



PIPELINER[®]

Premium Pipe Welding Consumables

www.lincolnelectric.com

LINCOLN[®]
ELECTRIC
THE WELDING EXPERTS[®]



About The Lincoln Electric Company

Lincoln Electric is the world's leading manufacturer of welding equipment and consumables. Our focus is on helping companies make their welding operations more effective, more efficient, more profitable. We are dedicated to two equally important goals: 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, service-first attitude. Fresh approaches to design, manufacturing, and packaging. Worldwide strength. Choose Lincoln.

Pipeliner® — World's Premier Pipeline Consumable

Pipeliner® is Lincoln Electric's family of premium Stick (SMAW), MIG (GMAW), Flux-Cored Gas-Shielded (FCAW-G) and Flux-Cored Self-Shielded (FCAW-S) consumables developed specifically to meet the rigorous demands of the global pipe welding industry.

Pipeline Process Control™ Manufacturing

Performance tops the list of what contractors and welders want from pipe consumables – Pipeliner® delivers. Lincoln Electric's Pipeliner® manufacturing operations throughout the world are tightly controlled and routinely pass quality assurance audits by agencies and pipe welding professionals from around the world. This extraordinary emphasis on the integrity of the Pipeliner® manufacturing processes results in consumables with unmatched performance characteristics and consistency.

Testing

All Pipeliner® products are lot-controlled and lot-tested, with actual certified mechanical and chemical property test results to ensure the highest level of performance, consistency and quality. All Pipeliner® products carry Q2 certification which means each lot has archived records of in-process testing and manufacturing, as well as any testing of finished product.

Packaging

The world's best pipe consumables deserve the best protection. All Pipeliner® products are packaged in hermetically sealed, moisture resistant containers that ensure the product's integrity – even when stored in the harshest environments.

Global Support

Pipe contractors need to be able to mobilize and deploy resources quickly and efficiently – no matter where the next job calls them. Lincoln Electric's global network of manufacturing and distribution facilities, pipe welding engineers, welding technicians, and technical experts are there to deliver. Wherever your project, Lincoln Electric's team of dedicated professionals and world class products are there with the support that you need.

ISO 9001 and 14001 Certified

Manufactured to standards for environmental and quality management systems.



Complete Pipe Welding Solutions

By partnering with Lincoln Electric, pipe contractors can rely on a single, comprehensive welding resource to provide the latest in pipe welding technology for improving productivity, quality and safety. Choose Pipeliner® for consistently reliable product performance.

This is why many of the world's most successful pipe contractors have chosen Lincoln Electric as their single-source welding partner. Lincoln offers world class welding equipment and consumables designed specifically around the needs of pipe welding.

Understanding the needs of the pipeline contractor is our focus. We are constantly working to improve our offering to this mission critical industry segment. Because of this, we engineer the equipment, consumables and process to work together for the benefit of the contractor. The result is less downtime, improved production rates and higher profit potential with every pipe project.

Visit Our Website

Consumable AWS Certificates:

<http://www.lincolnelectric.com/products/certificates/>

Material Safety Data Sheets (MSDS):

<http://www.lincolnelectric.com/product/msds/>

ANSI Z49.1, E205 Safety Booklet, and other Arc Welding Safety Materials:

<http://www.lincolnelectric.com/community/safety/>

Safe Practices Article:

<http://www.lincolnelectric.com/knowledge/articles/content/lenstaybl.asp>

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ELECTRODE SELECTION GUIDE

Pipe Grades

Pipe grades are classified in accordance with API 5L specification. The specification established requirements for two product specification levels – PSL 1 and PSL 2. Reference API 5L for full specifications.

PSL 1: Includes requirements for chemistry, ductility, minimum yield strength, and minimum tensile strength.

PSL 2: Adds requirements for maximum yield strength, and maximum tensile strength.

API SPECIFICATION 5L, 44TH EDITION

Requirements for the Results of Tensile Tests for PSL 1 Pipe

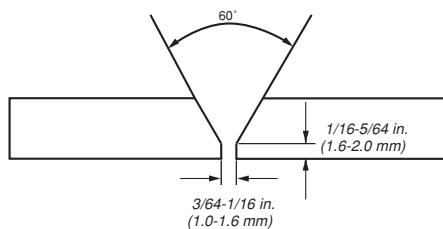
Grade	Yield Strength Minimum		Ultimate Tensile Strength Minimum	
	MPa	ksi	MPa	ksi
A25	175	25	310	45
A25P	175	25	310	45
A	210	31	335	49
B	245	36	415	60
X42	290	42	415	60
X46	320	46	435	63
X52	360	52	460	67
X56	390	57	490	71
X60	415	60	520	75
X65	450	65	535	78
X70	485	70	570	83

API SPECIFICATION 5L, 44TH EDITION - Requirements for the Results of Tensile Tests for PSL 2 Pipe

Grade	Yield Strength Minimum		Yield Strength Maximum		Ultimate Tensile Strength Minimum		Ultimate Tensile Strength Maximum	
	MPa	ksi	MPa	ksi	MPa	ksi	MPa	ksi
B	245	36	450	65	415	60	760	110
X42	290	42	495	72	415	60	760	110
X46	320	46	525	76	435	63	760	110
X52	360	52	530	77	460	67	760	110
X56	390	57	545	79	490	71	760	110
X60	415	60	565	82	520	75	760	110
X65	450	65	600	87	535	78	760	110
X70	485	70	635	92	570	83	760	110
X80	555	81	705	102	625	91	825	120
X90	625	91	775	112	695	101	915	133
X100	690	100	840	122	760	110	990	144
X120	830	120	1050	152	915	133	1145	166

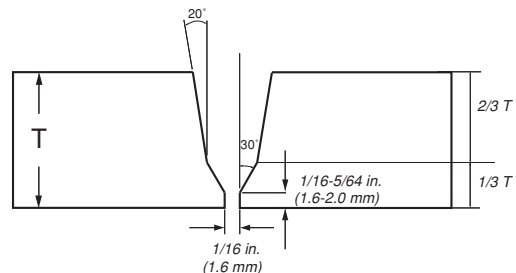
Common Pipe Joint Designs

A common weld joint for thinner walled pipe is the "API" fitup with a 60 degree included angle, a 1.6 mm (1/16 in.) and 1.6 mm (1/16 in.).



Wall thickness < 3/4 in. (< 20mm)

As an alternative, for thicker-walled pipe (>20 mm, >3/4 in.), a compound bevel can be used. The amount of material required to fill a compound bevel joint is less than that for a 60 degree included angle preparation, so productivity may be increased.



Wall thickness > 3/4 in. (> 20mm)

ELECTRODE SELECTION GUIDE

Products	AWS Classification	Low Strength				High Strength			
		<X60	X60	X65	X70	X80	X90	X100	
MANUAL ELECTRODES									
<i>Stick (SMAW) Electrodes - Cellulosic</i>									
Pipeliners® 6P+	E6010	R+F	R+F	R	R	R			
Pipeliners® 7P+	E7010-P1		R+F	R+F	R	R			
Pipeliners® 8P+	E8010-P1		R+F	R+F	R+F	R			
<i>Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Up</i>									
Pipeliners® 16P	E7016 H4	R	R	R	R	R	R	R	R
Pipeliners® 17P	E7018-1 H4R	F	F	F					
Pipeliners® 18P	E8018-G H4R		F	F	F				
Pipeliners® 19P	E10018-G H4R			F	F	F	F		
Pipeliners® 20P	E12018-G H4R					F	F	F	
<i>Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Down</i>									
Pipeliners® LH-D80	E8045-P2 H4R		F	F	F				
Pipeliners® LH-D90	E9045-P2 H4R			F	F	F			
Pipeliners® LH-D100	E10045-P2 H4R				F	F	F		
SEMIAUTOMATIC / AUTOMATIC									
<i>MIG (GMAW) Wires - Solid</i>									
Pipeliners® 70S-G	ER70S-G	R+F	R+F	R+F	R+F	R	R	R	
Pipeliners® 80S-G	ER80S-G		R+F	R+F	R+F	R+F	R	R	
<i>Flux-Cored (FCAW-S) Wires - Self-Shielded</i>									
Pipeliners® NR®-207+	E71T8-K6	F	F	F					
Pipeliners® NR®-208-P	E81T8-G		F	F	F				
Pipeliners® NR®-208-XP	E81T8-G		F	F	F				
<i>Flux-Cored (FCAW-G) Wires - Gas-Shielded</i>									
Pipeliners® G70M	E71T-1M-JH8/E71T-9M-JH8	F	F	F	F				
Pipeliners® G80M	E101T1-GM-H8		F	F	F	F			
Pipeliners® G90M	E111T1-K3M-JH8				F	F			

R = Root Pass Only R+F = Root & Fill Passes F = Fill Pass Only

NOTE 1: This table indicates common welding electrodes by API 5L pipe grade. Final product selection should be project specific. The specific electrode recommendation depends on project specifications, including strength overmatch and minimum toughness requirements. For help in selecting the appropriate consumables and other technical questions, please contact our Pipe Welding Application Group at +1-866-635-4709 or email appengr@lincolnelectric.com.

NOTE 2: Please note that the welding consumable recommendations in this table are based on weld metal strength matching the nominal pipe strength based upon API 5L minimum requirements. Recommended consumables in this chart are based upon these standards and not actual strength of pipe.

