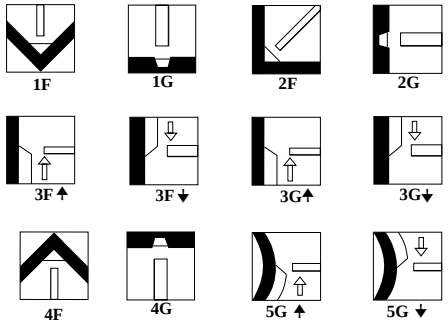
ADVANTAGE LINCOLN

- General purpose electrode particularly good for vertical and overhead welding.
- Light slag with little slag interference for easy arc control.
- Deep penetration with high admixture.
- Capable of x-ray quality welds, out-of-position.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Galvanized, plated, dirty, painted or greasy steel which cannot be completely cleaned.
- Pipe welding — in-plant, and non-critical small pipe.
- Vertical up and overhead welding.
- Joints requiring deep penetration such as square edge groove welds.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E6011[1]
ASME SFA-5.1: E6011
CSA W48: E4311

[1]*See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E6011	48,000 (331) min.	60,000 (414) min.	22 min.	20 (27) min.
Test Results				
As-welded	48,000 - 54,900 (331 - 379)	60,000 - 67,400 (414 - 465)	22 - 34	20 - 50 (27 - 68)
Stress-relieved [2] 1 hour @ 1150°F (620°C)	46,000 - 51,000 (317 - 352)	60,000 - 65,000 (414 - 448)	28 - 33	—

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Carton
1/8 (3.2)	ED028158
5/32 (4.0)	ED028159

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/8" (3.2mm)	5/32" (4.0mm)
AC	80 - 130	120 - 160
DC+	70 - 120	110 - 150
DC-	70 - 120	110 - 150

NOTE: Preferred polarity is listed first

DEPOSIT COMPOSITION [1]

	%C	%Mn	%Si	%S	%P
Requirements AWS E6011			Not Specified		
Test Results	.07-.11	.55-.65	.06-.09	.015 max.	.015 max.

[1] Typical all weld metal.

Got a small AC welder? Here's your electrode! Fleetweld 180 offers excellent arc stability 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.

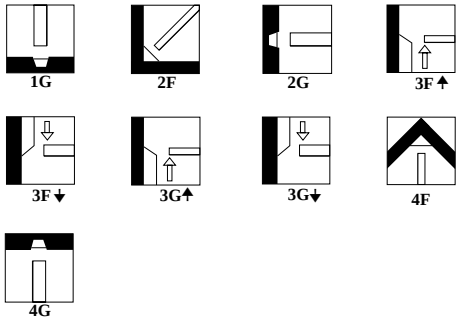
ADVANTAGE LINCOLN

- An all-position electrode particularly good for vertical and overhead.
- Light slag with little slag interference for easy arc control.
- Deep penetration with maximum admixture.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Great for use with small AC welders.
- Excellent for sheet metal welding on edge, corner and butt joints.
- Plated, dirty, painted or greasy steel which cannot be completely cleaned.
- All-position welding.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E6011[1]
ASME SFA-5.1: E6011
CSA W48: E4311

[1]*See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E6011	48,000 (331) min.	60,000 (414) min.	22 min.	20 (27) min.
Test Results As-welded	48,000 - 70,000 (331 - 480)	60,000 - 84,000 (414 - 579)	22 - 35	20 - 53 (27 - 72)

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	5 Lb. (2.3 kg) Carton (40 Lb. Master)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7kg) Easy Open Cans
3/32 (2.4)	ED030155		ED010110
1/8 (3.2)	ED030156	ED010103	ED010105
5/32 (4.0)	ED030157		ED010114

TYPICAL OPERATING PROCEDURES

Polarity	(Current) Amps 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)
AC	40-90	60-120	115-150
DC+	40-80	55-110	105-135
DC-	40-80	55-110	105-135

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1]

	%C	%Mn	%Si	%S	%P
Requirements AWS E6011	.		Not Specified		
Test Results	.10-.18	.40-.70	.25-.50	.005-.020	.005-.015

[1] Typical all weld metal.

Developed specifically for floor decking and other applications where burnthrough spot 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.

ADVANTAGE LINCOLN

- Light slag with little slag interference for easy arc control.
- Deep penetration with maximum admixture.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Designed specifically for floor decking to beams with burnthrough spot welds and similar applications.
- Galvanized, plated, dirty, painted or greasy sheet steel which cannot be completely cleaned.
- Joints requiring deep penetration such as square edge butt welds.

WELDING POSITIONS

CONFORMANCE

AWS A5.1: E6022[1]
ASME SFA-5.1: E6022

[1]See Notes 1 and 2 on page 44.

MECHANICAL PROPERTIES - As Welded per AWS A5.1-91

	Yield Strength psi (MPa)	Tensile Strength[1] psi (MPa)	Longitudinal Bend Test
Required AWS E6022	Not Specified	60,000 (414) min.	Required
Test Results As-welded	—	60,000 - 82,000 (414 - 565)	Pass

[1] Transverse tension.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Carton
1/8 (3.2)	ED021896
5/32 (4.0)	ED021895

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/8" (3.2mm)	5/32" (4.0mm)
DC-	110-150	150-180
AC	110-150	150-180

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1]

	%C	%Mn	%Si	%S	%P
Requirements AWS E6022			Not Specified		
Test Results	.17	.93	.02	.009	.03

[1] Typical all weld metal.

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 purpose electrode for single or multi-pass applications.

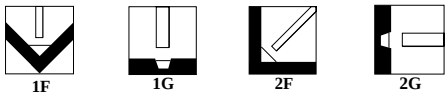
ADVANTAGE LINCOLN

- Excellent deposition rates.
- Smooth beads with minimal spatter.
- Easy slag removal.
- Shallow penetration for minimum dilution.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Best choice when large welds are required.
- Flat and slightly downhill (15° max.) positions.
- For multiple pass welds including fillets and deep groove joints.
- Impacts @ 0° F (-18°C).

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7024-1[1]
ASME SFA-5.1: E7024-1
ABS: E7024-1
Lloyd's: Grade 1M
DNV: Grade 1
GL: Grade 1
BV: Grade 1
CSA W48: E4924-1

[1] See Note 2 on page 44.

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ 0°F (-18°C)
Required AWS E7024-1 As-welded	58,000 (399) min.	70,000 (482) min.	22 min.	20 (27) min.
Test Results				
As-welded	58,000 - 79,000 (399 - 545)	70,000 - 86,000 (482 - 593)	22 - 31	20 - 44 (27 - 60)
Stress-relieved[2] 1 hr @ 1150°F (620°C)	63,000 - 66,000 (434 - 455)	74,000 - 79,000 (510 - 545)	23 - 27	25 - 35 (34 - 47)

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Carton
3/32 (2.4)	ED010369
1/8 (3.2)	ED010362
5/32 (4.0)	ED010372
3/16 (4.8)	ED010366
7/32 (5.6)	ED010375
1/4 (6.4)	ED010360

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
AC	65-120	115-175	180-240	240-300	300-380	340-440
DC+	60-110	100-160	160-215	220-280	270-340	320-400
DC-	60-110	100-160	160-215	220-280	270-340	320-400

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.1-91*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7024-1	Not Specified	1.25 max.	.90 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.05-.10	.70-1.00	.30-.90	.005-.020	.010-.020	.01-.06	<.01	.05-.17	.01-.03

[1] Typical all weld metal.

When the job demands x-ray quality welds, high deposition rates, and excellent wash-in, reach for Jetweld 2. We've designed Jetweld 2 for peak performance on multiple pass welds, and fast-fill single pass welds.

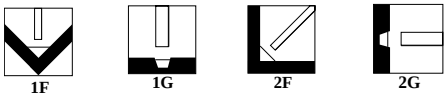
ADVANTAGE LINCOLN

- Excellent deposition rates.
- Smooth beads with minimal spatter.
- Easy slag removal — easy to remove.
- Shallow penetration for minimum dilution.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Made especially for welding mild steels.
- Flat and horizontal positions.
- For multiple pass welds including fillets and deep groove welds.
- "Fast-Fill" single pass welds such as production fillets.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E6027[1]
ASME SFA-5.1: E6027
ABS: E6027
Lloyd's: Grade 3M
DNV: Grade 3
GL: Grade 3
BV: Grade 3

[1] *See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E6027 As-welded	48,000 (331) min.	60,000 (414) min.	22 min.	20 (27) min.
Test Results				
As-welded	48,000 - 60,000 (331 - 414)	60,000 - 72,000 (414 - 496)	22 - 35	20 - 54 (27 - 73)
Stress-relieved[2] 1 hour @ 1150°F (620°C)	50,000 - 59,000 (344 - 407)	62,000 - 70,000 (427 - 480)	25 - 32	—

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Carton
5/32 (4.0)	ED010502
3/16 (4.8)	ED010501
1/4 (6.4)	ED010500

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 5/32" (4.0mm)	3/16" (4.8mm)	1/4" (6.4mm)
AC	190 - 240	250 - 300	350 - 450
DC+	175 - 215	230 - 270	315 - 405
DC-	175 - 215	230 - 270	315 - 405

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1]

	%C	%Mn	%Si	%S	%P
Requirements AWS E6027	Not Specified				
Test Results	.05-.10	.65-.95	.15-.30	.010-.025	.015-.025

[1] Typical all weld metal.

Jetweld 3's high deposition rates, and smooth bead make it a great choice for welding on mild steel. It is especially effective for multi-pass welds and fast-fill single pass welds.

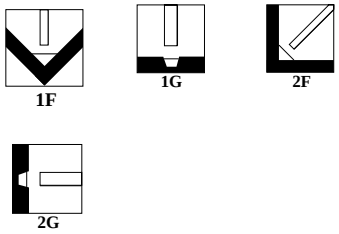
ADVANTAGE LINCOLN

- Excellent deposition rates.
- Smooth, ripple-free beads with minimal spatter.
- Easy slag removal — heavy slag tends to peel off.
- Shallow penetration for minimum dilution.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Made especially for welding mild steels.
- Flat and slightly downhill (15° max.) positions.
- For multiple pass welds including fillets and deep groove butt joints.
- "Fast-Fill" single pass welds such as production fillets and laps.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7024[1]
ASME SFA-5.1: E7024
ABS: E7024
DNV: Grade 1
GL: Grade 1
BV: Grade 1

[1]*See Notes 1 and 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)
Required AWS E7024 As-welded	58,000 (399) min.	70,000 (482) min.	17 min.
Test Results			
As-welded	58,000 - 75,000 (399 - 517)	70,000 - 95,000 (482 - 655)	17 - 29
Stress-relieved[2] 1 hour @ 1150°F (620°C)	65,000 - 71,000 (448 - 489)	77,000 - 81,000 (531 - 558)	22 - 23

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Carton
3/32 (2.4)	ED010529
1/8 (3.2)	ED010521
5/32 (4.0)	ED010533
3/16 (4.8)	ED010525
7/32 (5.6)	ED010536
1/4 (6.4)	ED010518

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
AC	65-120	115-175	180-240	240-315	300-380	350-450
DC+	60-110	100-160	160-215	215-285	270-340	315-405
DC-	60-110	100-160	160-215	215-285	270-340	315-405

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.1-91*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7024	Not Specified	1.25 max.	.90 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.05-.10	.60-1.00	.60-.90	.005-.020	.010-.020	.01-.06	<.01	.05-.15	.01-.05

[1] Typical all weld metal.

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.

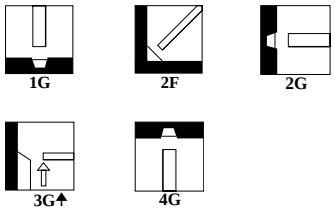
ADVANTAGE LINCOLN

- An all-position electrode for the welding of mild steel.
- Excellent choice for sheet metal fillet welds and lap joints, especially with diameters up to 3/16" (4.8 mm).
- Superb fast follow characteristics, and operation on poor fit-up joints.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Sheet metal lap and fillet welds.
- Irregular or short welds that change direction or position, and downhill fillets and laps.
- General purpose plate welding in production and maintenance, especially when one electrode is used for a variety of work.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E6012[1]
ASME SFA-5.1: E6012
ABS: E6012

[1]See Notes 1 and 2 on page 44.

