

# STICK

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**SMAW**  
CONSUMABLES

# Selection Guide

INTRODUCTION

STICK

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<b>Stick (SMAW) Electrode</b>							
Product Name & AWS Class	Key Features	Diameters Available in (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)
<b>Mild Steel, Cellulosic</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Fleetweld® 5P (E6010)	<ul style="list-style-type: none"> <li>• Deep arc penetration</li> <li>• Light slag with minimal arc interference</li> <li>• Excellent vertical and overhead capability</li> </ul>	✓	✓	✓	✓	✓	✓
Fleetweld® 5P+ (E6010)	<ul style="list-style-type: none"> <li>• High operator appeal and control</li> <li>• Easy slag removal</li> <li>• Standard in the pipe welding industry</li> </ul>	✓	✓	✓	✓		
Pipeliner® 6P+ (E6010)	<ul style="list-style-type: none"> <li>• High operator appeal and control</li> <li>• Easy slag removal</li> <li>• Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>	✓ <sup>(1)</sup>	✓	✓			
Fleetweld® 180 (E6011)	<ul style="list-style-type: none"> <li>• AC polarity welding</li> <li>• Performs on low amperages and OCV</li> <li>• Easy to strike arc</li> </ul>	✓	✓	✓			
Fleetweld® 35 (E6011)	<ul style="list-style-type: none"> <li>• Stable arc performance</li> <li>• High operator appeal</li> <li>• DC and AC welding</li> </ul>	✓	✓	✓	✓	✓	✓
Fleetweld® 35LS (E6011)	<ul style="list-style-type: none"> <li>• Use for tack welds under Innershield® deposits</li> <li>• Light, easy to remove slag</li> <li>• DC and AC welding</li> </ul>		✓	✓			
<b>Mild Steel, Rutile</b>		5/64 (2.0)	3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)
Fleetweld® 37 (E6013)	<ul style="list-style-type: none"> <li>• Operable with low amperages on sheet metal</li> <li>• Excellent bead appearance</li> <li>• Slag control accommodates vertical down welding</li> </ul>	✓	✓	✓	✓	✓	
Fleetweld® 22 (E6022)	<ul style="list-style-type: none"> <li>• Deep penetration</li> <li>• Optimized for burn-through spot welding</li> <li>• Little slag interference in arc</li> </ul>			✓	✓		
Fleetweld® 47 (E7014)	<ul style="list-style-type: none"> <li>• High deposition rates</li> <li>• Excellent operator appeal</li> <li>• Easy to use</li> </ul>		✓	✓	✓	✓	
<b>Mild Steel, High Deposition</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Jetweld® 2 (E6027)	<ul style="list-style-type: none"> <li>• High deposition rates</li> <li>• Smooth bead appearance</li> <li>• Shallow penetration for minimal dilution</li> </ul>				✓		✓

<sup>(1)</sup> Manufactured to 2.5 mm diameter.

# Selection Guide

<b>Stick (SMAW) Electrode</b>							
<b>Product Name &amp; AWS Class</b>	<b>Key Features</b>	<b>Diameters Available in (mm)</b>					
<b>Mild Steel, High Deposition</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Jetweld® 1 (E7024-1)	<ul style="list-style-type: none"> <li>High deposition rates</li> <li>Smooth bead appearance</li> <li>Minimal spatter</li> </ul>		✓	✓	✓	✓	✓
<b>Mild Steel, Low Hydrogen</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Pipeliner® 16P (E7016 H4)	<ul style="list-style-type: none"> <li>Low hydrogen, vertical up capability on X60 grade pipe</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>	✓ <sup>(1)</sup>	✓	✓			
Excalibur® 7018 MR (E7018 H4R)	<ul style="list-style-type: none"> <li>Premium arc performance</li> <li>Square coating burn-off</li> <li>Easy strike and re-strike</li> </ul>	✓	✓	✓	✓	✓	✓
Jetweld® LH-70 (E7018 H4R)	<ul style="list-style-type: none"> <li>Low hydrogen</li> <li>Smooth arc performance</li> </ul>	✓	✓	✓	✓	✓	✓
Jet-LH® 78 MR (E7018 H4R)	<ul style="list-style-type: none"> <li>Low hydrogen</li> <li>Smooth arc performance</li> </ul>	✓	✓	✓	✓	✓	✓
Lincoln® 7018AC (E7018 H8)	<ul style="list-style-type: none"> <li>AC polarity welding</li> <li>Capable of cold re-strikes</li> <li>Minimal spatter</li> </ul>	✓	✓	✓			
Excalibur® 7018-1 MR (E7018-1 H4R)	<ul style="list-style-type: none"> <li>Premium arc performance</li> <li>Square coating burn-off</li> <li>Effortless slag removal</li> </ul>	✓	✓	✓	✓	✓	✓
Excalibur® 7028 (E7028 H8)	<ul style="list-style-type: none"> <li>High deposition rates</li> <li>Premium arc performance</li> <li>High speed</li> </ul>			✓	✓	✓	
<b>Low Alloy, Cellulosic</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Shield-Arc® HYP+ (E7010-P1)	<ul style="list-style-type: none"> <li>Light slag for minimal arc interference</li> <li>Deep penetration</li> <li>Clean, visible weld puddle</li> </ul>		✓	✓	✓		
Pipeliner® 7P+ (E7010-P1)	<ul style="list-style-type: none"> <li>High productivity in vertical down and out-of-position pipe welding</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>		✓	✓	✓ <sup>(2)</sup>		
Shield-Arc® 85 (E7010-A1)	<ul style="list-style-type: none"> <li>For welding 0.50% molybdenum steel</li> <li>Light slag for minimal arc interference</li> <li>Deep penetration and superior puddle control</li> </ul>	✓	✓	✓	✓		