ELECTRODE SELECTION GUIDE

Electrode Name	AWS Classifications	Recommended Polarity	General Description	Page No.
<i>Stick (SMAW) Electrodes - Cellulosic</i>				
Pipeliner® 6P+	AWS A5.1/A5.1M: 2004 E6010	DC+	Pipeliner® 6P+ sets the standard for root pass welding in the pipeline industry. It is recommended for root pass welding in either vertical up or vertical down welding positions of up to X80 grade pipe as well as hot, fill and cap pass welding of up to X60 grade pipe. For all position pipe welding – choose Pipeliner® 6P+.	8
Pipeliner® 7P+	AWS A5.5/A5.5M: 2006 E7010-P1	DC+	Pipeliner® 7P+ allows for increased fill capabilities resulting in fewer fill passes. It is capable of meeting stringent pipeline welding requirements when tested for low temperature impact toughness. It is recommended for root pass welding of up to X80 grade pipe, and hot, fill and cap pass welding of up to X65 grade pipe. For vertical down pipe welding – choose Pipeliner® 7P+.	9
Pipeliner® 8P+	AWS A5.5/A5.5M: 2006 E8010-P1	DC+	Pipeliner® 8P+ is the highest strength cellulosic electrode in the Lincoln Pipeliner® family and allows for increased fill capabilities resulting in fewer fill passes. It is recommended for root pass welding of up to X80 grade pipe, and hot, fill and cap pass welding of up to X70 grade pipe. For vertical down pipe welding – choose Pipeliner® 8P+.	10
<i>Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Up</i>				
Pipeliner® 16P	AWS A5.1/A5.1M: 2004 E7016 H4	DC± AC	Pipeliner® 16P has unique properties that enable low hydrogen SMAW root passes meeting strict pipe welding requirements. It is recommended for root pass welding of up to X100 grade pipe. For vertical up pipe welding – choose Pipeliner® 16P.	11
Pipeliner® 17P	AWS A5.1/A5.1M: 2004 E7018-1 H4R	DC+ AC	Pipeliner® 17P has high operator appeal with a smooth arc, square burn-off and excellent puddle control. It is recommended for fill and cap pass welding of up to X65 grade pipe. For vertical up pipe welding – choose Pipeliner® 17P.	12
Pipeliner® 18P	AWS A5.5/A5.5M: 2006 E8018-G H4R	DC+ AC	Pipeliner® 18P has high operator appeal with a smooth arc, square burn-off and excellent puddle control. It is recommended for fill and cap pass welding of up to X70 grade pipe. For vertical up pipe welding – choose Pipeliner® 18P.	13
Pipeliner® 19P	AWS A5.5/A5.5M: 2006 E10018-G H4R	DC+ AC	Pipeliner® 19P has high operator appeal with a smooth arc, square burn-off and excellent puddle control. It is recommended for fill and cap pass welding of up to X80 grade pipe. For vertical up pipe welding – choose Pipeliner® 19P.	14
Pipeliner® 20P	AWS A5.5/A5.5M: 2006 E12018-G H4R	DC+ AC	Pipeliner® 20P has high operator appeal with a smooth arc, square burn-off and excellent puddle control. It is recommended for fill and cap pass vertical up welding of up to X100 grade pipe. For vertical up pipe welding – choose Pipeliner® 20P.	15
<i>Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Down</i>				
Pipeliner® LH-D80	AWS A5.5/A5.5M: 2006 E8045-P2 H4R	DC+	Pipeliner® LH-D80 is a low hydrogen high deposition electrode specially designed for the vertical down welding of pipe. It is recommended for fill and cap pass welding of up to X70 pipe as well as pipe repair and hot tapping applications. For an electrode capable of the lowest diffusible hydrogen levels of any vertical down stick electrode in the industry, high productivity and operator appeal – choose Pipeliner® LH-D80.	16

ELECTRODE SELECTION GUIDE

Electrode Name	AWS Classifications	Recommended Polarity	General Description	Page No.
Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Down				
Pipeliner® LH-D90	AWS A5.5/A5.5M: 2006 E9045-P2 H4R	DC+	Pipeliner® LH-D90 is a low hydrogen high deposition electrode specially designed for the vertical down welding of pipe. It is recommended for fill and cap pass welding of up to X80 pipe as well as pipe repair and hot tapping applications. For an electrode capable of the lowest diffusible hydrogen levels of any vertical down stick electrode in the industry, high productivity and operator appeal – choose Pipeliner® LH-D90.	17
Pipeliner® LH-D100	AWS A5.5/A5.5M: 2006 E10045-P2 H4R	DC+	Pipeliner® LH-D100 is a low hydrogen high deposition electrode specially designed for the vertical down welding of pipe. It is recommended for fill and cap pass welding of up to X90 pipe as well as pipe repair and hot tapping applications. For an electrode capable of the lowest diffusible hydrogen levels of any vertical down stick electrode in the industry, high productivity and operator appeal – choose Pipeliner® LH-D100.	18
MIG (GMAW) Wires - Solid				
Pipeliner® 70S-G	AWS A5.18/A5.18M: 2005 ER70S-G	DC+	Pipeliner® 70S-G has a low silicon level for unblemished welds with less clean up required. Provides good back bead shape when using the STT® process on root passes. It is recommended for root pass welding of up to X100 grade pipe as well as hot, fill and cap pass welding of up to X70 grade pipe. For all position welding – choose Pipeliner® 70S-G.	19
Pipeliner® 80S-G	AWS A5.28/A5.28M: 2005 ER80S-G	DC+	Pipeliner® 80S-G is the highest strength MIG wire in Pipeliner® family. Recommended for root pass welding of up to X100 grade pipe as well as hot, fill and cap pass welding of up to X80 grade pipe. For all position welding – choose Pipeliner® 80S-G.	20
Flux-Cored (FCAW-S) Wires - Self-Shielded				
Pipeliner® NR®-207+	AWS A5.29/A5.29M: 2005 E71T8-K6	DC-	Pipeliner® NR®-207+ has the portability of stick electrode and the productivity of wire. It is recommended for hot, fill and cap pass welding of up to X70 grade pipe. For vertical down pipe welding – choose Pipeliner® NR®-207+.	21
Pipeliner® NR®-208-P	AWS A5.29/A5.29M: 2005 E81T8-G	DC-	Pipeliner® NR®-208-P has the portability of stick electrode and the productivity of wire. It is capable of producing impact values of 27 J (20 ft•lbf) @ -29°C (-20°F). It is recommended for hot, fill and cap pass welding of up to X80 grade pipe. For vertical down pipe welding – choose Pipeliner® NR®-208-P.	22
Pipeliner® NR®-208-XP	AWS A5.29/A5.29M: 2005 E81T8-G	DC-	Pipeliner® NR®-208-XP has been micro-alloyed to be capable of exceeding impact values of 68 J (50 ft•lbf) @ -29°C (-20°F). It is recommended for hot, fill and cap pass welding of up to X80 grade pipe. For vertical down pipe welding – choose Pipeliner® NR®-208-XP.	23
Flux-Cored (FCAW-G) Wires - Gas-Shielded				
Pipeliner® G70M	AWS A5.20/A5.20M: 1995 E71T-1M-JH8 / E71T-9M-JH8	DC+	Pipeliner® G70M is designed for use with semiautomatic and mechanized welding systems and has the best operator appeal in difficult welding positions. It is recommended for hot, fill and cap pass welding of up to X70 grade pipe. For vertical up pipe welding – choose Pipeliner® G70M.	24
Pipeliner® G80M	AWS A5.29/A5.29M: 2005 E101T1-GM-H8	DC+	Pipeliner® G80M is higher strength than G70M. It is recommended for hot, fill and cap pass welding of up to X80 grade pipe. For vertical up pipe welding – choose Pipeliner® G80M.	25
Pipeliner® G90M	AWS A5.29/A5.29M: 2005 E111T1-K3M-JH8	DC+	Pipeliner® G90M is the highest strength flux-cored wire in the Pipeliner® family. It is recommended for hot, fill and cap pass welding of up to X80 grade pipe. For vertical up pipe welding – choose Pipeliner® G90M.	26

Pipeliner® 6P+

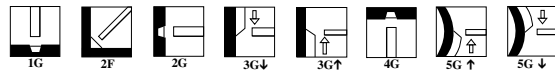
Stick (SMAW) Electrodes - Cellulosic (AWS E6010)

Pipeliner® 6P+ sets the standard for root pass welding in the pipeline industry. It is recommended for root pass welding in either vertical up or vertical down welding positions of up to X80 grade pipe as well as hot, fill and cap pass welding of up to X60 grade pipe. For all position pipe welding – choose Pipeliner® 6P+.

Key Features

- **High Operator Appeal and Control** – Forceful cellulosic arc for high operator appeal and control when root pass welding.
- **True Cellulosic Electrode** – Stiff, driving, penetrating arc for optimal hot pass penetration.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **Hermetically Sealed Packaging** – Easy Open Cans – Delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.1, Class C3 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.1/A5.1M: 2004	E6010
ASME SFA-5.1	E6010
CSA W48	E4310

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	2.5 mm (3/32 in.)	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)
DC+	50 - 70	75 - 125	100 - 165
DC-	50 - 70	75 - 125	100 - 165

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Can	
	13.6 kg (30 lb) Cardboard Carton Master	22.7 kg (50 lb) Easy Open Hermetic Can
2.5 (3/32)	ED032609	
3.2 (1/8)	ED032610	ED030848
4.0 (5/32)	ED032611	ED030849

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.1/A5.1M: 2004

	Yield Strength ⁽³⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
Requirements AWS E6010	330 (48) min.	415 (60) min.	22 min.	27 (20) min.
Typical Performance⁽²⁾ As-Welded	405 - 515 (59 - 75)	495 - 620 (72 - 90)	22 - 36	27 - 85 (20 - 63)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V
Requirements AWS E6010	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified	0.30 max.	0.20 max.	0.30 max.	0.08 max.
Typical Performance⁽²⁾	0.11 - 0.23	0.51 - 0.77	0.15 - 0.32	0.006 - 0.16	0.005 - 0.011	0.01 - 0.04	0.01 - 0.04	0.01 - 0.02	≤0.01

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset.

NOTE: This AWS electrode classification is not required to deposit weld metal that is low in hydrogen. Therefore, these electrodes should not be used in applications where the hydrogen content of the weld metal is required to be controlled.

Pipeliner® 7P+

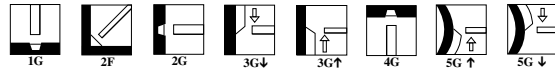
Stick (SMAW) Electrodes - Cellulosic (AWS E7010-P1)

Pipeliner® 7P+ allows for increased fill capabilities resulting in fewer fill passes. It is capable of meeting stringent pipeline welding requirements when tested for low temperature impact toughness. It is recommended for root pass welding of up to X80 grade pipe, and hot, fill and cap pass welding of up to X65 grade pipe. For vertical down pipe welding – choose Pipeliner® 7P+.

Key Features

- **High Operator Appeal and Control** – Less spatter and clear puddle while fill, hot or cap pass welding.
- **High Productivity** – True 5.0mm metric diameter yields 15-20% productivity gain over Shield-Arc® 70+. High productivity in vertical down and out-of-position pipe welding.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **Hermetically Sealed Packaging** – Easy Open Cans – Delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.5, Class C3 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.5/A5.5M: 2006	E7010-P1 (Also meets E7010-G)
ASME SFA-5.5	E7010-P1 (Also meets E7010-G)
CSA W48	E4910-P1

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)	5.0 mm (13/64 in.)
DC+	65 - 130	100 - 165	130 - 210

Although not specified in AWS classification, Pipeliner® 7P+ can be run on DC-.