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)
Required AWS E6012 As-welded	48,000 (331) min.	60,000 (414) min.	17 min.
Test Results As-welded	48,000 - 70,000 (331 - 480)	60,000 - 78,000 (414 - 538)	17 - 26
Stress-relieved[2] 1 hr @ 1150°F (620°C)	55,000 - 73,000 (379 - 503)	67,000 - 84,000 (462 - 482)	17 - 24

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Carton
1/8 (3.2)	ED010319
5/32 (4.0)	ED010327
3/16 (4.8)	ED010323
7/32 (5.6)	ED010330
1/4 (6.4)	ED010315

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
DC-	80-135	110-180	155-250	225-295	245-325
AC	90-150	120-200	170-275	250-325	275-360

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1]

	%C	%Mn	%Si	%S	%P
Requirements AWS E6012			Not Specified		
Test Results	.05 - .15	.30 - .45	.20 - .35	.005 - .015	.005 - .015

[1] Typical all weld metal.

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 position.

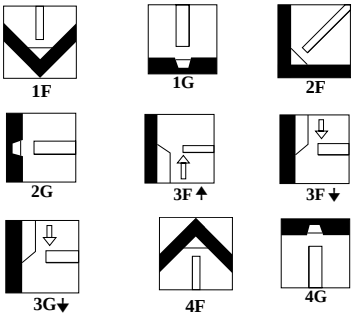
ADVANTAGE LINCOLN

- An all position electrode for the welding of mild steel.
- Excellent choice for sheet metal lap and fillet welds.
- Superior slag control, which makes it a great choice for vertical down.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Sheet metal lap and fillet welds.
- Irregular or short welds that change direction or position, and downhill fillets and laps.
- General purpose plate welding and maintenance.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E6013[1]
ASME SFA-5.1: E6013
ABS: E6013 DNV: Grade 1
Lloyd's: Grade 3M GL: Grade 1
CSA W48: E4313 BV: Grade 1

[1]See Notes 1 and 2 on page 44.

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)
Required AWS E6013 As-welded	48,000 (331) min.	60,000 (414) min.	17 min.
Test Results As-welded	48,000 - 70,000 (331 - 482)	60,000 - 78,000 (414 - 538)	25 - 32

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	5 Lb. (2.3 kg) Carton (40 Lb. Master)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7 kg) Carton
1/16 (1.6)	ED030305		
5/64 (2.0)	ED030161		ED010170
3/32 (2.4)	ED030162	ED010159	ED010161
1/8 (3.2)	ED030163	ED010151	ED010153
5/32 (4.0)	ED030164		ED010165
3/16 (4.8)			ED010156

DEPOSIT COMPOSITION [1]

	%C	%Mn	%Si	%S	%P
Requirements AWS E6013	Not Specified				
Test Results	.05-.10	.35-.50	.15-.25	.005-.020	.005-.020

[1] Typical all weld metal.

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/16" (1.6mm)	5/64" (2.0mm)	3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
AC	20-45	50-80	75-105	110-150	160-200	205-260
DC+	20-45	45-75	70-95	100-135	145-180	190-235
DC-	20-45	45-75	70-95	100-135	145-180	190-235

NOTE: Preferred polarity is listed first.

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.

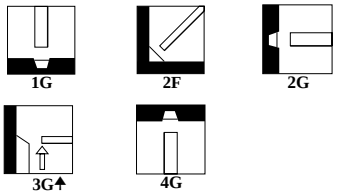
ADVANTAGE LINCOLN

- An all position electrode for the welding of mild steel.
- Easy to use with excellent operator appeal.
- Excellent choice for sheet metal lap and fillet welds, especially diameters up to 3/16" (4.8 mm).
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Sheet metal lap and fillet welds.
- Generally used for thicker steel than E6012 and E6013 electrodes.
- General purpose and maintenance welding.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7014[1]
ASME SFA-5.1: E7014
ABS: E7014
Lloyd's: Grade 1M
DNV: Grade 1
GL: Grade 1
BV: Grade 1
CSA W48: E4914

[1]See Notes 1 and 2 on page 44.

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)
Required AWS E7014 As-welded	58,000 (399) min.	70,000 (482) min.	17 min.
Test Results As-welded	58,000 - 74,000 (399 - 510)	70,000 - 83,000 (482 - 572)	17 - 29
Stress-relieved[2] 1 hr @ 1150°F (620°C)	55,000 - 70,000 (379 - 482)	67,000 - 77,000 (461 - 530)	24 - 30

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	5 Lb. (2.3 kg) Carton (40 Lb. Master)	50 Lb. (22.7 kg) Carton
3/32 (2.4)	ED030168	ED010189
1/8 (3.2)	ED030169	ED010183
5/32 (4.0)	ED030170	ED010193
3/16 (4.8)		ED010186
7/32 (5.6)		ED010195

TYPICAL OPERATING PROCEDURES

	Current (Amps)				
Polarity	3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)
AC	80-100	110-160	150-225	200-280	260-340
DC+	75-95	100-145	135-200	185-235	235-305
DC-	75-95	100-145	135-200	185-235	235-305

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.1-91*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7014	Not Specified	1.25 max.	.90 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.06-.11	.25-.55	.40-.65	.01-.02	.005-.010	.02-.06	.005-.02	.02-.10	.01-.02

[1] Typical all weld metal.

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 jobs that involve steels with poor weldability.

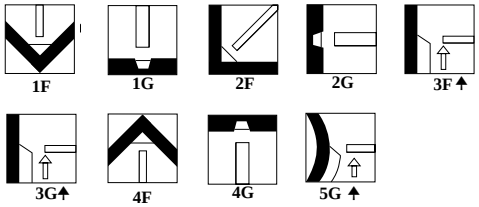
ADVANTAGE LINCOLN

- Designed for welding mild steel, low alloy steels and steels of poor weldability.
- Capable of x-ray quality welds.
- Ability to tie-in to side walls without undercutting, especially for critical out-of-position applications.
- Clean weld puddle and uniform slag follow make it easy for the welder to "see" and carry the puddle.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Structural steel and bridges.
- All-position welding of mild steels, some high strength, low alloy steels.
- Tolerates steels with poor weldability, such as high sulfur and high silicon steels.
- Welding of piping, fittings, and tie-ins in the petrochemical and power generation industries.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7018, E7018 H4R
ASME SFA-5.1: E7018, E7018 H4R
ABS: E7018M, 3, 3YH5
Lloyd's: 3M, 3YMH5
DNV: 3YH5
GL: 3YH5
BV: 3YHHH
CSA W48: E4918

MECHANICAL PROPERTIES - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbf (Joules) @ -20ºF (-29ºC)
Required AWS E7018 H4R	58,000 (399) min.	70,000 (482) min.	22 min.	20 (27) min.
Test Results				
As-welded	58,000 - 74,000 (399 - 510)	70,000 - 87,000 (482 - 600)	22 - 35	20 - 220 (27 - 298)
Stress relieved[1] 1 hour @ 1150°F (620°C)	56,000 - 64,000 (386 - 441)	72,000 - 74,000 (496 - 510)	32 - 38	204 - 263 (276 - 356)

[1] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED028481	ED028280
1/8 (3.2)	ED028482	ED028281
5/32 (4.0)	ED028483	ED028282
3/16 (4.8)	ED028484	ED028283
7/32 (5.6)		ED028917
1/4 (6.4)		ED028918

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
DC+	70-110	90-160	130-210	180-300	250-330	300-400
AC	80-120	100-160	140-210	200-300	270-370	325-420

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION - *As Required per AWS A5.1-91*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7018 H4R	Not Specified	1.60 max.	.75 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.04-.08	1.15-1.50	.30-.65	.005-.015	.010-.020	.01-.05	.01-.05	.01-.05	.001-.010

DIFFUSIBLE HYDROGEN - *As Required per AWS A5.1-91*

	(ml/100g weld deposit)
Requirements AWS E7018 H4R	<4 ml
Test Results	
3/32" (2.4 mm)	2.1
1/4" (6.4 mm)	2.9

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 weldability.

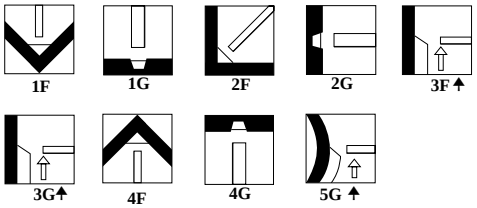
ADVANTAGE LINCOLN

- Designed for welding mild steel, low alloy steels and steels of poor weldability.
- Capable of x-ray quality welds.
- Ability to tie-in to side walls without undercutting, especially for critical out-of-position applications.
- Clean weld puddle and uniform slag follow make it easy for the welder to "see" and carry the puddle.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Structural steels and bridges.
- All position welding of mild steels, and some high strength, low alloy steels.
- Tolerates steels with poor weldability, such as high sulfur and high silicon steels.
- Welding of piping, fittings, and tie-ins in the petrochemical and power generation industries.
- Applications requiring -50˚F (-45˚C) toughness properties.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7018-1, E7018-1 H4R
ASME SFA-5.1: E7018-1, E7018-1 H4R
ABS: E7018M, 3, 3YH5
Lloyd's: 3M, 3YMH5
DNV: 3YH5
GL: 3YH5
BV: 3YHHH
CSA W48: E4918-1

MECHANICAL PROPERTIES - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -50°F (-46°C)
Required AWS E7018-1 H4R	58,000 (399) min.	70,000 (482) min.	22 min.	20 (27) min.
Test Results As-welded	58,000 - 79,000 (399 - 545)	70,000 - 91,000 (482 - 627)	22 - 35	20 - 130 (27 - 176)
Stress relieved[1] 1 hour @ 1150°F (620°C)	56,000 - 72,000 (386 - 496)	73,000 - 86,000 (503 - 593)	29 - 36	125 - 263 (169 - 356)

[1] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED028701	ED028700
1/8 (3.2)	ED028703	ED028702
5/32 (4.0)	ED028705	ED028704
3/16 (4.8)		ED028706
7/32 (5.6)		ED028919
1/4 (6.4)		ED028920

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
DC+	70-110	90-160	130-210	180-300	250-330	300-400
AC	80-120	100-160	140-210	200-300	270-370	325-420

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION - *As Required per AWS A5.1-91*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7018-1 H4R	Not Specified	1.60 max.	.75 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.04-.08	.80-1.50	.20-.65	.005-.015	.010-.020	.01-.05	.08-.25	.01-.05	.001-.010

DIFFUSIBLE HYDROGEN - *As Required per AWS A5.1-91*

	(ml/100g weld deposit)
Requirements AWS E7018-1 H4R	<4 ml
Test Results	
3/32" (2.4 mm)	2.1
1/4" (6.4 mm)	3.3

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.

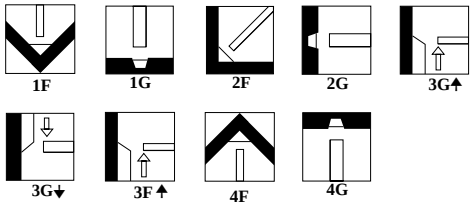
ADVANTAGE LINCOLN

- All position, moisture resistant, low hydrogen, low alloy electrode.
- Clean puddle and uniform slag follow make it easy to "carry" the puddle.
- Exceptional Excalibur operational characteristics, with smooth even burnoff, make Excalibur 7018-A1 MR the ideal choice for critical out-of-position applications.
- CTOD tested.
- High operator appeal with superior tie-in at weld bead edges.
- Resistant to fingernailing in critical out-of-position joints.
- Flexible coating means less breakage.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Fabrication and maintenance welding of pressure vessels and pressure piping of 0.5% molybdenum steels.
- Application requiring weld metal stress-relieved properties.
- High service temperature applications.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E7018-A1 H4R
ASME SFA-5.5: E7018-A1 H4R
ABS: E7018-A1 H4R
CSA W48: E4918-A1

MECHANICAL PROPERTIES – *Stress Relieved per AWS A5.5.96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20°F (-29°C)
Required AWS E7018-A1 H4 Stress relieved 1hour @1150ºF (620ºC)	57,000 (390) min.	70,000 (480) min.	25 min.	—
Test Results Stress relieved 1 hour @1150ºF (620ºC)	57,000 - 70,000 (390 - 480)	70,000 - 83,000 (480 - 572)	25 - 31	50 - 185 (68 - 251)

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7kg) Easy Open Cans
3/32 (2.4)	ED030865	ED030862
1/8 (3.2)	ED030866	ED030863
5/32 (4.0)	ED030867	ED030864

TYPICAL OPERATING PROCEDURES

	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)
DC+	70 - 110	90 - 160	130 - 210
AC	80 - 120	100 - 160	140 - 210

DEPOSIT COMPOSITION – *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%Mo	%S	%P
Requirements AWS E7018-A1	.12 max.	.90 max.	.80 max.	.40-.65	.03 max.	.03 max.
Test Results	.03-.06	.50-.75	.20-.35	.45-.60	.005-.015	.010-.020

DIFFUSIBLE HYDROGEN

- As Required per AWS A5.5-96

	(ml/100g weld deposit)
Requirements AWS E7018-A1 H4R	<4 ml
Test Results	
3/32" (2.4mm)	1.2
5/32" (4.0mm)	1.5

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.