<sup>(1)</sup> Manufactured to 2.5 mm diameter. <sup>(2)</sup> Manufactured to a 5.0 mm diameter.

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<b>Stick (SMAW) Electrode</b>							
<b>Product Name &amp; AWS Class</b>	<b>Key Features</b>	<b>Diameters Available in (mm)</b>					
<b>Low Alloy, Cellulosic</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Shield-Arc® 70+ (E8010-P1)	<ul style="list-style-type: none"> <li>Light slag for minimal arc interference</li> <li>Deep penetration</li> <li>Clean, visible weld puddle</li> </ul>		✓	✓	✓		
Pipliner® 8P+ (E8010-P1)	<ul style="list-style-type: none"> <li>High productivity in vertical down and out-of-position pipe welding</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>		✓	✓	✓ <sup>(1)</sup>		
Shield-Arc® 90 (E9010-G)	<ul style="list-style-type: none"> <li>Light slag for minimal arc interference</li> <li>Deep penetration</li> <li>Clean, visible weld puddle</li> </ul>		✓	✓	✓ <sup>(1)</sup>		
<b>Low Alloy, Low Hydrogen</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Excalibur® 7018-A1 MR (E7018-A1 H4R)	<ul style="list-style-type: none"> <li>Designed for welding 0.50% molybdenum steel</li> <li>Premium arc performance</li> <li>Square coating burn-off</li> </ul>	✓	✓	✓			
Excalibur® 8018-B2 MR (E8018-B2 H4R)	<ul style="list-style-type: none"> <li>Designed for welding 1.25% chromium, 0.50% molybdenum steel</li> <li>Premium arc performance</li> <li>Square coating burn-off</li> </ul>	✓	✓	✓			
Excalibur® 8018-B2 XF MR (E8018-B2 H4R)	<ul style="list-style-type: none"> <li>X-Factor &lt; 15 ppm</li> <li>Premium arc performance and strikeability</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>	✓	✓	✓			
Excalibur® 8018-C1 MR (E8018-C1 H4R)	<ul style="list-style-type: none"> <li>Designed to produce a nominal 2-1/4% nickel deposit</li> <li>Premium arc performance</li> <li>Square coating burn-off</li> </ul>	✓	✓	✓	✓	✓	✓
Excalibur® 8018-C3 MR (E8018-C3 H4R)	<ul style="list-style-type: none"> <li>Designed to produce a 1% nickel deposit</li> <li>Premium arc performance</li> <li>Square coating burn-off</li> </ul>	✓	✓	✓	✓	✓	✓
Pipliner® 18P (E8018-G H4)	<ul style="list-style-type: none"> <li>Low hydrogen, vertical up capability on X70 grade pipe</li> <li>Charpy V-Notch impact toughness tested to -46°C (-50°F)</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>		✓	✓			

<sup>(1)</sup> Manufactured to 5.0 mm diameter.