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Can	
	13.6 kg (30 lb) Cardboard Carton Master	22.7 kg (50 lb) Easy Open Hermetic Can
3.2 (1/8)	ED032612	ED031611
4.0 (5/32)	ED032613	ED031612
5.0 (13/64)	ED032614	ED031613

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -40°C (-40°F)
Requirements AWS E7010-P1	415 (60) min.	485 (70) min.	22 min	27 (20) min.	Not Specified
Typical Performance⁽²⁾ As-Welded	455 - 515 (66 - 75)	525 - 635 (76 - 92)	23 - 29	49 - 92 (36 - 68)	31 - 85 (23 - 63)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V
Requirements AWS E7010-P1	0.20 max.	1.20 max.	0.60 max.	0.03 max.	0.03 max.	1.00 max.	0.30 max.	0.50 max.	0.10 max.
Typical Performance⁽²⁾	0.09 - 0.20	0.44 - 0.83	0.06 - 0.31	0.01 - 0.02	0.01 - 0.02	0.58 - 0.90	0.02 - 0.05	0.04 - 0.21	≤ 0.01

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. NOTE 1: This product contains micro-alloying elements. Additional information available on request.
NOTE 2: This AWS electrode classification is not required to deposit weld metal that is low in hydrogen. Therefore, these electrodes should not be used in applications where the hydrogen content of the weld metal is required to be controlled.

Pipelin[®]er 8P+

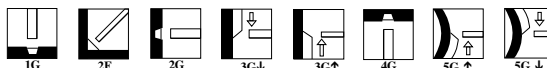
Stick (SMAW) Electrodes - Cellulosic (AWS E8010-P1)

Pipelin[®]er 8P+ is the highest strength cellulosic electrode in the Lincoln Pipelin[®]er family and allows for increased fill capabilities resulting in fewer fill passes. It is recommended for root pass welding of up to X80 grade pipe, and hot, fill and cap pass welding of up to X70 grade pipe. For vertical down pipe welding – choose Pipelin[®]er 8P+.

Key Features

- **High Operator Appeal and Control** – Less spatter and clear puddle while fill, hot or cap pass welding.
- **High Productivity** – True 5.0mm metric diameter yields 15-20% productivity gain over Shield-Arc[®] 70+. High productivity in vertical down and out-of-position pipe welding.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **Hermetically Sealed Packaging** – Easy Open Cans – Delivers quality product, performance reliability and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.1, Class C3 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.5/A5.5M: 2006 E8010-P1 (Also meets E8010-G)
ASME SFA-5.5 E8010-P1 (Also meets E8010-G)
CSA W48 E5510-P1

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)	5.0 mm (13/64 in.)
DC+	65 - 120	100 - 165	130 - 210

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Can	
	13.6 kg (30 lb) Cardboard Carton Master	22.7 kg (50 lb) Easy Open Hermetic Can
3.2 (1/8)	ED032615	ED030826
4.0 (5/32)	ED032616	ED030827
5.0 (13/64)	ED032617	ED030828

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	Yield Strength ⁽³⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -40°C (-40°F)
Requirements AWS E8010-P1	460 (67) min.	550 (80) min.	19 min.	27 (20) min.	Not Specified
Typical Performance⁽²⁾ As-Welded	475 - 545 (69 - 79)	560 - 670 (81 - 97)	19 - 32	49 - 149 (36 - 110)	41 - 119 (30 - 88)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V
Requirements AWS E8010-P1	0.20 max.	1.20 max.	0.60 max.	0.03 max.	0.03 max.	1.00 max.	0.30 max.	0.50 max.	0.10 max.
Typical Performance⁽²⁾	0.09 - 0.20	0.55 - 0.98	0.07 - 0.27	0.01 - 0.02	0.01 - 0.02	0.73 - 1.00	0.02 - 0.05	0.13 - 0.22	0.01 max.

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. NOTE 1: This product contains micro-alloying elements. Additional information available on request.
 NOTE 2: This AWS electrode classification is not required to deposit weld metal that is low in hydrogen. Therefore, these electrodes should not be used in applications where the hydrogen content of the weld metal is required to be controlled.

Pipeliner® 16P

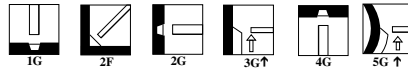
Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Up (AWS E7016 H4)

Pipeliner® 16P has unique properties that enable low hydrogen SMAW root passes meeting strict pipe welding requirements. It is recommended for root pass welding of up to X100 grade pipe. For vertical up pipe welding – choose Pipeliner® 16P.

Key Features

- **Low Hydrogen Vertical Up Capability** – Excellent for repair welds or welds with increased sensitivity to cracking.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **Hermetically Sealed Packaging – Easy Open Cans** – Delivers quality product, performance reliability and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.1, Class C3 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.1/A5.1M: 2004	E7016 H4
ASME SFA-5.1	E7016 H4

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	2.5 mm (3/32 in.)	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)
DC±	55 - 80	75 - 120	120 - 160
AC	60 - 80	80 - 120	120 - 160

DIAMETERS/PACKAGING

Diameters mm (in.)	22.7 kg (50 lb) Easy Open Hermetic Can
2.5 (3/32)	ED030916
3.2 (1/8)	ED030917
4.0 (5/32)	ED030918

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.1/A5.1M: 2004

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -40°C (-40°F)
Requirements AWS E7016 H4	400 (58) min.	485 (70) min.	22 min.	27 (20) min.	Not Specified
Typical Performance⁽²⁾ As-Welded	435 - 545 (63 - 79)	550 - 640 (80 - 93)	23 - 34	84 - 161 (62 - 119)	65 - 129 (48 - 95)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V	Mn+Ni+Cr +Mo+V	Diffusible Hydrogen, mL/100g
Requirements AWS E7016 H4	0.15 max.	1.60 max.	0.75 max.	0.035 max.	0.035 max.	0.30 max.	0.20 max.	0.30 max.	0.08 max.	1.75 max.	4.0 max.
Typical Performance⁽²⁾	0.04 - 0.08	1.10 - 1.60	0.39 - 0.67	0.005 - 0.020	0.004 - 0.012	<0.07	0.01 - 0.07	0.01 - 0.03	0.01 - 0.02	1.14 - 1.71	1 - 4

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset.

Pipeliner® 17P

Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Up (AWS E7018-1 H4R)

Pipeliner® 17P has high operator appeal with a smooth arc, square burn-off and excellent puddle control. It is recommended for fill and cap pass welding of up to X65 grade pipe. For vertical up pipe welding – choose Pipeliner® 17P.

Key Features

- **Low Hydrogen Vertical Up Capability** – Excellent for repair welds or welds with increased sensitivity to cracking.
- **Easy Strike Tip** – Improved arc starting and reduction of arc starting porosity.
- **Low Temperature Impact Toughness** – Every lot tested to -46°C (-50°F).
- **Hermetically Sealed Packaging** – Easy Open Cans – Delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.1, Class C3 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.1/A5.1M: 2004	E7018-1 H4R
ASME SFA-5.1	E7018-1 H4R
CSA W48	E4918-1

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)	
	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)
DC+	90 - 160	130 - 210
AC	100 - 160	140 - 160

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Can
	13.6 kg (30 lb) Cardboard Carton Master
3.2 (1/8)	ED032618
4.0 (5/32)	ED032619

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.1/A5.1M: 2004

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lb)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
Requirements AWS E7018-1 H4R	400 (58) min.	485 (70) min.	22 min.	Not Specified	27 (20) min.
Typical Performance⁽²⁾ As-Welded	400 - 470 (58 - 68)	515 - 550 (75 - 80)	28 - 33	163 - 355 (120 - 262)	115 - 285 (85 - 210)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V	Mn+Ni+Cr+ Mo+V	Diffusible Hydrogen, mL/100g
Requirements AWS E7018-1 H4R	0.15 max.	1.60 max.	0.75 max.	0.035 max.	0.035 max.	0.30 max.	0.20 max.	0.30 max.	0.08 max.	1.75 max.	4.0 max.
Typical Performance⁽²⁾	0.04 - 0.05	1.16 - 1.25	0.28 - 0.33	0.011 - 0.014	0.008 - 0.010	0.02 - 0.03	0.04 - 0.05	0.12 - 0.22	<0.01	1.39 - 1.47	1 - 4

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset.

Pipeliner® 18P

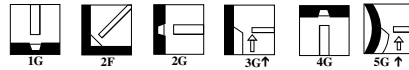
Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Up (AWS E8018-G H4R)

Pipeliner® 18P has high operator appeal with a smooth arc, square burn-off and excellent puddle control. It is recommended for fill and cap pass welding of up to X70 grade pipe. For vertical up pipe welding – choose Pipeliner® 18P.

Key Features

- **Low Hydrogen Vertical Up Capability** – Excellent for repair welds or welds with increased sensitivity to cracking.
- **Easy Strike Tip** – Improved arc starting and reduction of arc starting porosity.
- **Low Temperature Impact Toughness** – Every lot tested to -46°C (-50°F).
- **Hermetically Sealed Packaging** – Easy Open Cans – Delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.5, Class C1 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.5/A5.5M: 2006	E8018-G
ASME SFA-5.5	E8018-G H4R
CSA W48	E5518-G

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)	
	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)
DC+	80 - 145	120 - 185
AC	90 - 155	130 - 195

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Can 13.6 kg (30 lb) Cardboard Carton Master
3.2 (1/8)	ED032620
4.0 (5/32)	ED032621

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
Requirements AWS E8018-G H4R	460 (67) min.	550 (80) min.	19 min.	Not Specified	Not Specified
Typical Performance⁽²⁾ As-Welded	515 - 655 (75 - 95)	620 - 710 (90 - 103)	24 - 32	96 - 167 (71 - 123)	50 - 121 (37 - 89)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn ⁽⁴⁾	%Si ⁽⁴⁾	%P	%S	%Ni ⁽⁴⁾	%Cr ⁽⁴⁾	%Mo ⁽⁴⁾	%V ⁽⁴⁾	%Cu ⁽⁴⁾	Diffusible Hydrogen, mL/100g
Requirements AWS E8018-G H4R	Not Specified	1.00 min.	0.80 min.	0.03 max.	0.03 max.	0.50 min.	0.30 min.	0.20 min.	0.10 min.	0.20 min.	4.0 max.
Typical Performance⁽²⁾	0.04 - 0.06	1.28 - 1.42	0.44 - 0.58	0.01 - 0.02	≤0.01	0.76 - 0.85	0.04 - 0.06	0.17 - 0.39	<0.01	0.04 - 0.13	1 - 4

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. ⁽⁴⁾ In order to meet the alloy requirements of the "G" group, the undiluted weld metal shall have the minimum of at least one of the elements listed.

Pipeliner® 19P

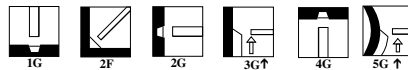
Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Up (AWS E10018-G H4R)

Pipeliner® 19P has high operator appeal with a smooth arc, square burn-off and excellent puddle control. It is recommended for fill and cap pass welding of up to X80 grade pipe. For vertical up pipe welding – choose Pipeliner® 19P.