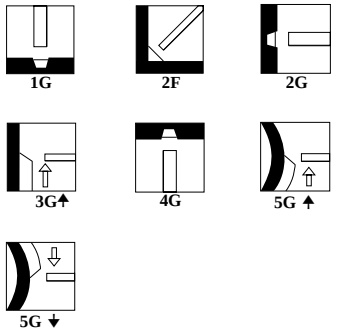
ADVANTAGE LINCOLN

- Designed for welding mild steel and many low alloy steels.
- All position welding with good deposit rates.
- Flat or slightly convex beads have distinct ripples with little spatter.
- Good low current and low open circuit voltage operation.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Excellent for tack and skip welds because of easy restriking.
- General purpose low hydrogen electrode for AC application.
- Single pass fillet welds on mild steel plate.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7018
ASME SFA-5.1: E7018
CSA W48: E4918

MECHANICAL PROPERTIES [1] - As Welded per AWS A5.1-91

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20°F (-29°C)
Required AWS E7018 H8	58,000 (399) min.	70,000 (482) min.	22 min.	20 (27) min.
Test Results As-welded	58,000 - 86,000 (399 - 593)	70,000 - 87,000 (482 - 600)	22 - 32	20 - 56 (27 - 76)

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	5 Lb. (2.3 kg) Carton (40 Lb. Master)
3/32 (2.4)	ED030180
1/8 (3.2)	ED030181
5/32 (4.0)	ED030182

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4 mm)	1/8" (3.2mm)	5/32" (4.0mm)
AC	75-120	105-150	130-200
DC+	70-115	100-140	120-185

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - As Required per AWS A5.1-91

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7018	Not Specified	1.60 max.	.75 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.04-.06	1.10-1.50	.20-.50	.005-.015	.010-.020	.02-.05	.01-.03	.01-.05	.01-.03

[1] Typical all weld metal.

DIFFUSIBLE HYDROGEN - As Required per AWS A5.1-91

	(ml/100g weld deposit)
Requirements AWS E7018 H8	<8 ml
Test Results	
3/32" (2.4 mm)	2.7
5/32" (4.0 mm)	3.6

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.

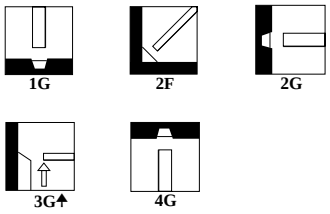
ADVANTAGE LINCOLN

- Designed for welding mild steel and high strength low alloy steels. Also, tolerates high sulfur and high silicon steels, which have poor weldability.
- Capable of x-ray quality and excellent notch toughness.
- Low hydrogen may reduce the need for preheat or postheat.
- Shipped in hermetically sealed containers, which can be stored indefinitely in normal conditions, without danger of moisture pickup.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Structural steel and bridges.
- Thick section and restrained joints when shrinkage tends to cause weld cracking.
- Cold rolled steel.
- Hard-to-weld steels.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7018 H4R
ASME SFA-5.1: E7018 H4R
ABS: E7018
Lloyd's: 3M, 3YMH5
DNV: 3Y40H5
GL: 3YH5
BV: 3YHHH
Military: MIL-E-22200/1; MIL-7018
CSA W48: E4918-1

MECHANICAL PROPERTIES (1) - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E7018	58,000 (399) min.	70,000 (482) min.	22 min.	20 (27) min.
Test Results As-welded	58,000 - 77,000 (399 - 530)	70,000 - 87,000 (482 - 600)	22 - 34	20 - 158 (27 - 214)

(1) Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	25 Lb. (11.3 kg) Easy Open Cans	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED010566	ED010571	ED010568
1/8 (3.2)	ED010560		ED010561
5/32 (4.0)	ED010574		ED010575
3/16 (4.8)			ED010564
7/32 (5.6)			ED010577
1/4 (6.4)			ED010558
5/16 (7.9)			ED010573

TYPICAL OPERATING PROCEDURES

	Current (Amps)						
Inches (mm)	3/32" (2.4)	1/8" (3.2)	5/32" (4.0)	3/16" (4.8)	7/32" (5.6)	1/4" (6.4)	5/16" (7.9)
DC+	70-100	90-150	120-190	170-280	AC 260-380	325-440	400-530
AC	80-120	110-170	135-225	200-300	DC+ 210-330	290-430	375-500

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION (1) - *As Required per AWS A5.1-91*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7018	Not Specified	1.60 max.	.75 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.035-.081	.89-1.20	.35-.66	.023-.029	.008-.013	.02-.06	.01-.03	.03-.11	.005-.04

(1) Typical all weld metal.

DIFFUSIBLE HYDROGEN

- As Required per AWS A5.1-91

	(ml/100g weld deposit)
Requirements AWS E7018 H4R	<4 ml
Test Results	
3/32" (2.4 mm)	1.3
1/4" (6.4 mm)	1.9

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.

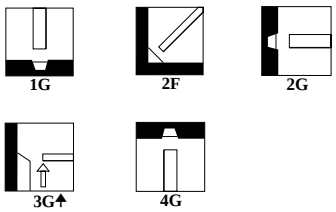
ADVANTAGE LINCOLN

- Designed for welding mild steel and high strength low alloy steels. Also, tolerates high sulfur and high silicon steels, which have poor weldability.
- Capable of x-ray quality welds.
- Low hydrogen may reduce the need for preheat or postheat.
- Shipped in hermetically sealed containers, which can be stored indefinitely in normal conditions, without danger of moisture pickup.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Structural steel and bridges.
- Cold rolled steel.
- Hard-to-weld steels.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7018 H4R
ASME SFA-5.1: E7018 H4R
ABS: E7018
Lloyd's: 3M, 3YMH5
DNV: 3YH5
GL: 3YH5
BV: 3YHHH
CSA W48: E4918-1

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E7018	58,000 (399) min.	70,000 (482) min.	22 min.	20 (27) min.
Test Results				
As-welded	58,000 - 80,000 (399 - 552)	70,000 -90,000 (482 - 620)	22 - 34	20 - 150 (27 - 203)
Stress relieved[2] 10 hrs @ 1150°F (620°C)	56,000 - 73,000 (386 - 503)	71,000 - 85,000 (489 - 586)	27 - 33	50 - 112 (68 - 152)

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	5 Lb. (2.3 kg) Carton (40 Lb. Mstr)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Mstr)	12 Lb. (5.4 kg) Easy Open Cans (72 Lb. Mstr)	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED030174	ED015766		ED015161
1/8 (3.2)	ED030175	ED015729		ED015198
5/32 (4.0)	ED030176	ED010799		ED015141
3/16 (4.8)				ED015186
7/32 (5.6)			ED017287	ED015258
1/4 (6.4)				ED015383

TYPICAL OPERATING PROCEDURES

	Current (Amps)					
Polarity	3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
DC+	85-110	110-160	130-200	180-270	250-330	300-400
AC	—	120-170	140-230	210-290	270-370	325-420

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.1-91*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7018	Not Specified	1.60 max.	.75 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.04-.08	.90-1.30	.35-.65	.010-.020	.006-.015	.02-.06	.01-.02	.03-.07	.01-.03

[1] Typical all weld metal.

DIFFUSIBLE HYDROGEN - *As Required per AWS A5.1-91*

	(ml/100g weld deposit)
Requirements AWS E7018 H4R	<4 ml
Test Results	
3/32" (2.4 mm)	1.2
1/4" (6.4 mm)	3.6

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.

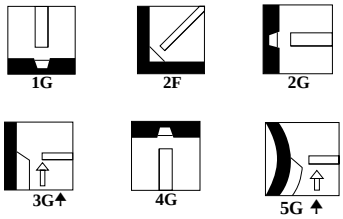
ADVANTAGE LINCOLN

- Designed for welding mild steel, low alloy steels and steels of poor weldability.
- Capable of x-ray quality welds.
- Designed for use on small AC machines, where low open circuit voltages are used.
- Shipped in hermetically sealed containers, which can be stored indefinitely in normal conditions, without danger of moisture pickup.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Excellent for tack and skip welds due to easy restriking.
- General purpose low hydrogen electrode for AC application.
- Single and multiple pass fillet welds on mild steel plate.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7018 H8
ASME SFA-5.1: E7018 H8
ABS: E7018
CSA W48: E4918

MECHANICAL PROPERTIES (1) - As Welded per AWS A5.1-91

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E7018 H8	58,000 (399) min.	70,000 (482) min.	22 min.	20 (27) min.
Test Results As-welded	58,000 - 86,000 (399 - 593)	70,000 - 87,000 (482 - 600)	22 - 32	20 - 56 (27 - 76)

(1) Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED010714
1/8 (3.2)	ED010711
5/32 (4.0)	ED010717

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)
AC	70 - 100	95 - 135	140 - 200
DC+	65 - 95	90 - 130	130 - 190

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION (1) - As Required per AWS A5.1-91

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7018	Not Specified	1.60 max.	.75 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.04-.06	1.09-1.60	.40-.65	.007-.012	.010-.018	.04-.06	.01-.03	.02-.04	.02-.04

(1) Typical all weld metal.

DIFFUSIBLE HYDROGEN - As Required per AWS A5.1-91

	(ml/100g weld deposit)
Requirements AWS E7018 H8	<8 ml
Test Results	
3/32" (2.4 mm)	2.7
5/32" (4.0 mm)	3.6

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).

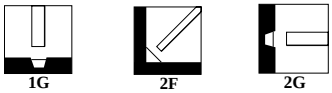
ADVANTAGE LINCOLN

- High speed, high deposition electrode designed for low hydrogen applications in the flat position.
- Excellent restriking characteristics makes LH-3800 ideal for skip and tack welding.
- Capable of x-ray quality welds.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Used for high production application, in the horizontal or flat positions.
- Excellent for tacking or skip welding.
- For mild steels, low alloy steels and steels of poor weldability.
- Tolerates high sulfur and high silicon steels.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E7028 H8
ASME SFA-5.1: E7028 H8
ABS: E7028
Lloyd's: 2,2H10 2M, 2YMH10
DNV: 2YHH
BV: 2YHH
GL: 2YH10
CSA W48: E4928

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ 70°F (21°C)	Charpy V-Notch ft•lbf (Joules) @ 0°F (-18°C)
Required AWS E7028 H8	58,000 (399) min.	70,000 (482) min.	22 min.	Not Specified	20 (27) min.
Test Results As-welded	58,000 - 79,000 (399 - 545)	70,000 - 91,000 (482 - 627)	22 - 31	—	20 - 63 (27 - 85)
Stress relieved[2] 1 hr @ 1150°F (620°C)	73,000 - 77,000 (503 - 530)	84,000 - 89,000 (579 - 614)	25 - 29	80 - 90 (108 - 122)	—

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Easy Open Cans
5/32 (4.0)	ED010547
3/16 (4.8)	ED010545
7/32 (5.6)	ED010548

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)
AC	180 - 270	240 - 330	275 - 410
DC+	170 - 240	210 - 300	260 - 380

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.1-91*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E7028	Not Specified	1.60 max.	.90 max.	Not Specified	Not Specified	.20 max.	.30 max.	.30 max.	.08 max.
Test Results	.05-.11	.70-1.15	.25-.60	.022-.026	.014-.016	.01-.06	.005-.010	.02-.04	.01-.02

[1] Typical all weld metal.

DIFFUSIBLE HYDROGEN - *As Required per AWS A5.1-91*

	(ml/100g weld deposit)
Requirements AWS E7028 H8	<8 ml
Test Results	
5/32" (4.0 mm)	3.2
7/32" (5.6 mm)	5.6

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-position electrode for applications requiring a nominal 2-1/4% nickel deposit.