Key Features

- **Low Hydrogen Vertical Up Capability** – Excellent for repair welds or welds with increased sensitivity to cracking.
- **Easy Strike Tip** – Improved arc starting and reduction of arc starting porosity.
- **Low Temperature Impact Toughness** – Every lot tested to -46°C (-50°F).
- **Hermetically Sealed Packaging** – Easy Open Cans – Delivers quality product, performance reliability and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.5, Class C3 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.5/A5.5M: 2006	E10018-G H4R
ASME SFA-5.5	E10018-G H4R
CSA W48	E6918-G

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)	
	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)
DC+	80 - 155	130 - 210
AC	80 - 160	140 - 215

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Cans
	13.6 kg (30 lb) Cardboard Carton Master
3.2 (1/8)	ED032622
4.0 (5/32)	ED032623

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
Requirements AWS E10018-G H4R	600 (87) min.	690 (100) min.	15 min.	Not Specified	Not Specified
Typical Performance⁽²⁾ As-Welded	660 - 740 (96 - 107)	740 - 825 (107 - 120)	20 - 26	91 - 129 (69 - 95)	81 - 111 (60 - 82)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn ⁽⁴⁾	%Si ⁽⁴⁾	%P	%S	%Ni ⁽⁴⁾	%Cr ⁽⁴⁾	%Mo ⁽⁴⁾	%V ⁽⁴⁾	%Cu ⁽⁴⁾	Diffusible Hydrogen, mL/100g
Requirements AWS E10018-G H4R	Not Specified	1.00 min.	0.80 min.	0.03 max.	0.03 max.	0.50 max.	0.30 min.	0.20 min.	0.10 min.	0.20 min.	4.0 max.
Typical Performance⁽²⁾	0.03 - 0.05	1.44 - 1.78	0.34 - 0.57	0.01 - 0.02	≤0.01	1.92 - 2.36	0.02 - 0.07	0.37 - 0.47	0.01 - 0.02	0.01 - 0.07	2 - 3

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. ⁽⁴⁾ In order to meet the alloy requirements of the "G" group, the undiluted weld metal shall have the minimum of at least one of the elements listed.

Pipeliner® 20P

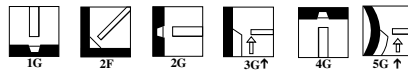
Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Up (AWS E12018-G H4R)

Pipeliner® 20P has high operator appeal with a smooth arc, square burn-off and excellent puddle control. It is recommended for fill and cap pass vertical up welding of up to X100 grade pipe. For vertical up pipe welding – choose Pipeliner® 20P.

Key Features

- **Low Hydrogen Vertical Up Capability** – Excellent for repair welds or welds with increased sensitivity to cracking.
- **Easy Strike Tip** – Improved arc starting and reduction of arc starting porosity.
- **Low Temperature Impact Toughness** – Every lot tested to -60°C (-76°F).
- **Hermetically Sealed Packaging** – Easy Open Cans – Delivers quality product, performance, reliability and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.5, Class C1 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.5/A5.5M: 2006	E12018-G H4R / E8318-G
ASME SFA-5.5	E12018-G H4R
CSA W48	E8318-G

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)	
	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)
DC+	80 - 130	120 - 180
AC	90 - 140	130 - 190

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Can 13.6 kg (30 lb) Cardboard Carton Master
3.2 (1/8)	ED032624
4.0 (5/32)	ED032625

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -60°C (-76°F)
Requirements AWS E12018-G H4R	740 (107) min.	825 (120) min.	14 min.	Not Specified	Not Specified
Typical Performance⁽²⁾ As-Welded	795 - 840 (115 - 122)	820 - 850 (119 - 123)	17 - 21	80 (59)	60 (44)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn ⁽⁴⁾	%Si ⁽⁴⁾	%P	%S	%Ni ⁽⁴⁾	%Cr ⁽⁴⁾	%Mo ⁽⁴⁾	%V ⁽⁴⁾	%Cu ⁽⁴⁾	Diffusible Hydrogen, mL/100g
Requirements AWS E12018-G H4R	Not Specified	1.00 min.	0.80 min.	0.03 max.	0.03 max.	0.50 min.	0.30 min.	0.20 min.	0.10 min.	0.20 min.	4.0 max.
Typical Performance⁽²⁾	0.05 - 0.08	1.25 - 1.60	0.30 - 0.60	0.01 - 0.02	≤0.02	1.60 - 2.05	0.35 - 0.60	0.35 - 0.60	0.01 - 0.02	0.01 - 0.08	1 - 4

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. ⁽⁴⁾ In order to meet the alloy requirements of the "G" group, the undiluted weld metal shall have the minimum of at least one of the elements listed.

Pipeliner® LH-D80

Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Down (AWS E8045-P2 H4R)

Pipeliner® LH-D80 is a low hydrogen high deposition electrode specially designed for the vertical down welding of pipe. It is recommended for fill and cap pass welding of up to X70 pipe as well as pipe repair and hot tapping applications. For an electrode capable of the lowest diffusible hydrogen levels of any vertical down stick electrode in the industry, high productivity and operator appeal – choose Pipeliner® LH-D80.

Key Features

- **High Productivity** – Carry and deposit more weld metal in vertical down pipe welding allowing for faster travel speeds and high deposition rates.
- **Low Hydrogen - AWS H4R** – Integrated Silicate Technology™ improves resistance to moisture pickup allowing this AWS H4R electrode to reduce chances for hydrogen-induced cracking.
- **Easy Strike Tapered Tip** – Innovative tip design enables easy touch start arc initiation for minimal starting porosity.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.5, Class C3 Schedule I. Charpy V-notch testing at -40°C (-40°F). Actual certificates of test available at www.lincolnelectric.com.
- **Best-in-Class Arc Performance** – Smooth arc, excellent puddle control and low spatter for ease of use, operator appeal and higher productivity.

Welding Positions



Conformance

AWS A5.5/A5.5M: 2006	E8045-P2 H4R
ASME SFA-5.5	E8045-P2 H4R

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)	4.5 mm (11/64 in.)
DC+	120 - 170	170 - 250	200 - 300

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Can 13.6 kg (30 lb) Cardboard Carton Master	
	3.2 (1/8)	ED032626
4.0 (5/32)	ED032627	
4.5 (11/64)	ED032628	

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	Yield Strength ⁽³⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
Requirements AWS E8045-P2 H4R	460 (67) min.	550 (80) min.	19 min.	27 (20) min.	Not Specified
Typical Performance⁽²⁾ As-Welded	485 - 515 (70 - 75)	570 - 600 (83 - 87)	26 - 31	75 - 125 (55 - 92)	50 - 95 (37 - 70)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V	Diffusible Hydrogen, mL/100g
Requirements AWS E8045-P2 H4R	0.12 max.	0.90 - 1.70	0.80 max.	0.03 max.	0.03 max.	1.00 max.	0.20 max.	0.50 max.	0.05 max.	4.0 max.
Typical Performance⁽²⁾	0.04 - 0.06	1.10 - 1.25	0.35 - 0.50	≤0.01	≤0.01	≤0.04	≤0.05	≤0.02	≤0.01	2 - 4

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. NOTE: This product contains micro-alloying elements. Additional information available on request.

Pipeliner® LH-D90

Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Down (AWS E9045-P2 H4R)

Pipeliner® LH-D90 is a low hydrogen high deposition electrode specially designed for the vertical down welding of pipe. It is recommended for fill and cap pass welding of up to X80 pipe as well as pipe repair and hot tapping applications. For an electrode capable of the lowest diffusible hydrogen levels of any vertical down stick electrode in the industry, high productivity and operator appeal – choose Pipeliner® LH-D90.

Key Features

- **High Productivity** – Carry and deposit more weld metal in vertical down pipe welding allowing for faster travel speeds and high deposition rates.
- **Low Hydrogen - AWS H4R** – Integrated Silicate Technology™ improves resistance to moisture pickup allowing this AWS H4R electrode to reduce chances for hydrogen-induced cracking.
- **Easy Strike Tapered Tip** – Innovative tip design enables easy touch start arc initiation for minimal starting porosity.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.5, Class C3 Schedule I. Charpy V-notch testing at -40°C (-40°F). Actual certificates of test available at www.lincolnelectric.com.
- **Best-in-Class Arc Performance** – Smooth arc, excellent puddle control and low spatter for ease of use, operator appeal and higher productivity.

Welding Positions



Conformance

AWS A5.5/A5.5M: 2006 E9045-P2 H4R
ASME SFA-5.5 E9045-P2 H4R

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)	4.5 mm (11/64 in.)
DC+	120 - 170	170 - 250	200 - 300

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Can 13.6 kg (30 lb) Cardboard Carton Master	
	3.2 (1/8)	ED032629
4.0 (5/32)	ED032630	
4.5 (11/64)	ED032631	

MECHANICAL PROPERTIES⁽¹⁾ - As required per AWS A5.5/A5.5M: 2006

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
Requirements AWS E9045-P2 H4R	530 (77) min.	620 (90) min.	17 min.	27 (20) min.	Not Specified
Typical Performance⁽²⁾ As-Welded	550 - 600 (80 - 87)	625 - 670 (91 - 97)	24 - 28	89 - 119 (66 - 88)	65 - 95 (48 - 70)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V	Diffusible Hydrogen, mL/100g
Requirements AWS E9045-P2 H4R	0.12 max.	0.90 - 1.70	0.80 max.	0.03 max.	0.03 max.	1.00 max.	0.20 max.	0.50 max.	0.05 max.	4.0 max.
Typical Performance⁽²⁾	0.04 - 0.06	1.15 - 1.35	0.35 - 0.55	≤0.01	≤0.01	0.25 - 0.30 ⁽⁴⁾ 0.80 - 1.00 ⁽⁵⁾	≤0.05	0.15 - 0.25	≤0.01	2 - 4

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. ⁽⁴⁾ Range for 3.2 (1/8 in.) mm size only. ⁽⁵⁾ Range for 4.0 mm (5/32 in.) and 4.5 mm (11/64 in.) sizes.
NOTE: This product contains micro-alloying elements. Additional information available on request.

Pipeliner® LH-D100

Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Down (AWS E10045-P2 H4R)

Pipeliner® LH-D100 is a low hydrogen high deposition electrode specially designed for the vertical down welding of pipe. It is recommended for fill and cap pass welding of up to X90 pipe as well as pipe repair and hot tapping applications. For an electrode capable of the lowest diffusible hydrogen levels of any vertical down stick electrode in the industry, high productivity and operator appeal – choose Pipeliner® LH-D100.

Key Features

- **High Productivity** – Carry and deposit more weld metal in vertical down pipe welding allowing for faster travel speeds and high deposition rates.
- **Low Hydrogen - AWS H4R** – Integrated Silicate Technology™ improves resistance to moisture pickup allowing this AWS H4R electrode to reduce chances for hydrogen-induced cracking.
- **Easy Strike Tapered Tip** – Innovative tip design enables easy touch start arc initiation for minimal starting porosity.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.5, Class C3 Schedule I. Charpy V-notch testing at -40°C (-40°F). Actual certificates of test available at www.lincolnelectric.com.
- **Best-in-Class Arc Performance** – Smooth arc, excellent puddle control and low spatter for ease of use, operator appeal and higher productivity.

Welding Positions



Conformance

AWS A5.5/A5.5M: 2006	E10045-P2 H4R
ASME SFA-5.5	E10045-P2 H4R

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	3.2 mm (1/8 in.)	4.0 mm (5/32 in.)	4.5 mm (11/64 in.)
DC+	120 - 170	170 - 250	200 - 300

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Easy Open Hermetic Can 13.6 kg (30 lb) Cardboard Carton Master	
	3.2 (1/8)	ED032632
4.0 (5/32)	ED032633	
4.5 (11/64)	ED032634	

MECHANICAL PROPERTIES⁽¹⁾ - As required per AWS A5.5/A5.5M: 2006

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
Requirements AWS E10045-P2 H4R	600 (87) min.	690 (100) min.	16 min.	27 (20) min.	Not Specified
Typical Performance⁽²⁾ As-Welded	620 - 690 (90 - 100)	705 - 750 (102 - 109)	21 - 28	75 - 110 (55 - 81)	56 - 85 (41 - 63)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V	Diffusible Hydrogen, mL/100g
Requirements AWS E10045-P2 H4R	0.12 max.	0.90 - 1.70	0.80 max.	0.03 max.	0.03 max.	1.00 max.	0.20 max.	0.50 max.	0.05 max.	4.0 max.
Typical Performance⁽²⁾	0.04 - 0.06	1.25 - 1.65	0.35 - 0.55	≤0.01	≤0.01	0.70 - 1.00	≤0.08	0.40 - 0.50	≤0.01	2 - 4

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. NOTE: This product contains micro-alloying elements. Additional information available on request.

Pipeliner® 70S-G

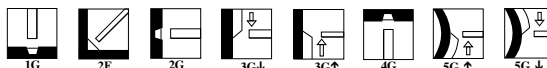
MIG (GMAW) Wires - Solid (AWS ER70S-G)

Pipeliner® 70S-G has a low silicon level for unblemished welds with less clean up required. Provides good back bead shape when using the STT® process on root passes. It is recommended for root pass welding of up to X100 grade pipe as well as hot, fill and cap pass welding of up to X70 grade pipe. For all position welding – choose Pipeliner® 70S-G.

Key Features

- **Micro Guard™ Ultra** – Provides enhanced feedability, increased arc stability, and reduced spatter.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **ProTech™ Packaging System** – Hermetically sealed foil bagged plastic spool delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.18 (DC+ Only), Class S4 Schedule K. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.18/A5.18M: 2005 ER70S-G
ASME SFA-5.18 ER70S-G

Recommended Shielding Gas

100% CO₂
75 - 95% Argon/Balance CO₂

TYPICAL OPERATING PROCEDURES

Parameters	Diameters mm (in.) 1.1 (0.045)
Polarity	DC+
CTWD* - mm (in.)	12 - 19 (1/2 - 3/4)
WFS - m/min (in./min.)	3.2 - 12.7 (125 - 500)
Arc Voltage (volts)	19 - 30
Approx. Current (amps)	145 - 340
Melt-Off Rate - kg/hr (lb/hr)	1.5 - 6.0 (3.4 - 13.2)

* For Electrical Stickout (ESO) subtract 6.4 mm (1/4 in.) from Contact Tip to Work Distance (CTWD).

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Plastic Spool (Vacuum Sealed Foil Bag)	13.6 kg (30 lb) Plastic Spool (Vacuum Sealed Foil Bag)
0.045 (1.1)	ED030904	ED030905

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.18/A5.18M: 2005

	Yield Strength ⁽³⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
Requirements AWS ER70S-G	400 (58) min.	485 (70) min.	22 min.	Not Specified
Typical Performance⁽²⁾ As-Welded (100% CO ₂)	405 - 425 (59 - 62)	510 - 540 (74 - 78)	24 - 26	54 - 81 (40 - 60)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.18/A5.18M: 2005

	%C	%Mn	%Si	%P	%S	%Cu
Requirements AWS ER70S-G	Not Specified	Not Specified	Not Specified	Not Specified	Not Specified	Not Specified
Typical Performance⁽²⁾	0.05 - 0.15	0.80 - 1.40	0.30 - 0.60	≤0.02	≤0.02	≤0.20

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset.

Pipeliner® 80S-G

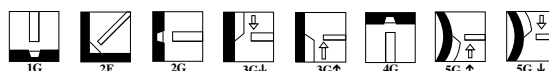
MIG (GMAW) Wires - Solid (AWS ER80S-G)

Pipeliner® 80S-G is the highest strength MIG wire in the Pipeliner® family. Recommended for root pass welding of up to X100 grade pipe as well as hot, fill and cap pass welding of up to X80 grade pipe. For all position welding – choose Pipeliner® 80S-G.

Key Features

- **Micro Guard™ Ultra** – Provides enhanced feedability, increased arc stability, and reduced spatter.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **ProTech™ Packaging System** – Hermetically sealed foil bagged plastic spool delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.28 (DC+ Only), Class S4 Schedule K. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.28/A5.28M: 2005 ER80S-G
ASME SFA-5.28 ER80S-G

Recommended Shielding Gas

100% CO₂
75 - 95% Argon/Balance CO₂

TYPICAL OPERATING PROCEDURES

Parameters	Diameters mm (in.) 1.1 (0.045)
Polarity	DC+
CTWD* - mm (in.)	12 - 19 (1/2 - 3/4)
WFS - m/min (in./min.)	3.2 - 12.7 (125 - 500)
Arc Voltage (volts)	19 - 30
Approx. Current (amps)	145 - 340
Melt-Off Rate - kg/hr (lb/hr)	1.5 - 6.0 (3.4 - 13.2)

* For Electrical Stickout (ESO) subtract 6.4 mm (1/4 in.) from Contact Tip to Work Distance (CTWD).

DIAMETERS/PACKAGING

Diameters in. (mm)	4.5 kg (10 lb) Plastic Spool (Vacuum Sealed Foil Bag)	13.6 kg (30 lb) Plastic Spool (Vacuum Sealed Foil Bag)
0.045 (1.1)	ED031493	ED031494

MECHANICAL PROPERTIES⁽¹⁾ - As Required per A5.28/A5.28M: 2005

	Yield Strength ⁽³⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
Requirements AWS ER80S-G	Not Specified	550 (80) min.	Not Specified	Not Specified
Typical Performance⁽²⁾ As-Welded (100% CO ₂) As-Welded (80% Ar / 20% CO ₂)	585 - 620 (85 - 90) 620 - 690 (90 - 100)	620 - 690 (90 - 100) 690 - 760 (100 - 110)	22 - 24 20 - 24	27 - 54 (20 - 40) 110 - 150 (80 - 110)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per A5.28/A5.28M: 2005

	%C	%Mn	%Si	%P	%S	%Cu
Requirements AWS ER80S-G	Not Specified	Not Specified	Not Specified	Not Specified	Not Specified	Not Specified
Typical Performance⁽²⁾	0.05 - 0.15	1.40 - 1.60	0.40 - 0.70	≤0.02	≤0.02	≤0.20

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset.

Pipeliner® NR®-207+

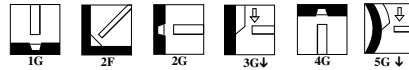
Flux-Cored (FCAW-S) Wires - Self-Shielded (AWS E71T8-K6)

Pipeliner® NR®-207+ has the portability of stick electrode and the productivity of wire. It is recommended for hot, fill and cap pass welding of up to X70 grade pipe. For vertical down pipe welding – choose Pipeliner® NR®-207+.

Key Features

- **High Deposition Rates** – Carry and deposit weld metal with ease in vertical down and out-of-position applications.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **ProTech™ Packaging Systems** – Hermetically sealed pail delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.29 (DC- Only), Class T4 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.29/A5.29M: 2005 E71T8-K6
ASME SFA-5.29 E71T8-K6

TYPICAL OPERATING PROCEDURES

Parameters	Diameters mm (in.) 2.0 (5/64)
Polarity	DC-
CTWD* - mm (in.)	19 (3/4)
WFS - m/min (in./min.)	1.7 - 3.3 (70 - 130)
Arc Voltage (volts)	18 - 21
Approx. Current (amps)	210 - 305
Melt-Off Rate - kg/hr (lb/hr)	2.0 - 3.7 (4.3 - 8.1)

* For Electrical Slickout (ESO) subtract 6.4 mm (1/4 in.) from Contact Tip to Work Distance (CTWD).

DIAMETERS/PACKAGING

Diameters in. (mm)	14 lb (6.3 kg) Coil 56 lb (25.4 kg) Hermetically Sealed Pail Master
5/64 (2.0)	ED030924

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.29/A5.29M: 2005

	Yield Strength ^(3, 4) MPa (ksi)	Tensile Strength ⁽⁴⁾ MPa (ksi)	Elongation ⁽⁴⁾ (%)	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
Requirements AWS E71T8-K6	400 (58) min.	485 - 620 (70 - 90)	20 min.	27 (20) min.
Typical Performance⁽²⁾ As-Welded	425 - 470 (62 - 68)	540 - 565 (78 - 82)	29 - 31	119 - 205 (88 - 151)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.29/A5.29M: 2005

	%C	%Mn ⁽⁵⁾	%Si	%P	%S	%Ni ⁽⁶⁾	%Cr ⁽⁵⁾	%Mo ⁽⁵⁾	%V ⁽⁵⁾	%Al ⁽⁵⁾
Requirements AWS E71T8-K6	0.15 max.	0.50 - 1.50	0.80 max.	0.030 max.	0.030 max.	0.40 - 1.00	0.20 max.	0.15 max.	0.05 max.	1.8 max.
Typical Performance⁽²⁾	0.04 - 0.06	1.18 - 1.33	0.24 - 0.28	<0.01	<0.01	0.78 - 0.93	0.02 - 0.03	0.01 - 0.02	<0.01	0.9 - 1.2

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. ⁽⁴⁾ Strength and elongation properties were obtained from a 0.500 in. tensile specimen artificially aged at 104°C (220°F) for 48 hours as permitted by AWS A5.29:2005. ⁽⁵⁾ In order to meet the alloy requirements of the "G" group, the undiluted weld metal shall have not less than the minimum of at least one of the elements listed. NOTE: This product contains micro-alloying elements. Additional information available upon request.

Pipeliner® NR®-208-P

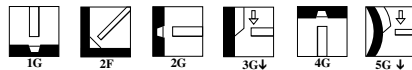
Flux-Cored (FCAW-S) Wires - Self-Shielded (AWS E81T8-G)

Pipeliner® NR®-208-P has the portability of stick electrode and the productivity of wire. It is capable of producing impact values of 27 J (20 ft•lbf) @ -29°C (-20°F). It is recommended for hot, fill and cap pass welding of up to X80 grade pipe. For vertical down pipe welding – choose Pipeliner® NR®-208-P.