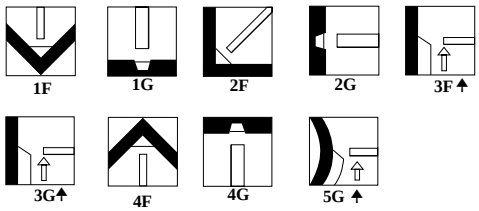
ADVANTAGE LINCOLN

- All position, moisture resistant, low hydrogen, low alloy electrode.
- Clean puddle and uniform slag follow make it easy to "carry" the puddle.
- Exceptional Excalibur operational characteristics, with smooth even burnoff, make Excalibur 8018-C1 MR the ideal choice for critical out-of-position applications.
- CTOD tested.
- High operator appeal with superior tie-in at weld bead edges.
- Resistant to fingernailing in critical out-of-position joints.
- Flexible coating means less breakage.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Primarily designed for low temperature applications where weld metal toughness is required.
- Refrigerated ammonia tanks.
- Liquified gas storage, piping and transportation.
- Weathering steels.
- Application requiring weld metal stress-relieved properties.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E8018-C1 H4R
ASME SFA-5.5: E8018-C1 H4R
ABS: E8018-C1 H4R
CSA W48: E5518-C1

MECHANICAL PROPERTIES – *Stress Relieved per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -75°F (-59°C)
Required AWS E8018-C1 Stress relieved 1 hour @ 1125°F (610°C)	67,000 (460) min.	80,000 (550) min.	19 min.	20 (27) min.
Test Results Stress relieved 1 hour @ 1125°F (610°C)	67,000 - 78,000 (460 - 538)	80,000 - 93,000 (550 - 641)	19 - 32	20 - 110 (27 - 150)

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7kg) Easy Open Cans
3/32 (2.4)	ED030882	ED030876
1/8 (3.2)	ED030883	ED030877
5/32 (4.0)	ED030884	ED030878
3/16 (4.8)		ED030879
7/32 (5.6)		ED030881
1/4 (6.4)		ED030880

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
DC+	70-110	90-160	130-210	180-300	250-330	300-400
AC	80-120	100-160	140-210	200-300	270-370	325-430

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION – *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Ni
Requirements AWS E8018-C1	.12 max.	1.25 max.	.80 max.	.03 max.	.03 max.	2.00-2.75
Test Results	.04-.07	.90-1.20	.20-.50	.005-.015	.010-.020	2.10-2.60

DIFFUSIBLE HYDROGEN
- As Required per AWS A5.5-96

	(ml/100g weld deposit)
Requirements AWS E8018-C1 H4R	<4 ml
Test Results 3/32" (2.4mm)	0.9
1/4" (6.4mm)	3.4

Excalibur 8018-C3 MR is a 1% nickel all position electrode for fabrication or repair of 1% nickel steels, as well as a wide variety of other low alloy and carbon steels.

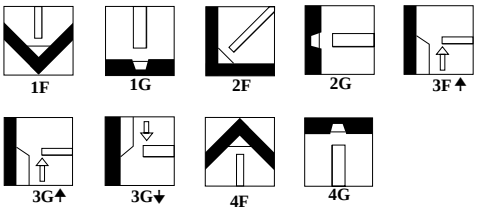
ADVANTAGE LINCOLN

- All position, moisture resistant, low hydrogen, low alloy electrode.
- Clean puddle and uniform slag follow make it easy to "carry" the puddle.
- Exceptional Excalibur operational characteristics, with smooth even burnoff, make Excalibur 8018-C3 MR the ideal choice for critical out-of-position applications.
- CTOD tested.
- High operator appeal with superior tie-in at weld bead edges.
- Resistant to fingernailing in critical out-of-position joints.
- Flexible coating means less breakage.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Applications requiring weld metal toughness and a minimum of 80,000 psi (552 MPa) tensile strength in the as-welded condition.
- Shipbuilding.
- Piping and gas storage tanks.
- Weathering steels.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E8018-C3 H4R
ASME SFA-5.5: E8018-C3 H4R
ABS: E8018-C3 H4R
CSA W48: E5518-C3

MECHANICAL PROPERTIES – *As Welded per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @-40°F (-40°C)
Required AWS E8018-C3	68,000 - 80,000 (470 - 550)	80,000 (550) min.	24 min.	20 (27) min.
Test Results	68,000 - 80,000 (470 - 550)	80,000 - 93,000 (550 - 641)	24 - 32	20 - 110 (27 - 150)

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7kg) Easy Open Cans
3/32 (2.4)	ED030898	ED030892
1/8 (3.2)	ED030899	ED030893
5/32 (4.0)	ED030900	ED030894
3/16 (4.8)		ED030895
7/32 (5.6)		ED030897
1/4 (6.4)		ED030896

TYPICAL OPERATING PROCEDURES

	Current (Amps)					
Polarity	3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
DC+	70-110	90-160	130-210	180-300	250-330	300-400
AC	80-120	100-160	140-210	200-300	270-370	325-420

DEPOSIT COMPOSITION – *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Mo	%Ni	%Cr
Requirements AWS E8018-C3	0.12 max.	40 - 1.25	.80 max.	.03 max.	.03 max.	.35 max.	.80-1.10	.15 max.
Test Results	.04-.07	.90-1.15	.25-.60	.005-.015	.010-.020	.10-.25	.85-1.05	.04 max.

DIFFUSIBLE HYDROGEN
- As Required per AWS A5.5-96

	(ml/100g weld deposit)
Requirements AWS E8018-C3 H4R	<4 ml
Test Results 3/32" (2.4mm)	1.7
1/4" (6.4mm)	3.2

Excalibur 9018M MR is intended for welding high strength steels of 90,000 psi (620 MPa) tensile strength and higher.

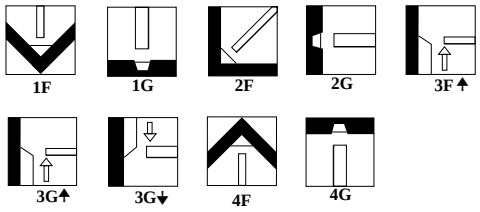
ADVANTAGE LINCOLN

- All position, moisture resistant, low hydrogen, low alloy electrode.
- Clean puddle and uniform slag follow make it easy to "carry" the puddle.
- Exceptional Excalibur operational characteristics, with smooth even burnoff, make Excalibur 9018-M MR the ideal choice for critical out-of-position applications.
- CTOD tested.
- High operator appeal with superior tie-in at weld bead edges.
- Resistant to fingernailing in critical out-of-position joints.
- Flexible coating means less breakage.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- High strength steel of 90,000 psi (620 MPa) tensile strength and higher, such as HY-80, HY-90, T-1.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E9018-M H4R
ASME SFA-5.5: E9018-M H4R
ABS: E9018M H4R
CSA W48: E6218-M

MECHANICAL PROPERTIES – *As Welded per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -60°F (-51°C)
Required AWS E9018-M H4R	78,000 - 90,000 (540 - 620)	90,000 (620) min.	24 min.	20 (27) min.
Test Results	78,000 - 90,000 (540 - 620)	90,000 - 102,000 (620 - 703)	24 - 27	20 - 90 (27 - 122)

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7kg) Easy Open Cans
3/32 (2.4)	ED030872	ED030868
1/8 (3.2)	ED030873	ED030869
5/32 (4.0)	ED030874	ED030870
3/16 (4.8)	ED030875	ED030871

TYPICAL OPERATING PROCEDURES

	Current (Amps)			
Polarity	3/32" (2.4mm)	1/8" (3.2 mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	70-110	90-160	130-210	180-300

DEPOSIT COMPOSITION – *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Mo	%Ni	%Cr
Requirements AWS E9018M	.10 max.	.60-1.25	.80 max.	.03 max.	.03 max.	.35 max.	1.40-1.80	.15 max.
Test Results	.04-.07	.90-1.10	.30-.50	.005-.015	.010-.020	.25-.35	1.50-1.80	.05-.12

DIFFUSIBLE HYDROGEN

- As Required per AWS A5.5-96

	(ml/100g weld deposit)	
Requirements AWS E9018-M H4R	<4 ml	
Test Results	3/32" (2.4mm)	0.9
	3/16" (4.8mm)	2.9

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% molybdenum deposit and meets the requirements of high tensile (90,000 psi) steels.

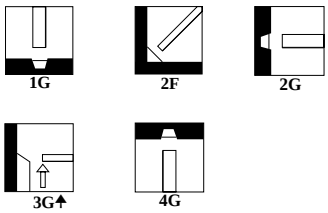
ADVANTAGE LINCOLN

- Capable of producing 1-1/4% chromium, 1/2% molybdenum deposit commonly required for high temperature, high pressure pipe.
- All-position welding.
- Also meets requirements of E9018-G for welding some high strength steels — 90,000 psi tensile.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Primarily designed for all position fabrication and repair welding of the alloy steels requiring specific mechanical or chemical properties.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E8018-B2 H4R,[1] E9018-G H4R
ASME SFA-5.5: E8018-B2 H4R, E9018-G H4R

[1] *See Note 1 on page 44.*

MECHANICAL PROPERTIES [1] - *Stress Relieved per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)
Required E8018-B2 Stress relieved 1 hr @1275°F (690°C)	67,000 (460) min.	80,000 (550) min.	19 min.
Test Results Stress relieved 1 hr @ 1275°F (690°C)	67,000 - 93,000 (460 - 641)	80,000 - 98,000 (550 - 680)	19 - 27

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Easy Open Cans
1/8 (3.2)	ED015436
5/32 (4.0)	ED015426
3/16 (4.8)	ED015437

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	110 - 150	130 - 190	180 - 270
AC	120 - 170	140 - 225	210 - 290

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo
Requirements AWS E8018-B2	.05-.12	.90 max.	.80 max.	.03 max.	.03	1.00-1.50	.40-.65
Test Results	.05-.07	.45-.71	.31-.57	.005-.019	.009-.016	1.04-1.30	.42-.52

[1] Typical all weld metal.

DIFFUSIBLE HYDROGEN - *As Required per AWS A5.5-96*

	(ml/100g weld deposit)
Requirements AWS E8018-B2 H4R	<4 ml
Test Results 1/8" (3.2 mm)	2.0
3/16" (4.8mm)	3.1

If your welding involves 1-1/4% chromium and 1/2% moly power pipe, tubes, boilers or casting, you'll want Jet-LH 8018-B2 MR as your welding partner. It offers a 1-1/4% chromium and 1/2% molybdenum deposit. Reach for this electrode when operating temperatures exceed 850°F (450°C).

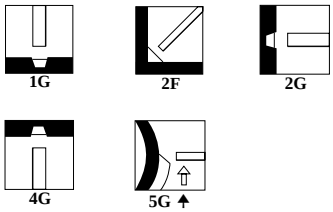
ADVANTAGE LINCOLN

- Capable of producing 1-1/4% chromium, 1/2% molybdenum deposit for welding power piping, tubes, boilers and casting with operating temperatures above 850°F (450°C).
- All-position welding.
- Produces x-ray quality welds.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Primarily designed for all position fabrication or repair welding of power piping, tubes, boilers and casting of creep resistant steels.
- May also be used in the marine equipment, chemical processing, utilities and shipbuilding industries.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E8018-B2 H4 (3/32")
AWS A5.5: E8018-B2 H4R (1/8", 5/32")
ASME SFA-5.5: E8018-B2 H4 (3/32")
ASME SFA-5.5: E8018-B2 H4R (1/8", 5/32")

MECHANICAL PROPERTIES [(1)] - *Stress Relieved per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20°F (-29°C)	Charpy V-Notch ft•lbf (Joules) @ -50°F (-46°C)
Required E8018-B2 H4R Stress relieved 1 hr @ 1275°F (690°C)	67,000 (460) min.	80,000 (550) min.	19 min.	Not Specified	Not Specified
Test Results Stress relieved 1 hr @ 1275°F (690°C)	67,000 - 93,000 (460 - 641)	80,000 - 103,000 (550 - 710)	19 - 28	63 - 108 (85 - 146)	32 - 52 (43 - 70)

(1) Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	25 Lb. (11.3 kg) Easy Open Cans	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED023472	
1/8 (3.2)		ED023473
5/32 (4.0)		ED023474

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)
DC+	70 - 110	100 - 140	120 - 190
AC	85 - 120	110 - 150	135 - 200

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [(1)] - *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo
Requirements AWS E8018-B2	.05-.12	.90 max.	.80 max.	.03 max.	.03 max.	1.00-1.50	.40-.65
Test Results	.060-.085	.65-.80	.50-.75	.008-.012	.013-.016	1.15-1.30	.43-.51

(1) Typical all weld metal.