Key Features

- **High Deposition Rates** – Carry and deposit weld metal with ease in vertical down and out-of-position applications.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **ProTech™ Packaging Systems** – Hermetically sealed pail delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.29 (DC- Only), Class T1 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.29/A5.29M: 2005 E81T8-G
ASME SFA-5.29 E81T8-G

TYPICAL OPERATING PROCEDURES

Parameters	Diameters mm (in.) 2.0 (5/64)
Polarity	DC-
CTWD* - mm (in.)	19 (3/4)
WFS - m/min (in./min.)	1.7 - 3.3 (70 - 130)
Arc Voltage (volts)	18 - 21
Approx. Current (amps)	210 - 305
Melt-Off Rate - kg/hr (lb/hr)	1.6 - 3.0 (3.6 - 6.7)

* For Electrical Stickout (ESO) subtract 6.4 mm (1/4 in.) from Contact Tip to Work Distance (CTWD).

DIAMETERS/PACKAGING

Diameters mm (in.)	6.3 kg (14 lb) Coil 25.4 kg (56 lb) Hermetically Sealed Pail Master
2.0 (5/64)	ED032890

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.29/A5.29M: 2005

	Yield Strength ^(3,4) MPa (ksi)	Tensile Strength ⁽⁴⁾ MPa (ksi)	Elongation ⁽⁴⁾ (%)	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
Requirements AWS E81T8-G	470 (68) min.	550 - 690 (80 - 100)	21 min.	Not Specified
Typical Performance⁽²⁾ As-Welded	490 - 515 (71 - 75)	595 - 622 (86 - 90)	26 - 31	83 - 133 (61 - 98)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.29/A5.29M: 2005

	%C	%Mn ⁽⁵⁾	%Si	%P	%S	%Ni ⁽⁵⁾	%Cr ⁽⁵⁾	%Mo ⁽⁵⁾	%V ⁽⁵⁾	%Al ⁽⁵⁾
Requirements AWS E81T8-G	Not Specified	0.50 min.	1.00 max.	0.030 max.	0.030 max.	0.50 min.	0.30 min.	0.20 min.	0.10 min.	1.8 max.
Typical Performance⁽²⁾	0.04 - 0.08	1.74 - 1.96	0.32 - 0.37	0.012 - 0.019	0.004 - 0.009	0.94 - 1.11	≤0.01	0.01 - 0.02	≤0.03	1.0 - 1.2

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. ⁽⁴⁾ Strength and elongation properties were obtained from a 0.500 in. tensile specimen artificially aged at 104°C (220°F) for 48 hours as permitted by AWS A5.29:2005.

⁽⁵⁾ In order to meet the alloy requirements of the "G" group, the undiluted weld metal shall have not less than the minimum of at least one of the elements listed.

Pipeliner® NR®-208-XP

Flux-Cored (FCAW-S) Wires - Self-Shielded (AWS E81T8-G)

Pipeliner® NR®-208-XP has been micro-alloyed to be capable of exceeding impact values of 68 J (50 ft•lbf) @ -29°C (-20°F). It is recommended for hot, fill and cap pass welding of up to X80 grade pipe. For vertical down pipe welding – choose Pipeliner® NR®-208-XP.

Key Features

- **High Deposition Rates** – Carry and deposit weld metal with ease in vertical down and out-of-position applications with increased strength and toughness compared to Pipeliner® NR®-208-P.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **ProTech™ Packaging Systems** – Hermetically sealed pail delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.29 (DC- Only), Class T4 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.29/A5.29M: 2005	E81T8-G
ASME SFA-5.29	E81T8-G

TYPICAL OPERATING PROCEDURES

Parameters	Diameters mm (in.) 2.0 (5/64)
Polarity	DC-
CTWD* - mm (in.)	19 (3/4)
WFS - m/min (in./min.)	1.7 - 3.3 (70 - 130)
Arc Voltage (volts)	17 - 20
Approx. Current (amps)	195 - 295
Melt-Off Rate - kg/hr (lb/hr)	1.8 - 3.5 (4.0 - 7.6)

* For Electrical Stickout (ESO) subtract 6.4 mm (1/4 in.) from Contact Tip to Work Distance (CTWD).

DIAMETERS/PACKAGING

Diameters mm (in.)	6.3 kg (14 lb) Coils 25.4 kg (56 lb) Hermetically Sealed Pail Master
2.0 (5/64)	ED031968

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.29/A5.29M: 2005

	Yield Strength ^(3,4) MPa (ksi)	Tensile Strength ⁽³⁾ MPa (ksi)	Elongation ⁽³⁾ (%)	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
Requirements AWS E81T8-G	470 (68) min.	550 - 690 (80 - 100)	19 min.	Not Specified
Typical Performance⁽²⁾ As-Welded	485 - 515 (70 - 75)	550 - 585 (80 - 85)	27 - 29	153 - 302 (113 - 223)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.29/A5.29M: 2005

	%C	%Mn ⁽⁵⁾	%Si	%P	%S	%Ni ⁽⁵⁾	%Cr ⁽⁵⁾	%Mo ⁽⁵⁾	%V ⁽⁵⁾	%Al ⁽⁵⁾
Requirements AWS E81T8-G	Not Specified	0.50 min.	1.00 max.	0.030 max.	0.030 max.	0.50 min.	0.30 min.	0.20 min.	0.10 min.	1.8 max.
Typical Performance⁽²⁾	≤0.02	2.10 - 2.20	0.12 - 0.13	0.004 - 0.007	<0.003	0.74 - 0.80	0.04 - 0.05	0.01 - 0.03	<0.004	0.9 - 1.1

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Strength and elongation properties were obtained from a 0.500 in. tensile specimen artificially aged at 104°C (220°F) for 48 hours as permitted by AWS A5.29:2005. ⁽⁴⁾ Measured with 0.2% offset. ⁽⁵⁾ In order to meet the alloy requirements of the "G" group, the undiluted weld metal shall have not less than the minimum of at least one of the elements listed. NOTE: This product contains micro-alloying elements. Additional information available on request.

Pipeliner® G70M

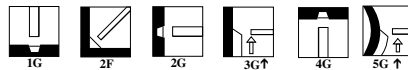
Flux-Cored (FCAW-G) Wires - Gas-Shielded (AWS E71T-1M-JH8 / E71T-9M-JH8)

Pipeliner® G70M is designed for use with semiautomatic and mechanized welding systems and has the best operator appeal in difficult welding positions. It is recommended for hot, fill and cap pass welding of up to X70 grade pipe. For vertical up pipe welding – choose Pipeliner® G70M.

Key Features

- **High Deposition Rates** – Carry and deposit weld metal with ease in vertical up and out-of-position applications.
- **Low Temperature Impact Toughness** – Every lot tested to -40°C (-40°F).
- **ProTech™ Packaging Systems** – Hermetically sealed foil bagged plastic spool delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.20 (DC+ Only), Class T4 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.20/A5.20M: 1995 E71T-1M-JH8 / E71T-9M-JH8
ASME SFA-5.20 E71T-1M-JH8 / E71T-9M-JH8

Recommended Shielding Gas

75 - 80% Argon/Balance CO₂

TYPICAL OPERATING PROCEDURES

Parameters	Diameters mm (in.)	
	1.1 (0.045)	1.3 (0.052)
Polarity	DC+	DC+
CTWD* - mm (in.)	25 (1)	25 (1)
WFS - m/min (in./min.)	4.4 - 10.2 (175 - 400)	4.4 - 9.5 (175 - 375)
Arc Voltage (volts)	23 - 30	23 - 30
Approx. Current (amps)	130 - 275	130 - 275
Melt-Off Rate - kg/hr (lb/hr)	1.8 - 5.4 (3.9 - 11.9)	1.8 - 5.4 (3.9 - 11.9)

* For Electrical Stickout (ESO) subtract 6.4 mm (1/4 in.) from Contact Tip to Work Distance (CTWD).

DIAMETERS/PACKAGING

Diameters in. (mm)	10 lb (4.5 kg) Plastic Spool (Vacuum Sealed Foil Bag)	25 lb (11 kg) Plastic Spool (Vacuum Sealed Foil Bag)
	0.045 (1.1) 0.052 (1.3)	ED030926 ED030928

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.20/A5.20M: 1995

	Yield Strength ^(3, 4) MPa (ksi)	Tensile Strength ⁽⁴⁾ MPa (ksi)	Elongation ⁽⁴⁾ (%)	Charpy V-Notch J (ft•lbf) @ -40°C (-40°F)
Requirements AWS E71T-1M-JH8 / E71T-9M-JH8	400 (58) min.	485 (70) min.	22 min.	27 (20) min.
Typical Performance⁽²⁾ As-Welded (75% Ar / 25% CO ₂)	550 - 580 (80 - 84)	635 - 655 (92 - 95)	25 - 27	119 - 130 (88 - 96)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.20/A5.20M: 1995

	%C	%Mn	%Si	%P	%S	%Ni	Diffusible Hydrogen, mL/100g
Requirements AWS E71T-1M-JH8 AWS E71T-9M-JH8	0.18 max.	1.75 max.	0.90 max.	0.03 max.	0.03 max.	0.50 max.	8.0 max.
Typical Performance⁽²⁾	0.04 - 0.06	1.43 - 1.50	0.35 - 0.40	0.009 - 0.02	0.01 - 0.02	0.34 - 0.36	4 - 8

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. NOTE: This product contains micro-alloying elements. Additional information available upon request.

⁽⁴⁾ Strength and elongation properties were obtained from a 0.500 in. tensile specimen artificially aged at 104°C (220°F) for 48 hours as permitted by AWS A5.20:1995.

Pipeliner® G80M

Flux-Cored (FCAW-G) Wires - Gas-Shielded (AWS E101T1-GM-H8)

Pipeliner® G80M is higher strength than G70M. It is recommended for hot, fill and cap pass welding of up to X80 grade pipe. For vertical up pipe welding – choose Pipeliner® G80M.

Key Features

- **High Deposition Rates** – Carry and deposit weld metal with ease in vertical up and out-of-position applications.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **ProTech™ Packaging Systems** – Hermetically sealed foil bagged plastic spool delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.29 (DC+ Only), Class T4 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.29/A5.29M: 2005 E101T1-GM-H8
ASME SFA-5.29 E101T1-GM-H8

Recommended Shielding Gas

75 - 80% Argon/Balance CO₂

TYPICAL OPERATING PROCEDURES

Diameters mm (in.)	
Parameters	1.1 (0.045)
Polarity	DC+
CTWD* - mm (in.)	25 (1)
WFS - m/min (in./min.)	4.4 - 10.2 (175 - 400)
Arc Voltage (volts)	23 - 30
Approx. Current (amps)	130 - 275
Melt-Off Rate - kg/hr (lb/hr)	1.8 - 4.1 (4.0 - 9.0)

* For Electrical Stickout (ESO) subtract 6.4 mm (1/4 in.) from Contact Tip to Work Distance (CTWD).

DIAMETERS/PACKAGING

Diameters in. (mm)	10 lb (4.5 kg) Plastic Spool	25 lb (11 kg) Plastic Spool
	(Vacuum Sealed Foil Bag)	(Vacuum Sealed Foil Bag)
0.045 (1.1)	ED031107	ED031486

MECHANICAL PROPERTIES⁽¹⁾ - As required per AWS A5.29/A5.29M: 2005

	Yield Strength ^(3,4) MPa (ksi)	Tensile Strength ⁽⁴⁾ MPa (ksi)	Elongation ⁽⁴⁾ (%)	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -40°C (-40°F)
Requirements AWS E101T1-GM-H8	605 (88) min.	690 - 825 (100 - 120)	16 min.	Not Specified	Not Specified
Typical Performance⁽²⁾ As-Welded (75% Ar / 25% CO ₂)	660 - 700 (95 - 102)	700 - 740 (102 - 107)	21 - 26	52 - 58 (44 - 64)	46 - 49 (34 - 36)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.29/A5.29M: 2005

	%C	%Mn ⁽⁵⁾	%Si	%P	%S	%Ni ⁽⁵⁾	%Cr ⁽⁵⁾	%Mo ⁽⁵⁾	%V ⁽⁵⁾	Diffusible Hydrogen, mL/100g
Requirements AWS E101T1-GM-H8	Not Specified	1.75 min.	0.80 min.	0.03 max.	0.03 max.	0.50 min.	0.30 min.	0.20 min.	0.10 min.	8.0 max.
Typical Performance⁽²⁾	0.03 - 0.04	1.70 - 1.79	0.37 - 0.41	0.015 - 0.017	0.008 - 0.012	0.90 - 0.98	0.07 - 0.11	0.24 - 0.27	0.022 - 0.023	4 - 7

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. ⁽⁴⁾ Strength and elongation properties were obtained from a 0.500 in. tensile specimen artificially aged at 104°C (220°F) for 48 hours as permitted by AWS A5.29:2005. ⁽⁵⁾ In order to meet the alloy requirements of the "G" group, the undiluted weld metal shall have not less than the minimum of at least one of the elements listed. NOTE: This product contains micro-alloying elements. Additional information available upon request.

Pipelin[®]er G90M

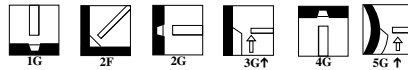
Flux-Cored (FCAW-G) Wires - Gas-Shielded (AWS E111T1-K3M-JH8)

Pipelin[®]er G90M is the highest strength flux-cored wire in the Pipelin[®]er family. It is recommended for hot, fill and cap pass welding of up to X80 grade pipe. For vertical up pipe welding – choose Pipelin[®]er G90M.

Key Features

- **High Stacking Efficiency** – Carry and deposit weld metal with ease in difficult vertical up and out-of-position applications.
- **Low Temperature Impact Toughness** – Every lot tested to -29°C (-20°F).
- **ProTech™ Packaging Systems** – Hermetically sealed foil bagged plastic spool delivers quality product, performance, reliability, and consistent results.
- **Lot Control and Q2 Testing** – Manufactured to lot control standards and tested per AWS A5.29 (DC+ Only), Class T4 Schedule I. Actual certificates of test available at www.lincolnelectric.com.

Welding Positions



Conformance

AWS A5.29/A5.29M: 2005 E111T1-K3M-JH8
ASME SFA-5.29 E111T1-K3M-JH8

Recommended Shielding Gas

75 - 80% Argon/Balance CO₂

TYPICAL OPERATING PROCEDURES

Parameters	Diameters mm (in.)	
	1.2 (0.047)	1.3 (0.052)
Polarity	DC+	DC+
CTWD* - mm (in.)	25 (1)	25 (1)
WFS - m/min (in./min.)	4.4 - 10.2 (175 - 400)	4.4 - 9.5 (175 - 375)
Arc Voltage (volts)	23 - 30	23 - 30
Approx. Current (amps)	130 - 275	130 - 275
Melt-Off Rate - kg/hr (lb/hr)	1.8 - 4.1 (4.0 - 9.0)	2.5 - 5.0 (5.5 - 11.0)

* For Electrical Stickout (ESO) subtract 6.4 mm (1/4 in.) from Contact Tip to Work Distance (CTWD).

DIAMETERS/PACKAGING

Diameters mm (in.)	4.5 kg (10 lb) Plastic Spool (Vacuum Sealed Foil Bag)	15 kg (33 lb) Plastic Spool (Vacuum Sealed Foil Bag)
	1.2 (0.047)	ED032860
1.3 (0.052)	ED032664	

MECHANICAL PROPERTIES⁽¹⁾ - As Required per AWS A5.29/A5.29M: 2005

	Yield Strength ⁽⁴⁾ MPa (ksi)	Tensile Strength ⁽⁴⁾ MPa (ksi)	Elongation ⁽⁴⁾ (%)	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
Requirements AWS E111T1-K3M-JH8	675 (98)	760 - 860 (110 - 125)	15 min.	27 (20) min.
Typical Performance⁽²⁾ As-Welded (75% Ar / 25% CO ₂)	760 - 825 (110 - 120)	795 - 860 (115 - 125)	19 - 22	56 - 85 (41 - 63)

DEPOSIT COMPOSITION⁽¹⁾ - As Required per AWS A5.29/A5.29M: 2005

	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V	Diffusible Hydrogen, mL/100g
Requirements AWS E111T1-K3M-JH8	0.15 max.	0.75 - 2.25	0.80 max.	0.030 max.	0.030 max.	1.25 - 2.60	0.15 max.	0.25 - 0.65	0.05 max.	8.0 max.
Typical Performance⁽²⁾	0.05 - 0.07	1.45 - 1.70	0.21 - 0.28	0.01 - 0.02	0.01 - 0.02	1.80 - 2.22	0.03 - 0.06	0.50 - 0.61	0.02	2 - 5

⁽¹⁾ Typical all weld metal. ⁽²⁾ See test results disclaimer on pg. 34. ⁽³⁾ Measured with 0.2% offset. ⁽⁴⁾ Strength and elongation properties were obtained from a 0.500 in. tensile specimen artificially aged at 104°C (220°F) for 48 hours as permitted by AWS A5.29:2005.
NOTE: This product contains micro-alloying elements. Additional information available upon request.

STORAGE RECOMMENDATIONS FOR FLUX-CORED (FCAW-G AND FCAW-S) ELECTRODES

Lincoln Electric self-shielded and gas-shielded flux-cored electrodes perform best when kept dry and stored properly. Electrode should be used directly from the original, undamaged package, and when stored in accordance to the conditions listed below.

When proper procedures are not followed, consumables may show signs of moisture. These include porosity, a rough bead surface or slag that is unusually difficult to remove.

The following minimum precautions should be taken to safeguard the electrode after opening the original package:

1. It is recommended to use electrodes within one week of opening the original package.
2. Open electrodes should not be exposed to damp moisture conditions or extremes in temperature and/or humidity where surface condensation can occur.
3. When not in use, electrodes should be placed in original packaging and sealed as best as possible.
4. If exposed to moisture conditions, discard any rusty electrode.
5. For applications in which the weld metal hydrogen must be controlled (usually 8 mL or lower), or where shipping and storage conditions are not controlled or known, only hermetically sealed packaging is recommended.
6. After exposure, hydrogen levels can be reduced by conditioning the electrode. Electrodes may be conditioned at a temperature of $100^{\circ}\text{C} \pm 14^{\circ}\text{C}$ ($250^{\circ}\text{F} \pm 25^{\circ}\text{F}$) for a period of 6 to 12 hours, cooled and then stored in seal poly bags (4 mL minimum thickness) or equivalent. Electrode on plastic spools should not be heated at temperatures in excess of 65°C (150°F).

STORAGE AND RE-DRYING RECOMMENDATIONS FOR STICK (SMAW) ELECTRODES

Storing Low Hydrogen Electrodes

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

Moisture resistant electrodes with an “R” suffix have a high resistance to coating moisture pick-up.

However, 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. Specific code requirements may indicate exposure limits different from these guidelines.

Depending on the amount of moisture absorbed and other factors, moisture pickup can degrade weld quality in various ways.

1. Moisture in low hydrogen electrodes may cause porosity. This porosity could be completely subsurface and require x-ray inspection or destructive testing. The porosity could also be visible, external porosity.
2. High moisture can also lead to excessive slag fluidity, a rough weld surface, and difficult slag removal.
3. Excessive moisture in low hydrogen electrodes will lead to elevated levels of diffusible hydrogen which, in turn, can lead to hydrogen-induced weld cracking and/or underbead cracking.

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 which would result in lower than normal tensile or impact properties.

Any low hydrogen electrode should be discarded if excessive redrying 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.

Storing Cellulosic 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).

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.

APPROXIMATE PIPELINER® EN and ISO CLASSIFICATIONS

Electrode Name	EN Classification	ISO Classification
<i>Stick (SMAW) Electrodes - Cellulosic</i>		
Pipeliner® 6P+	EN ISO 2560: 2005 ISO 2560-A-E 38 3 C 2 5 ISO 2560-B-E 43 10 C 2 5	ISO 2560: 2002 ISO 2560-A-E 38 3 C 2 5 ISO 2560-B-E 43 10 C 2 5
Pipeliner® 7P+	EN ISO 2560: 2005 ISO 2560-A-E 42 3 Z C 2 5 ISO 2560-B-E 49 10-G A U	ISO 2560: 2002 ISO 2560-A-E 42 3 Z C 2 5 ISO 2560-B-E 49 10-G A U
Pipeliner® 8P+	EN ISO 2560: 2005 ISO 2560-A-E 46 4 Z C 2 5 ISO 2560-B-E 55 10-G A U	ISO 2560: 2002 ISO 2560-A-E 46 4 Z C 2 5 ISO 2560-B-E 55 10-G A U
<i>Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Up</i>		
Pipeliner® 16P	EN ISO 2560: 2005 ISO 2560-A-E 42 4 B 1 2 H5 ISO 2560-B-E 49 16 A U H5	ISO 2560: 2002 ISO 2560-A-E 42 4 B 1 2 H5 ISO 2560-B-E 49 16 A U H5
Pipeliner® 17P	EN ISO 2560: 2005 ISO 2560-A-E 42 5 B 3 2 H5 ISO 2560-B-E 49 18-1 A U H5	ISO 2560: 2002 ISO 2560-A-E 42 5 B 3 2 H5 ISO 2560-B-E 49 18-1 A U H5
Pipeliner® 18P	EN ISO 2560: 2005 ISO 2560-A-E 50 6 Mn1Ni B 3 2 H5 ISO 2560-B-E 57 18-G A H5	ISO 2560: 2002 ISO 2560-A-E 50 6 Mn1Ni B 3 2 H5 ISO 2560-B-E 57 18-G A H5
Pipeliner® 19P	EN 757: 1997 EN 757 - E 69 5 Mn2NiMo B 3 2 H5	ISO 18275: 2005 ISO 18275-A-E 69 5 Mn2NiMo B 3 2 H5 ISO 18275-A-E 83 18-G A H5
Pipeliner® 20P	EN 757: 1997 EN 757 - E 69 5 Mn2NiCrMo B 3 2 H5	ISO 18275: 2005 ISO 18275-A-E 69 5 Mn2NiCrMo B 3 2 H5 ISO 18275-A-E 83 18-N4C2M2 A U H5
<i>Stick (SMAW) Electrodes - Basic, Low Hydrogen, Vertical Down</i>		
Pipeliner® LH-D80	EN ISO 2560: 2005 ISO 2560-A-E 46 4 B 4 5 H5 ISO 2560-B-E 55 15 G A H5	ISO 2560: 2005 ISO 2560-A-E 46 4 B 4 5 H5 ISO 2560-B-E 55 15 G A H5
Pipeliner® LH-D90	EN 757: 1997 EN 757 - E 55 4 Z B 45 H5	ISO 18275: 2005 ISO 18275-A-E 55 4 Z B 4 5 H5 ISO 18275-B-E 62 15 G A H5
Pipeliner® LH-D100	EN 757: 1997 EN 757 - E 62 4 Mn1NiMo B 45 H5	ISO 18275: 2005 ISO 18275-A-E 62 4 Mn1NiMo B 4 5 H5 ISO 18275-B-E 69 15 G A H5