DIFFUSIBLE HYDROGEN - *As Required per AWS A5.5-96*

	(ml/100g weld deposit)
Requirements AWS E8018-B2 H4R	<4 ml
Test Results 3/32" (2.4 mm)	1.8
5/32" (4.0 mm)	1.8

Jet-LH 8018-C1 MR has outstanding impact properties. This is 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% nickel deposit.

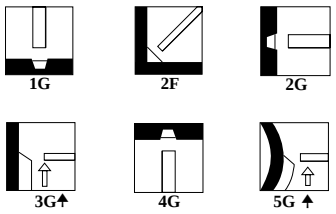
ADVANTAGE LINCOLN

- All position welding — weld metal freezes rapidly even though slag remains relatively fluid.
- Produces x-ray quality welds.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Primarily designed for all position fabrication or repair of liquid propane tanks, piping and pressure vessels.
- Refrigerated ammonia tanks and barges, and heavy construction equipment.
- Liquified gas storage and transportation equipment.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E8018-C1 H4R
ASME SFA-5.5: E8018-C1 H4R
ABS: E8018-C1 H4R
CSA W48: E55018-C1

MECHANICAL PROPERTIES [1] - *Stress Relieved per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -75°F (-59°C)
Required AWS E8018-C1 Stress relieved 1 hour @ 1125°F (610°C)	67,000 (460) min.	80,000 (550) min.	19 min.	20 (27) min.
Test Results Stress relieved 1 hour @ 1125°F (610°C)	67,000 - 81,000 (460 - 558)	80,000 - 96,000 (550 - 662)	19 - 32	20 - 85 (27 - 115)

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Easy Open Cans
1/8 (3.2)	ED015566
5/32 (4.0)	ED015357
3/16 (4.8)	ED015863
1/4 (6.4)	ED015259

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	1/4" (6.4mm)
DC+	90 - 150	120 - 180	180 - 270	250 - 350
AC	110 - 160	140 - 200	200 - 300	300 - 400

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Ni
Requirements AWS E8018-C1	.12 max.	1.25 max.	.80 max.	.03 max.	.03 max.	2.00-2.75
Test Results	.050-.086	.95-1.20	.35-.70	.009-.019	.007-.017	2.08-2.70

[1] Typical all weld metal.

DIFFUSIBLE HYDROGEN - *As Required per AWS A5.5-96*

	(ml/100g weld deposit)
Requirements AWS E8018-C1 H4R	<4 ml
Test Results 1/8" (3.2 mm)	1.7
1/4" (6.4 mm)	2.9

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 applications. A good choice for welding on weathering type steels.

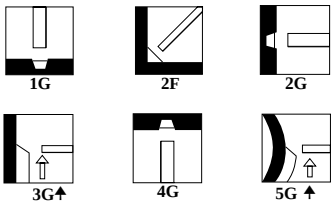
ADVANTAGE LINCOLN

- All-position welding.
- Produces x-ray quality welds.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Primarily designed for all position fabrication or repair of 1% nickel steels and a wide variety of other low alloy steels.
- General purpose welding of many high strength alloy that require a deposit with a tensile strength of 80,000 psi.
- Also used for undermatched fillet welds on 110,000 psi steel quenched and tempered such as ASTM A514 and A517 where the weld must have weathering characteristics.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E8018-C3 H4R
ASME SFA-5.5: E8018-C3 H4R
ABS: E8018-C3 H4R
Military: MIL-E-22200/1; MIL-8018-C3

MECHANICAL PROPERTIES (1) - As Welded per AWS A5.5-96

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -40°F (-40°C)
Required E8018-C3 H4R	68,000 - 80,000 (470 - 552)	80,000 (550) min.	24 min.	20 (27) min.
Test Results As welded	68,000 - 79,000 (470 - 545)	80,000 - 94,000 (550 - 648)	24 - 31	20 - 115 (27 - 156)
Stress relieved(2) 2 hrs @ 1150°F (620°C)	67,000 - 73,000 (462 - 503)	76,000 - 84,000 (524 - 579)	30 - 32	Not Specified

(1) Typical all weld metal. (2) Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (23 kg) Easy Open Cans
1/8 (3.2)	ED015153
5/32 (4.0)	ED015146
3/16 (4.8)	ED015157
7/32 (5.6)	ED015583

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
DC+	110 - 150	130 - 190	180 - 270	250 - 330	300 - 400
AC	120 - 170	140 - 225	210 - 290	270 - 370	325 - 420

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION (1) - As Required per AWS A5.5-96

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E8018-C3 H4R	.12 max.	.40-.125	.80 max.	.03 max.	.03 max.	.15 max.	.35 max.	.80-1.10	.05 max.
Test Results	.04-.08	.64-1.24	.32-.62	.012-.023	.006-.018	.01-.10	.01-.26	.83-1.09	.001-.013

(1) Typical all weld metal.

DIFFUSIBLE HYDROGEN - As Required per AWS A5.5-96

	(ml/100g weld deposit)
Requirements AWS E8018-C3 H4R	<4 ml
Test Results 1/8" (3.2 mm)	1.6
7/32" (5.6 mm)	2.1

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 850°F (450°C).

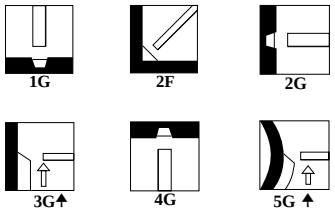
ADVANTAGE LINCOLN

- Capable of producing 2-1/4% chromium, 1% molybdenum deposit for welding power piping, tubes, boilers and casting with design temperatures above 850°F (450°C).
- All position welding.
- Produces x-ray quality welds.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Primarily designed for all position fabrication or repair welding of high temperature service steels in the steam power generating, petroleum, pressure vessel, and pressure pipe industries.
- May also be used in the marine equipment, chemical processing, utilities and shipbuilding industries.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E9018-B3 H4 (3/32")
AWS A5.5: E9018-B3 H4R (1/8", 5/32")
ASME SFA-5.5: E9018-B3 H4 (3/32")
ASME SFA-5.5: E9018-B3 H4R (1/8", 5/32")

MECHANICAL PROPERTIES [1] - *Stress Relieved per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ 0°F (-18°C)	Charpy V-Notch ft•lbf (Joules) @ -20°F (-29°C)
Required E9018-B3 H4R Stress relieved 1 hr @ 1275°F (690°C)	77,000 (530) min.	90,000 (620) min.	17 min.	Not Specified	Not Specified
Test Results Stress relieved 1 hr @ 1275°F (690°C)	77,000 - 100,000 (530 - 690)	90,000 - 114,000 (620 - 786)	17 - 25	59 - 82 (80 - 111)	37 - 65 (50 - 88)

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	25 Lb. (11.3 kg) Easy Open Cans	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED023475	
1/8 (3.2)		ED023476
5/32 (4.0)		ED023477

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)
DC+	70 - 110	100 - 140	120 - 190
AC	85 - 120	110 - 150	135 - 200

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo
Requirements AWS E9018-B3	.05-.12	.90 max.	.80 max.	.03 max.	.03 max.	2.00-2.50	.90-1.20
Test Results	.06-.08	.60-.75	.55-.70	.006-.013	.010-.018	2.10-2.45	.91-.98

[1] Typical all weld metal.

DIFFUSIBLE HYDROGEN - *As Required per AWS A5.5-96*

	(ml/100g weld deposit)
Requirements AWS E9018-B3 H4R	<4 ml
Test Results 3/32" (2.4 mm)	2.2
5/32" (4.0 mm)	1.6

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.

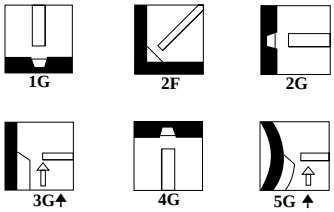
ADVANTAGE LINCOLN

- All position welding — weld metal freezes rapidly even though slag remains relatively fluid.
- Excellent tensile strengths and yield strengths.
- Produces x-ray quality welds.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- For all position welding of high tensile, low alloy casting, forgings and steel plate such as T-1 and HY-80.
- Certain ASTM quenched and tempered steels for structural work and pressure vessels such as A514 and A517.
- General fabrication where weld deposit must meet the requirements of AWS ASME E11018-M.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E11018-M H4R
ASME SFA-5.5: E11018-M H4R
ABS: E11018-M
Military: MIL-E-22200/1; MIL-11018-M

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -60°F (-51°C)
Required E11018-M H4R As welded	98,000 - 110,000 (680 - 760)	110,000 (760) min.	20 min.	20 (27) min.
Test Results As welded	98,000 - 109,000 (680 - 751)	110,000 - 128,000 (760 - 882)	20 - 25	20 - 69 (27 - 93)

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED010419	ED015570
1/8 (3.2)		ED015162
5/32 (4.0)		ED015156
3/16 (4.8)		ED015152
1/4 (6.4)		ED010417

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	1/4" (6.4mm)
DC+	70 - 100	90 - 155	120 - 190	160 - 280	230 - 360
AC	80 - 110	100 - 170	135 - 225	200 - 310	290 - 410

NOTE: Preferred polarity is listed first.

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Cr	%Mo	%Ni	%V
Requirements AWS E11018M	.10 max.	1.30-1.80	.60 max.	.030 max.	.030 max.	.40 max.	.25-.50	1.25-.250	.05 max.
Test Results	.04-.09	1.30-1.80	.26-.59	.008-.016	.008-.018	.03-.35	.30-.47	1.70-2.30	.005-.015

[1] Typical all weld metal.

DIFFUSIBLE HYDROGEN - *As Required per AWS A5.5-96*

	(ml/100g weld deposit)
Requirements AWS E11018-M H4R	<4 ml
Test Results	
3/32" (2.4 mm)	1.0
3/16" (4.8 mm)	1.8

Fleetweld 5P is a great choice for welding on dirty, rusty, greasy or painted steel — especially in vertical or overhead applications.

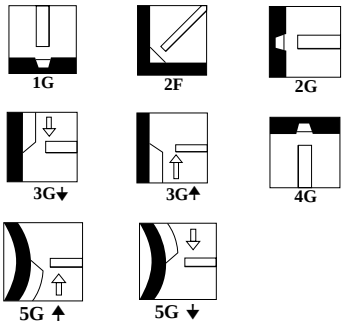
ADVANTAGE LINCOLN

- All-position, particularly good for vertical and overhead.
- Light slag with little slag interference for easy arc control.
- Deep penetration with maximum admixture.
- Capable of x-ray quality welds, out-of-position.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Tolerates galvanized, plated, dirty, painted or greasy steel which cannot be completely cleaned.
- Pipe welding — cross country and in-plant.
- Joints requiring deep penetration such as square edge butt welds.
- Repair welding.

WELDING POSITIONS



CONFORMANCE

AWS A5.1[1]: E6010
ASME SFA-5.1: E6010
Lloyd's: Grade 3M
ABS: E6010
CSA W48: E4310

[1]See Note 2 on page 44.

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E6010	48,000 (331) min.	60,000 (414) min.	22 min.	20 (27) min.
Test Results				
As-welded	48,000 - 67,000 (331 - 460)	60,000 - 76,000 (414 - 524)	22 - 33	20 - 71 (27 - 96)
Stress-relieved[2] 1 hour @ 1150°F (620°C)	48,000 - 61,000 (331 - 420)	62,000 - 69,000 (427 - 475)	28 - 36	50 - 55 (68 - 75)

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	5 Lb. (2.3 kg) Carton (40 Lb. Master)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED030141	ED010210	ED010211
1/8 (3.2)	ED030142	ED010202	ED010203
5/32 (4.0)	ED030143	ED010215	ED010216
3/16 (4.8)			ED010207
7/32 (5.6)			ED010219
1/4 (6.4)			ED010200

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.1-91*

	%C	%Mn	%Si	%S	%P
Requirements AWS E6010		Not Specified			
Test Results	.08-.15	.35-.55	.15-.25	.010-.020	.005-.010

[1] Typical all weld metal.

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	7/32" (5.6mm)	1/4" (6.4mm)
DC+	40-70	75-130	90-175	140-225	200-275	220-325

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.

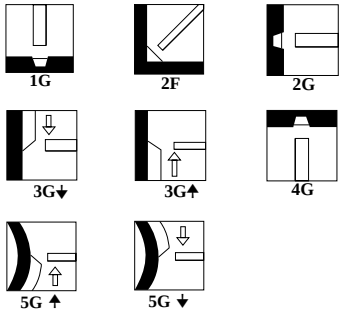
ADVANTAGE LINCOLN

- Truly all-position, particularly good for vertical and overhead.
- Light slag with little slag interference for easy arc control. Easy slag removal, smooth bead.
- Deep penetration with maximum admixture.
- Capable of x-ray quality welds, out-of-position.
- Better bead appearance and slag removal compared to Fleetweld 5P.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- Tolerates galvanized, plated, dirty, painted or greasy steel which cannot be completely cleaned.
- Pipe welding — cross country and in-plant.
- Joints requiring deep penetration such as square edge butt welds.
- Repair welding.

WELDING POSITIONS



CONFORMANCE

AWS A5.1: E6010[1]
ASME SFA-5.1: E6010
ABS: E6010
CSA W48: E4310

[1] *See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.1-91*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E6010	48,000 (331) min.	60,000 (414) min.	22 min.	20 (27) min.
Test Results				
As-welded	48,000 - 76,000 (331 - 524)	60,000 - 86,200 (414 - 594)	22 - 33	20 - 63 (27 - 85)
Stress-relieved[2] 1 hr @ 1150°F (612°C)	51,000 - 64,000 (352 - 441)	67,000 - 78,000 (462 - 538)	30 - 34	45 - 53 (61 - 72)

[1] Typical all weld metal. [2] Data provided for information only — not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Easy Open Cans (60 Lb. Master)	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED010282	ED010283
1/8 (3.2)	ED010277	ED010278
5/32 (4.0)	ED010284	ED010285
3/16 (4.8)		ED010281

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	40 - 70	65 - 130	90 - 175	140 - 225

DEPOSIT COMPOSITION [1]

	%C	%Mn	%Si	%S	%P
Requirements AWS E6010		Not Specified		—	—
Test Results	.10-.20	.40-.65	.11-.30	.009-.020	.005-.025

[1] Typical all weld metal.

Need a reliable, all-position stick electrode? 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.

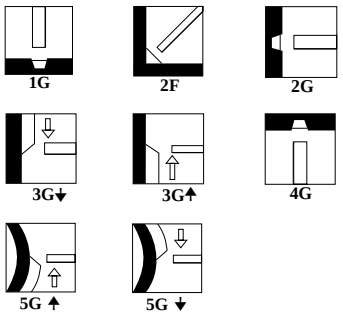
ADVANTAGE LINCOLN

- All position pipe welding low alloy steel stick electrode.
- Light slag with little slag interference for easy arc control.
- Deep penetration with maximum admixture.
- Capable of x-ray quality welds, out-of-position.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- API 5LX-42 through X-56 grade pipe, and 1/2% moly steels.
- Pipe welding — cross country and in-plant.
- Vertical and overhead plate welding.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E7010-A1[1]
ASME SFA-5.5: E7010-A1
ABS: E7010-A1
Military: MIL-E-22200/7; MIL-7010-A1
CSA W48: E4910-A1

[1] *See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Required per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20°F (-29°C)
Required AWS E7010-A1 Stress-relieved 1 hour @ 1150°F (620°C)	57,000 min. (390)	70,000 min. (482)	22 min.	Not Specified
Test Results Stress-relieved 1 hour @ 1150°F (620°C)	64,000 - 74,000 (441 - 510)	78,000 - 84,000 (538 - 579)	25- 30	26 - 32 (35 - 43)

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Easy Open Cans
3/32 (2.4)	ED012893
1/8 (3.2)	ED012885
5/32 (4.0)	ED012896
3/16 (4.8)	ED012889

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3/32" (2.4mm)	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	50-90	75-130	90-175	140-225

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Mo
Requirements AWS E7010-A1	.12 max.	.60 max.	.40 max.	.03 max.	.03 max.	.40-.65
Test Results	.08-.12	.30-.55	.10-.30	.005-.020	.005-.020	.40-.55

[1] Typical all weld metal.

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.

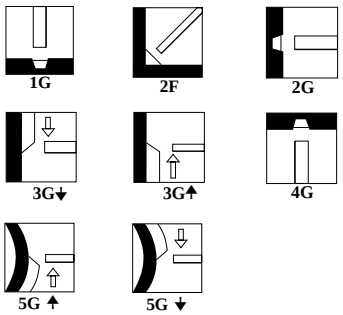
ADVANTAGE LINCOLN

- All-position, pipe welding low alloy steel stick electrode.
- Light slag with little slag interference for easy arc control.
- Deep penetration with maximum admixture.
- Capable of x-ray quality welds, out-of-position.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- API 5LX-52 through X-65 grade pipe.
- Pipe welding — cross country and in-plant.
- Vertical down and overhead plate welding.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E7010-G, E7010-P1[1]
ASME SFA-5.5: E7010-G, E7010-P1
ABS: E7010-P1
CSA W48: E4910-P1

[1] *See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)
Required AWS E7010-P1 As-welded	60,000 (414) min.	70,000 (480) min.	22 min.	20 (27) min.
Test Results				
As-welded	60,000 - 71,000 (414 - 489)	70,000 - 86,000 (480 - 593)	22 - 30	20 - 41 (27 - 56)
Stress-relieved[2] 1 hour @ 1150°F (620°C)	59,000 - 66,000 (407 -455)	75,000 - 82,000 (517 - 566)	28 - 31	35 - 45 (48 - 62)

[1] Typical all weld metal. [2] Data provided for information only – not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Easy Open Cans
1/8 (3.2)	ED029511
5/32 (4.0)	ED029513
3/16 (4.8)	ED029509

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	75 - 130	90 - 185	140 - 225

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%S	%P	%Mo	%Cr	%Ni	%V
Requirements AWS E7010-P1	.20 max.	1.20 max.	.60 max.	.03 max.	.03 max.	.50 max.	.30 max.	1.00 max.	.10 max.
Test Results	.13-.17	.49-.63	.08-.18	.008-.011	.009-.014	.27-.31	.02	.01-.02	<.01

[1] Typical all weld metal.

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.

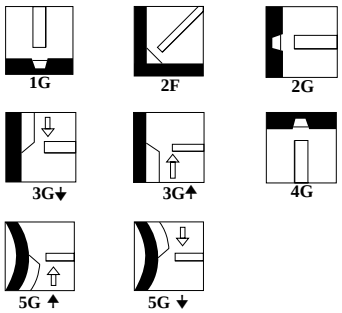
ADVANTAGE LINCOLN

- All-position pipe welding low alloy steel stick electrode.
- Light slag with little slag interference for easy arc control.
- Deep penetration with maximum admixture.
- Capable of x-ray quality welds, even out-of-position.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- API 5LX-56 through X-70 grade pipe, and relatively high silicon pipe.
- Pipe welding — cross country and in-plant.
- Vertical down and overhead plate welding.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E8010-G[1]
ASME SFA-5.5: E8010-G
ABS: E8010-G
CSA W48: E5510-G

[1] *See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20°F (-29°C)	Charpy V-Notch ft•lbf (Joules) @ -50°F (-46°C)
Required AWS E8010-G As-welded	67,000 min. (460)	80,000 min. (550)	19 min.	Not Specified	Not Specified
Test Results					
As-welded	67,000 - 76,000 (460 - 524)	80,000 - 94,000 (550 - 648)	19 - 28	38 - 57 (51 - 77)	27 - 47 (37 - 64)
Stress-relieved[2] 1 hour @ 1150°F (620°C)	67,000 - 72,000 (460 - 496)	76,000 - 80,000 (524 - 550)	23 - 24	44 - 64 (60 - 87)	34 - 53 (46 - 72)

[1] Typical all weld metal. [2] Data provided for information only — not part of AWS classification.

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (22.7 kg) Easy Open Cans
1/8 (3.2)	ED012841
5/32 (4.0)	ED012849
3/16 (4.8)	ED012845

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	75 -130	90 - 185	140 - 225

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%Ni	%Cr	%Mo	%V	%S	%P
Requirements AWS E8010-G[2]	Not Specified	1.00 min.	.80 min.	.50 min.	.30 min.	.20 min.	.10 min.	Not Specified	Not Specified
Test Results	.13-.17	.60-1.20	.05-.30	.75-.97	.01-.20	.05-.15	.025-.040	.007-.010	.008-.012

[1] Typical all weld metal.
[2] Weld deposit must meet the minimum requirement of at least one of the elements listed.

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 maximizes productivity on the job site. Also meets AWS E8010-P1 requirements.

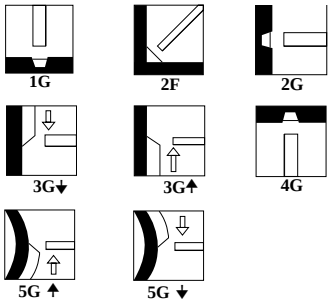
ADVANTAGE LINCOLN

- All-position pipe welding low alloy steel stick electrode.
- Excellent low temperature impact properties.
- Light slag with little slag interference for easy arc control.
- Deep penetration with maximum admixture.
- Capable of x-ray quality welds, even out-of-position.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- API 5LX-56 through X-70 grade pipe, and relatively high silicon pipe.
- Vertical down and overhead plate welding.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E8010-G, E8010-P1[1]
ASME SFA-5.5: E8010-G, E8010-P1
CSA W48: E5510-G

[1] *See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20ºF (-29ºC)	@ -50°F (-46°C)
Required AWS E8010-G As-welded	67,000 min. (460)	80,000 min. (550)	19 min.	Not Specified	Not Specified
Test Results As-welded	67,000 - 83,000 (460 - 572)	80,000 - 94,000 (550 - 648)	19 - 26	59 - 78 (80 - 106)	49 - 65 (66 - 88)

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter mm	(Inches)	50 Lb. (22.7 kg) Easy Open Cans
3.2	(1/8)	ED021400
4.0	(5/32)	ED021401
4.8	(3/16)	ED020922

Manufactured in metric diameters,
U.S. Customary sizes are approximate.

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) (3.2mm) 1/8"	(4.0mm) 5/32"	(4.8mm) 3/16"
DC+	75 - 130	90 - 185	140 - 225

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.5-96*

	%C	%Mn	%Si	%Ni	%Cr	%Mo	%V	%S	%P
Requirements AWS E8010-G[2]	Not Specified	1.0 min.	0.8 min.	.50 min.	.30 min.	.20 min.	.10 min.	Not Specified	Not Specified
Test Results	.12-.18	.60-.90	.12-.28	.70-.90	.02-.04	.23-.50	<.01	.009-.011	.008-.012

[1] Typical all weld metal.
[2] Weld deposit must meet the minimum requirement of at least one of the elements listed.

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.

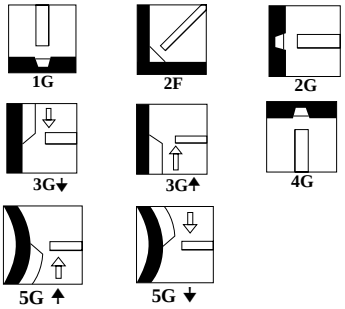
ADVANTAGE LINCOLN

- All-position pipe welding low alloy steel stick electrode.
- Light slag with little slag interference for easy arc control.
- Deep penetration with maximum admixture.
- Capable of x-ray quality welds, even out-of-position.
- Manufactured under a quality system certified to ISO 9001 requirements.

TYPICAL APPLICATIONS

- API 5LX-56 through X-70 grade pipe, and relatively high silicon pipe.
- Vertical down and overhead plate welding.
- Pipe welding — cross country and in-plant.

WELDING POSITIONS



CONFORMANCE

AWS A5.5: E9010-G[1]
ASME SFA-5.5: E9010-G

[1] *See Note 2 on page 44.*

MECHANICAL PROPERTIES [1] - *As Welded per AWS A5.5-96*

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft•lbf (Joules) @ -20°F (-29°C)	Charpy V-Notch ft•lbf (Joules) @ -50°F (-46°C)
Required AWS E9010-G As-welded	77,000 (530) min.	90,000 (620) min.	17 min.	Not Specified	Not Specified
Test Results As-welded	77,000 - 88,000 (530- 607)	90,000 - 100,000 (620 - 690)	17 - 26	50 - 72 (68 - 98)	41 - 46 (56 - 62)

[1] Typical all weld metal.