NOTE: The presented EN and ISO classifications are only the approximate classifications based on available test results. Specific EN and ISO classification tests were not performed in most cases.

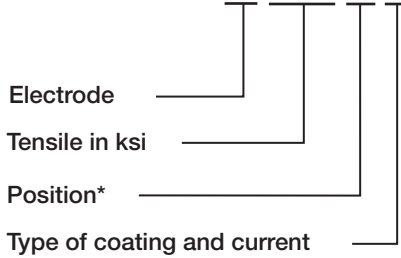
APPROXIMATE PIPELINER® EN and ISO CLASSIFICATIONS

Electrode Name	EN Classification	ISO Classification
MIG (GMAW) Wires - Solid		
Pipeliner® 70S-G	EN ISO 14341: 2008 ISO 14341-A-G 38A 3 M G2Si ISO 14341-B-G 49A 3U M G6	ISO 14341: 2002 ISO 14341-A-G 38A 3 M G2Si ISO 14341-B-G 49A 3U M G6
Pipeliner® 80S-G	EN ISO 14341: 2008 ISO 14341-A-G 50A 3 M G4Mo ISO 14341-B-G 57A 3U M G4M31	ISO 14341: 2002 ISO 14341-A-G 50A 3 M G4Mo ISO 14341-B-G 57A 3U M G4M31
Flux-Cored (FCAW-S) Wires - Self-Shielded		
Pipeliner® NR®-207+	EN ISO 17632: 2008 ISO 17632-A-42 3 1Ni Y N 5 H15 ISO 17632-B-49 3 Ni1 T8 N 1 U H15	ISO 17632: 2006 ISO 17632-A-42 3 1Ni Y N 5 H15 ISO 17632-B-49 3 Ni1 T8 N 1 U H15
Pipeliner® NR®-208-P	EN ISO 17632: 2008 ISO 17632-A-46 3 Z Y N 5 H15 ISO 17632-B-55 3 G T8 N 1 U H15	ISO 17632: 2006 ISO 17632-A-46 3 Z Y N 5 H15 ISO 17632-B-55 3 G T8 N 1 U H15
Pipeliner® NR®-208-XP	EN ISO 17632: 2008 ISO 17632-A-46 3 Z Y N 5 H15 ISO 17632-B-55 3 G T8 N1 U H15	ISO 17632: 2006 ISO 17632-A-46 3 Z Y N 5 H15 ISO 17632-B-55 3 G T8 N1 U H15
Flux-Cored (FCAW-G) Wires - Gas-Shielded		
Pipeliner® G70M	EN ISO 17632: 2008 ISO 17632-A-T 46 4 O M 2 H10 ISO 17632-B-T 55 4 T1-1MA-U H10	ISO 17632: 2006 ISO 17632-A-T 46 4 P M 2 H10 ISO 17632-B-T 55 4 T1-1MA-U H10
Pipeliner® G80M	EN ISO 18276: 2006 ISO 18276-A-T 62 2 Mn1Ni P M 2 H10 ISO 18276-B-T 69 2 T1-1 MA-N2M1 H10	ISO 18276: 2005 ISO 18276-A-T 62 2 Mn1Ni P M 2 H10 ISO 18276-B-T 69 2 T1-1 MA-N2M1 H10
Pipeliner® G90M	EN ISO 18276: 2006 ISO 18276-A-T 69 3 MN2NiMo P M 2 H10 ISO 18276-B-T 76 3 T1-1MA-N4M2 H10	ISO 18276: 2005 ISO 18276-A-T 69 3 Mn2NiMo P M 2 H10 ISO 18276-B-T 76 3 T1-1MA-N4M2 H10

NOTE: The presented EN and ISO classifications are only the approximate classifications based on available test results. Specific EN and ISO classification tests were not performed in most cases.

AWS A5.1 classification of carbon steel electrode

E6010

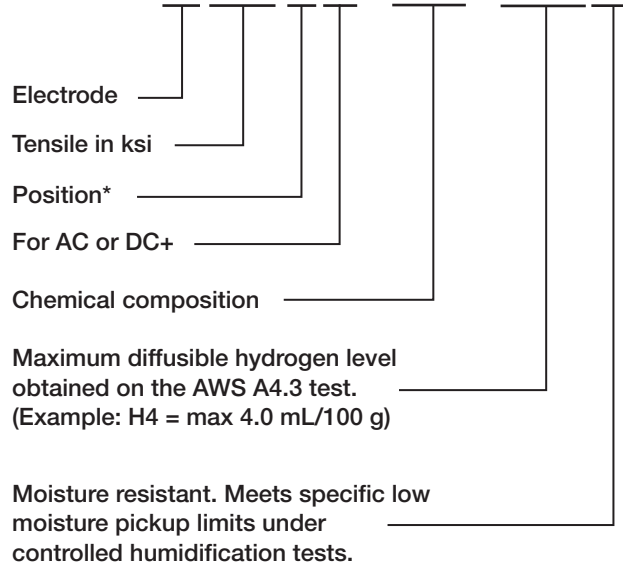


***Position**

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

AWS A5.5 classification of low alloy steel electrode

E8018-B1 H4R



Types of Coating and Current

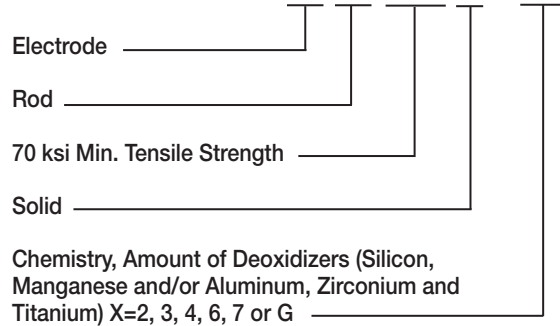
Digit	Type of Coating	Current
0	Cellulose sodium	DC+
1	Cellulose potassium	AC, DC±
2	Titania sodium	AC, DC-
3	Titania potassium	AC, DC+
4	Iron power titania	AC, DC±
5	Low hydrogen sodium	DC+
6	Low hydrogen potassium	AC, DC+
7	Iron powder iron oxide	AC, DC±
8	Iron powder low hydrogen	AC, DC±

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.

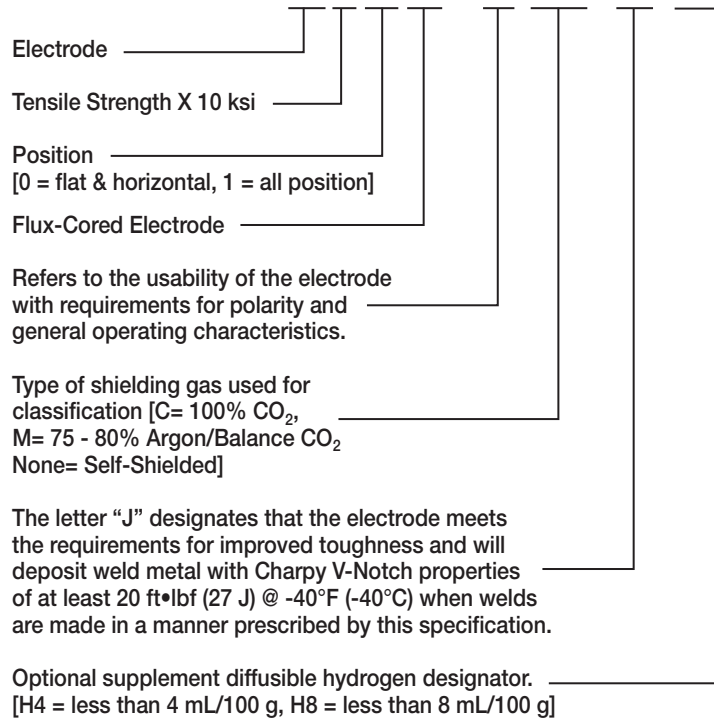
AWS classification of GMAW electrodes

ER70S-X



AWS A5.20 classification of flux-cored (tubular) wires

E70T-1 M-J H8



NOTES

TEST RESULTS

Test results for mechanical properties, deposit or electrode composition and diffusible hydrogen levels were obtained from a weld produced and tested according to prescribed standards, and should not be assumed to be the expected results in a particular application or weldment. Actual results will vary depending on many factors, including, but not limited to, weld procedure, plate chemistry and temperature, weldment design and fabrication methods. Users are cautioned to confirm by qualification testing, or other appropriate means, the suitability of any welding consumable and procedure before use in the intended application.

WARNING

As noted, using FCAW-GS electrodes with improper moisture content may result in a reduction of weld quality. Many variables beyond the control of Lincoln Electric® affect the results obtained in the use of re-dried electrodes. These variables include, but are not limited to, re-drying procedure, welding procedure, plate chemistry and temperature, weldment design, fabrication methods, and service requirements. Therefore, the serviceability of re-dried electrodes and the product or structure on which they are used, is and must be the sole responsibility of the user.

CUSTOMER ASSISTANCE POLICY

The business of The Lincoln Electric Company® is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or advice about their use of our products. Our employees respond to inquiries to the best of their ability based on information provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or advice. Moreover, the provision of such information or advice does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or advice, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose is specifically disclaimed.

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

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information.

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