DIAMETERS / PACKAGING

Diameter mm	Diameter (Inches)	50 Lb. (22.7 kg) Easy Open Cans
3.2	(1/8)	EDS01693
4.0	(5/32)	EDS01694
4.8	(3/16	EDS01695

Manufactured in metric diameters,
U.S. Customary sizes are approximate.

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3.2mm (1/8")	4.0mm (5/32")	4.8mm (3/16")
DC+	75 - 130	80 - 185	140 - 225

DEPOSIT COMPOSITION [1] - *As Required per AWS A5.5-96*

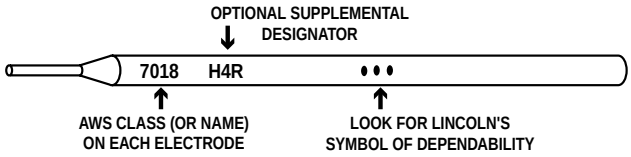
	%C	%Mn	%Si	%Ni	%Cr	%Mo	%V	%S	%P
Requirements AWS E9010-G [2]	Not Specified	1.00 min.	.80 min.	.50 min.	.30 min.	.20 min.	.10 min.	Not Specified	Not Specified
Test Results	.14-.17	.61-.85	.11-.20	.65-.80	.02-.04	.45-.65	<.01	.007-.008	.008-.012

[1] Typical all weld metal.
[2] Weld deposit must meet the minimum requirement of at least one of the elements listed.

PACKAGING TYPES

Lincoln Electric's stick electrodes are packaged in either cartons or hermitically sealed easy-open cans. Unopened, Lincoln cans or cartons of electrode will retain their proper moisture content indefinitely when stored in good condition.

Electrodes come in 10, 12, 14 and 18 inch (255mm, 305mm, 355mm and 460mm) lengths, depending on electrode and packaging ranges from 5 to 50 lb. (2.3 to 22.7 kg) cartons and 10 to 50 lb. (4.5 to 22.7 kg) easy open cans.



ASME BOILER & PRESSURE VESSEL CODE
Section IX
F and A No.'s for Stick Electrodes

Group No.	Weld Metal Analysis No.	Product
F-3	A-1	Fleetweld 5P
F-3	A-1	Fleetweld 5P+
F-3	A-1	Fleetweld 35
F-3	A-1	Fleetweld 180
F-1	—	Fleetweld 22
F-3	A-2	Shield-Arc 85
F-3	—	Shield-Arc HYP
F-3	—	Shield-Arc 70+
F-1	A-1	Jetweld 2
F-1	A-1	Jetweld 3
F-1	A-1	Jetweld 1
F-2	A-1	Fleetweld 7
F-2	A-1	Fleetweld 37
F-2	A-1	Fleetweld 47
F-4	A-1	Jetweld LH-70

Group No.	Weld Metal Analysis No.	Product
F-4	A-1	Jet-LH 78 MR
F-4	A-1	Jetweld LH-73
F-4	A-1	Excalibur 7018
F-4	A-1	Jetweld LH-75 MR
F-4	A-1	Excalibur 7018-1
F-1	A-1	Jetweld LH-3800
F-4	A-1	Lincoln LH-D80
F-4	—	Lincoln 18P
F-4	A-1	Lincoln LH-D90
F-4	A-1	Lincoln LH-D100
F-4	A-3	Jetweld LH-90 MR
F-4	A-3	Jet-LH 8018-B2 MR
F-4	A-10	Jet-LH 8018-C1 MR
F-4	A-10	Jet-LH 8018-C3 MR
F-4	A-4	Jet-LH 9018-B3 MR
F-4	A-12	Jetweld LH-110M MR

AGENCY APPROVALS [1]

Stick Electrode	AWS/ ASME	ABS Grade	Lloyd's Register Grade	DNV Grade	BV Grade	CWB/CSA Grade	GL Grade	Military
Fleetweld 5P	E6010	E6010	3M			E4310		
Fleetweld 5P+	E6010	E6010				E4310		
Fleetweld 35	E6011	E6011	3M					
Fleetweld 35LS	E6011					E4311		
Fleetweld 180	E6011					E4311		
Fleetweld 7	E6012	E6012						
Fleetweld 37	E6013	E6013	3M	1	1	E4313	1	
Fleetweld 22	E6022							
Jetweld 2	E6027	E6027	3M	3	3		3	
Shield Arc 85	E7010-A1	E7010-A1				E4910-A1		MIL-7010-A1
Shield Arc HYP+	E7010-G, E7010-P1	E7010-P1				E4910-P1		
Fleetweld 47	E7014	E7014	1M	1	1	E4914	1	
Lincoln 7018 AC	E7018					E4918		
Jetweld LH-70	E7018 H4R	E7018	3M, 3MYH5	3Y40H5	3YHHH	E4918-1	3YH5	MIL-7018
Jet-LH 78 MR	E7018 H4R	E7018	3M, 3MYH5	3YH5	3YHHH	E4918-1	3YH5	
Jetweld LH-73	E7018 H8	E7018				E4918		
Excalibur 7018	E7018 E7018 H4R	E7018M, 3, 3YH5	3M, 3MYH5	3YH5	3YHHH	E4918	3YH5	
Excalibur 7018-1	E7018-1, E7018-1 H4R	E7018M, 3, 3YH5	3M, 3MYH5	3YH5	3YHHH	E4918-1	3YH5	
Excalibur 7018-A1 MR	E7018-A1 H4R	E7018-A1 H4R				E4918-A1		
Excalibur 8018-C1 MR	E8018-C1 H4R	E8018-C1 H4R				E5518-C1		
Excalibur 8018-C3 MR	E8018-C3 H4R	E8018-C3 H4R				E5518-C3		
Excalibur 9018M MR	E9018-M H4R	E9018-M H4R				E6218-M		
Jetweld 3	E7024	E7024		1	1		1	
Jetweld 1	E7024-1	E7024-1	1	1	1	E4924-1	1	
Jetweld LH-3800	E7028 H8	E7028	2M, 2YM	2Y10	2YHH	E4928	2YH10	
Shield-Arc 70+	E8010-G	E8010-G				E5510-G		
Shield-Arc 80	E8010-G, E8010-P1					E5510-G		
Jetweld LH-90 MR	E8018-B2 H4R, E9018-G H4R							
Jet-LH 8018-B2 MR	E8018-B2 H4R							
Jetweld 8018-C1 MR	E8018-C1 H4R	E8018-C1 H4R				E55018-C1		
Jetweld 8018-C3 MR	E8018-C3 H4R	E8018-C3 H4R						MIL-8018-C3
Shield-Arc 90	E9010-G							
Jet-LH 9018-B3 MR	E9018-B3 H4R				E69018-G			
Jetweld LH-110M MR	E11018-M H4R	E11018-M						MIL-11018-M

ABS: American Bureau of Shipping & Coast Guard
Lloyd's: Lloyd's Register of Shipping
DNV: Det Norske Veritas
BV: Bureau Veritas
CWB/CSA: Canadian Welding Bureau
GL: Germanischer Lloyd

[1] Approvals are updated periodically. Consult your local Lincoln district office for the latest Approval/Grade revision.

AWS A5.1 CARBON STEEL ELECTRODE

E6010

- Electrode
- Tensile in ksi
- Position
- Type of coating and current

Position

1 — Flat, Horizontal, Vertical, Overhead
2 — Flat and Horizontal only
4 — Flat, Horizontal, Vertical Down, Overhead

AWS A5.5 LOW ALLOY STEEL ELECTRODE

E8018-B1 H4R

- Electrode
- Tensile in ksi
- Position
- For AC or DC+
- Chemical composition (see chart on page 49)
- Maximum diffusible hydrogen level obtained on the AWS A4.3 test. (Example: H4 = max 4.0 ml/100 g)
- Moisture resistant. Meets specific low moisture pickup limits under controlled humidification tests.

Types of Coating and Current

Digit	Type of Coating	Current
0	Cellulose sodium	DC+
1	Cellulose potassium	AC, DC±
2	Titania sodium	AC, DC-
3	Titania potassium	AC, DC+
4	Iron powder titania	AC, DC±
5	Low hydrogen sodium	DC+
6	Low hydrogen potassium	AC, DC+
7	Iron powder iron oxide	AC, DC±
8	Iron powder low hydrogen	AC, DC±

Chemical Composition of Weld Deposit

Suffix	%Mn	%Ni	%Cr	%Mo	%V
A1				.50	
B1			.50	.50	
B2			1.25	.50	
B3			2.25	1.00	
C1		2.50			
C2		3.25			
C3		1.00	.15	.35	
D1/D2	1.25-.200			.25-.45	
G[1]		.50 min.	.30 min.	.20 min.	.10 min.

[1] Only one of the listed elements is required.

NOTE 1: Joining Electrodes, Non-Charpy V-Notch Rated

These electrodes (see below) and others of the same AWS classification, are not required to deposit weld metal capable of delivering any minimum specified Charpy V-Notch (CVN) properties. It should not be used in applications where minimum specified CVN properties are required. Typical applications where minimum specified CVN properties are required include, but are not restricted to, bridges, pressure vessels, and buildings in seismic zones. The user of this product is responsible for determining whether minimum CVN properties are required for the specific application.

Fleetweld 7
Fleetweld 22
Fleetweld 37
Fleetweld 47
Jetweld 3

NOTE 2: Joining Electrodes, Non-Low Hydrogen

These electrodes (see below) and others of the same AWS classification, are not required to deposit weld metal that is low in diffusible hydrogen. Therefore, these electrodes should not be used in applications where the hydrogen content of the weld metal is required to be controlled, such as applications that involve steels with higher carbon and alloy content, and higher strength.

Fleetweld 5P
Fleetweld 5P+
Fleetweld 35
Fleetweld 35LS
Fleetweld 180
Fleetweld 7
Fleetweld 37
Fleetweld 22
Shield-Arc 85
Shield-Arc 90
Shield-Arc HYP+
Fleetweld 47
Jetweld 1
Jetweld 2
Jetweld 3
Shield-Arc 70+
Shield-Arc 80

Welds on high strength and low alloy steel can often only be made with one or two specific electrodes. See pages 46 through 48 for selection information.

Full strength welds on mild steel can usually be made with a variety of different stick electrodes. Selection of the best stick electrode for maximum welding efficiency should be based on joint requirements.

Here is a three-step method for considering joint requirements:

1. Classify the joint as "Fast Freeze", "Fast Fill", Fill Freeze, or a combination of these.
2. Choose the electrode group "Fast Freeze", "Fast Fill", "Fill Freeze", or Low Hydrogen from the following information.
3. Review the stick electrodes in the appropriate group to select the best stick electrode for the specific applications.

"Fast Freeze" Welding

The weld deposit rapidly solidifies for all-position welding. "Fast Freeze" stick electrodes have a high cellulose coating which produces a deep penetration, forceful spray-type arc with light slag coverage.

- Use on plate 3/16 - 5/8" (4.8 - 16 mm).
- For 5/8" (16 mm) and thicker plate, the "Fill Freeze", low hydrogen electrodes are more economical because deposit rates are higher and they make welds with fewer large beads for reduced cleaning time.

"Fast Fill" Welding

The coating of "Fast Fill" stick electrodes is 50%, iron powder and, therefore, produces a larger amount of weld deposition per electrode. "Fast Fill" stick electrodes are limited to level or slightly downhill (15° max) welding positions.

- Groove, flat and horizontal fillets, and lap welds in plate over 3/16" (4.8 mm) .
- For the required tight fitup, plates are butted tight, a back-up strip is used, or a stringer bead is made with "Fill Freeze" stick electrodes.

"Fill Freeze" Welding (Sheet Metal)

These stick electrodes have an increase of weld deposition compared to "Fast Freeze", but can still be used for all-position welding. They have a titania rutile or lime based coating with the addition of iron powder in some cases.

- For sheet metal under 3/16" (4.8 mm) for electrodes that weld at high travel speeds with minimum skips, misses, slag entrapment and undercut.
- Fillet and lap welds in all-positions are best welded with EXX12 or EXX13 "Fill Freeze" electrode because of the excellent fast travel ability.
- Other types of joint are best welded with "Fast Freeze" stick electrodes because they have good puddle freezing ability.

Storing Low Hydrogen Electrodes

Low hydrogen electrodes must be dry to perform properly. Unopened Lincoln hermetically sealed containers provide excellent protection in good storage conditions. Opened cans should be stored in a cabinet at 250°- 300°F (120°-150°C).

1. Low hydrogen electrode coatings that have picked up moisture may result in hydrogen induced cracking, particularly in steels with 80,000 psi (550 MPa) and higher yield strength.

   Moisture resistant electrodes with an "R" suffix have a high resistance to coating moisture pickup and, if properly stored, will be less susceptible to this problem, regardless of the yield strength of the steel being welded. Specific code requirements may indicate exposure limits different from these guidelines.

   All low hydrogen electrodes should be stored properly, even those with an "R" suffix. Standard EXX18 electrodes should be supplied to welders twice per shift. Moisture resistant types may be exposed for up to 9 hours.

   When containers are punctured or opened, low hydrogen electrodes may pick up moisture. Depending upon the amount of moisture, it will damage weld quality in the following ways:

2. A greater amount of moisture in low hydrogen electrodes may cause porosity. Detection of this condition requires x-ray inspection or destructive testing. If the base metal or weld metal exceeds 80,000 psi (550 MPa) yield strength, this moisture may contribute to underbead or weld cracking.

3. A relatively high amount of moisture in low hydrogen electrode causes visible external porosity in addition to internal porosity. It also may cause excessive slag fluidity, a rough weld surface, difficult slag removal, and cracking.

3. Severe moisture pickup can cause weld cracks in addition to underbead cracking, severe porosity, poor appearance and slag problems.

Re-drying Low Hydrogen Electrodes

Re-drying, when done correctly, restores the electrodes' ability to deposit quality welds. Proper re-drying temperature depends upon the electrode type and its condition.

One hour at the listed final temperature is satisfactory. **DO NOT** dry electrodes at higher temperatures. Several hours at lower temperatures is not equivalent to using the specified requirements.

Electrodes of the E8018 and higher strength classifications should be given no more than three 1-hour re-dries in the 700° - 800°F (370° - 430°C) range. This minimizes the possibility of oxidation of alloys in the coating resulting in lower than normal tensile or impact properties.

Any low hydrogen electrode should be discarded if excessive re-drying causes the coating to become fragile and flake or break off while welding, or if there is a noticeable difference in handling or arc characteristics, such as insufficient arc force.

Electrodes to be re-dried should be removed from the can and spread out in the oven because each electrode must reach the drying temperature.

RE-DRYING CONDITIONS — LOW HYDROGEN

Condition	Pre-drying Temperature (1)	Final Re-drying Temperature	
		E7018, E7028	E8018, E9018, E10018, E11018
Electrodes exposed to air for less than one week; no direct contact with water.	—	650° - 750°F (340° - 400°C)	700° - 800°F (370° - 430°C)
Electrodes which have come in direct contact with water or which have been exposed to high humidity	180° - 220°F (80° - 105°C)	650° - 750°F (340° - 400°C)	700° - 800°F (370° - 430°C)

(1) Pre-dry for 1-2 hours. This will minimize the tendency for coating cracks or oxidation of the alloys in the coating.

Storing and Re-drying Non-Low Hydrogen Electrodes

Electrodes in unopened Lincoln cans or cartons retain the proper moisture content indefinitely when stored in good condition.

If exposed to humid air for long periods of time, electrodes from opened containers may pick up enough moisture to affect operating characteristics or weld quality. If moisture appears to be a problem, store electrodes from the opened containers in heated cabinets at 100° to 120°F (40° to 50°C). **DO NOT** use higher temperatures, particularly for electrodes from the "Fast Freeze" group.

Some electrodes from wet containers or long exposure to high humidity can be re-dried. Follow the procedures below for each type.

Using longer drying times or higher temperatures can easily damage the electrodes.

For drying, remove the electrodes from the container and spread them out in the furnace because each electrode must reach the drying temperature.

RE-DRYING CONDITIONS — NON-LOW HYDROGEN

Electrode	Electrode Group	Final Re-Drying Temperature	Time
E6010: Fleetweld 5P, 5P+ E6011: Fleetweld 35, 35LS, 180 E7010-A1: SA-85[1] E7010-G: SA-HYP+[1] E8010-G: SA-70+[1], SA-80[1] E9010-G: SA-90[1]	Fast Freeze — Excessive moisture is indicated by a noisy arc and high spatter, rusty core wire at the holder end or objectionable coating blisters while welding. **Rebaking of this group of electrodes is not recommended**.	Not recommended	—
E7024: Jetweld 1, 3 E6027: Jetweld 2	Fast Fill — Excessive moisture is indicated by a noisy or "digging" arc, high spatter, tight slag, or undercut. Pre-dry unusually damp electrodes for 30 - 45 minutes at 200°F to 230°F (90° - 110°C) before final drying to minimize cracking of the coating.	400° - 500°F (200 - 260°C)	30 - 45 minutes
E6012: Fleetweld 7 E6013: Fleetweld 37 E7014: Fleetweld 47 E6022: Fleetweld 22	Fill Freeze — Excessive moisture is indicated by a noisy or "digging" arc, high spatter, tight slag or undercut. Pre-dry unusually damp electrodes for 30 - 45 minutes at 200° - 230°F (90° - 110°C) before final drying to minimize cracking of the coating.	300° - 350°F (150° - 180°C)	20 - 30 minutes

[1] Pre-dry for 1-2 hours. This will minimize the tendency for coating cracks or oxidation of the alloys in the coating.

LINCOLN NORTH AMERICA

DISTRICT SALES OFFICES

U.S.A.

ALABAMA
BIRMINGHAM 35124-1156
(205) 988-8232
MOBILE 36582-5209
(251) 443-6524

ALASKA
Contact VANCOUVER, WA
(360) 693-4712

ARIZONA
PHOENIX 85260-1745
(480) 348-2004

ARKANSAS
LITTLE ROCK 72032-4371
(501) 764-0480

CALIFORNIA
FRESNO 93722-3949
(559) 276-0110
LOS ANGELES 90670-2936
(562) 906-7700
SACRAMENTO 95819-3111
(916) 452-1425
SAN DIEGO 92065-4165
(760) 787-1970
SAN FRANCISCO 94551-4847
(925) 443-9353

COLORADO
DENVER 80112-5115
(303) 792-2418

CONNECTICUT
NORTH HAVEN 06238-1090
(860) 742-8887

FLORIDA
JACKSONVILLE 32216-4634
(904) 642-3177
MIAMI 33178-1175
(305) 888-3203
ORLANDO 32714-1974
(407) 788-8557
TAMPA 33594
(813) 477-5817

GEORGIA
ATLANTA 30076-4914
(770) 475-0955
SAVANNAH 31324-5180
(912) 727-4286

HAWAII
Contact LOS ANGELES, CA
(562) 906-7700

IDAHO
BOISE 83616-6646
(208) 938-2302

ILLINOIS
CHICAGO 60527-5629
(630) 920-1500
PEORIA 60527-5629
(630) 920-1500

INDIANA
EVANSVILLE 47630
(812) 454-3428
FT. WAYNE 46825-5547
(260) 484-4422
SOUTH BEND 46561-9160
(219) 674-5523
INDIANAPOLIS 46250-5536
(317) 845-8445

IOWA
CEDAR RAPIDS 52402-3160
(319) 362-6804
DAVENPORT 52806-1344
(563) 386-6522
DES MOINES 50265-6218
(515) 963-1778

KANSAS
KANSAS CITY 66214-1625
(913) 894-0888
WICHITA 67037-9614
(316) 788-7367

KENTUCKY
LOUISVILLE 47112-7025
(502) 727-7335

LOUISIANA
BATON ROUGE 70808-3150
(225) 922-5151
LAFAYETTE 70507-3126
(337) 886-1090
SHREVEPORT 75692-9313
(318) 518-4099

MARYLAND
BALTIMORE 21050-3067
(443) 831-0416

MASSACHUSETTS
BOSTON 01701-7726
(508) 788-9353

MICHIGAN
DETROIT 48034-4005
(248) 353-9680
FLUSHING 48433-1855
(810) 487-1310
GRAND RAPIDS 49512-3924
(616) 942-8780

MINNESOTA
MINNEAPOLIS 55447-4743
(763) 551-1990

MISSISSIPPI
JACKSON 39212-9635
(601) 372-7679

MISSOURI
KANSAS CITY (KS) 66214-1625
(913) 894-0888
ST. LOUIS 63045
(314) 291-5877
SPRINGFIELD 65804
(417) 841-2779

MONTANA
Contact VANCOUVER, WA
(360) 693-4712

NEBRASKA
OMAHA 68046-2826
(402) 339-1809

NEW JERSEY
EDISON 08837-3939
(732) 225-2000

NEW MEXICO
ALBUQUERQUE 87008
(505) 890-6347

NEW YORK
ALBANY 12304-4320
(518) 393-7718
BUFFALO 14075-2520
(716) 646-8414
NEW YORK CITY
(888) 269-6755
SYRACUSE 13057-9313
(315) 432-0281

NORTH CAROLINA
CHARLOTTE 28273-6200
(704) 588-3251
RALEIGH 27604-8456
(919) 303-1972

OHIO
AKRON 44236-4680
(330) 342-8009
CINCINNATI 45242-3706
(513) 554-4440
CLEVELAND 44117-2525
(216) 383-2662
COLUMBUS 43221-4073
(614) 488-7913
DAYTON 45458
(937) 885-6964
TOLEDO 43528-9483
(419) 867-7284

OKLAHOMA
OKLAHOMA CITY 73139-2432
(405) 616-1751
TULSA 74146-1622
(918) 622-9353

PENNSYLVANIA
PHILADELPHIA 19008-4310
(610) 543-9462
PITTSBURGH 15001-4800
(724) 857-2750
HARRISBURG
17104-1422
(717) 213-9163

SOUTH CAROLINA
GREENVILLE 29681-4724
(864) 967-4157
COLUMBIA 29209
(803) 783-2851

SOUTH DAKOTA
SIOUX FALLS 57108-2609
(605) 339-6522

TENNESSEE
KNOXVILLE 37922-1736
(865) 966-9648
MEMPHIS 38115-5946
(901) 363-1075
NASHVILLE 37027
(615) 236-1144
TRI-CITIES 37659-5693
(423) 753-8098

TEXAS
DALLAS 76051-7602
(817) 329-9353
HOUSTON 77060-3143
(281) 847-9444
SAN ANTONIO 78133-3502
(830) 964-2421

UTAH
MIDVALE 84047-3759
(801) 233-9353

VIRGINIA
HERNDON 20170-5227
Washington, D.C.
(703) 904-7735
DANVILLE
(434) 489-3222
HAMPTON ROADS 23693-4171
(757) 870-5508

WASHINGTON
VANCOUVER 98661-8023
(360) 693-4712
SPOKANE 99005-9637
(509) 468-2770

WASHINGTON DC
HERNDON, VA 20170-5227
(703) 904-7735

WEST VIRGINIA
CHARLESTON 25526-8864
(304) 757-9862

WISCONSIN
GREEN BAY 54302-1829
(920) 435-1012
MILWAUKEE 53186-0403
(262) 650-9364

CANADA

ALBERTA
CALGARY
(403) 253-9600/(877) 600-WELD
EDMONTON
(780) 436-7385
WINNIPEG
(204) 488-6398

BRITISH COLUMBIA
VANCOUVER
(604) 945-7524

MARITIMES
NEW BRUNSWICK
(506) 658-0877

MANITOBA
WINNIPEG
(204) 488-6398

ONTARIO
MISSISSAUGA
(905) 565-5600
TORONTO
(416) 421-2600/(800) 268-0812

QUEBEC
MONTREAL
(450) 654-3121

LINCOLN INTERNATIONAL HEADQUARTERS

LATIN AMERICA
Miami, Florida U.S.A.
Phone: (305) 888-3203

EUROPE
Barcelona, Spain
Phone: 34 93 492 20 00

RUSSIA, AFRICA & MIDDLE EAST
Cleveland, Ohio U.S.A.
Phone: (216) 481-8100

ASIA PACIFIC
Singapore
Phone: 65 276 0878

HARRIS CALORIFIC DIVISION

2345 Murphy Blvd., Gainesville, Georgia 30504 U.S.A.
Phone: 1-800-241-0804 • Fax: (770) 535-0544 • Web Site: www.harriscal.com

LINCOLN® ELECTRIC
THE WELDING EXPERTS

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Ave.
Cleveland, Ohio 44117-1199

TEL: 216.481.8100 • FAX: 216.486.1751

lincolnelectric.com

Stick
C2.10 6/04