# Selection Guide

Stick (SMAW) Electrode							
Product Name & AWS Class	Key Features	Diameters Available in (mm)					
<b>Low Alloy, Low Hydrogen</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Excalibur® 9018-B3 MR (E9018-B3 H4R)	<ul style="list-style-type: none"> <li>Designed for all-position welding of 2.25% chromium, 1% molybdenum low alloy steels</li> <li>Premium arc performance</li> <li>Square coating burn-off</li> </ul>	✓	✓	✓			
Excalibur® 9018M MR (E9018M H4R)	<ul style="list-style-type: none"> <li>Designed to produce weld deposits with 620 MPa (90 ksi) tensile strength</li> <li>Premium arc performance</li> <li>Square coating burn-off</li> </ul>	✓	✓	✓	✓		
Excalibur® 10018-D2 MR (E10018-D2 H4R)	<ul style="list-style-type: none"> <li>Capable of exceeding 690 MPa (100 ksi) yield strength after 12 hours at 635°C (1175°F)</li> <li>Premium arc performance</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>	✓	✓	✓			
Excalibur® 11018M MR (E11018M H4R)	<ul style="list-style-type: none"> <li>Capable of producing weld deposits with 760 MPa (110 ksi) tensile strength</li> <li>Premium arc performance</li> <li>Square coating burn-off</li> </ul>	✓	✓	✓	✓		
Pipeliner® LH-D80 (E8045-P2 H4R)	<ul style="list-style-type: none"> <li>Low hydrogen, vertical down capability on up to X70 pipe</li> <li>High productivity</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>		✓	✓	✓ <sup>(1)</sup>		
Pipeliner® LH-D90 (E9045-P2 H4R)	<ul style="list-style-type: none"> <li>Low hydrogen, vertical down capability on up to X80 pipe</li> <li>High productivity</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>		✓	✓	✓ <sup>(1)</sup>		
Pipeliner® 19P (E10018-G H4R)	<ul style="list-style-type: none"> <li>Low hydrogen, vertical up capability on X80 grade pipe</li> <li>Charpy V-Notch impact toughness tested to -46°C (-50°F)</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>		✓	✓			
Pipeliner® LH-D100 (E10045-P2 H4R)	<ul style="list-style-type: none"> <li>Low hydrogen, vertical down capability on up to X90 pipe</li> <li>High productivity</li> <li>Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>		✓	✓	✓ <sup>(1)</sup>		

<sup>(1)</sup> Manufactured to 4.5 mm diameter.

# Fleetweld® 5P

## Mild Steel, Cellulosic

AWS E6010

### Key Features

- ▶ Deep arc penetration
- ▶ Light slag with minimal arc interference
- ▶ Excellent vertical and overhead capability

### Typical Applications

- ▶ Steel with moderate surface contaminants
- ▶ Cross country and in-plant pipe welding
- ▶ Square edge butt welds

### Welding Positions

All

### Conformances

AWS A5.1/A5.1M: 2004	E6010
ASME SFA-A5.1:	E6010
ABS:	E6010
Lloyd's Register:	3M
CWB/CSA W48-06:	E4310
TUV:	EN ISO 2560-A: E 42 3 C25

### DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	5 lb (2.3 kg) Plastic Tube 20 lb (9.1 kg) Carton	10 lb (4.5 kg) EO Can 30 lb (13.6 kg) Carton	50 lb (22.7kg) Easy Open Can
3/32 (2.4)	12 (300)	ED032402	ED032561	ED010211
1/8 (3.2)	14 (350)	ED032403	ED032562	ED010203
5/32 (4.0)	14 (350)	ED032404	ED032563	ED010216
3/16 (4.8)	14 (350)			ED010207
7/32 (5.6)	14 (350)			ED010219
1/4 (6.4)	14 (350)			ED010200

# Fleetweld® 5P

(AWS E6010)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @-29°C (-20°F)
<b>Requirements</b> AWS E6010	330 (48) min.	430 (60) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	420 - 475 (61 - 69)	515 - 570 (75-83)	25 - 31	41 - 68 (30 - 50)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E6010	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.09 - 0.17	0.40 - 0.63	0.09 - 0.43	0.005 - 0.017	0.005 - 0.014
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E6010	0.30 max.	0.20 max.	0.30 max.	0.08 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.01 - 0.05	0.01 - 0.05	≤ 0.03	≤ 0.01	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)					
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)	7/32 in (5.6 mm)	1/4 in (6.4 mm)
DC+	40 - 80	70 - 130	90 - 165	140 - 225	200 - 275	220 - 325

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# Fleetweld® 5P+

**Mild Steel, Cellulosic**

AWS E6010

**Key Features**

- ▶ High operator appeal and control
- ▶ Easy slag removal
- ▶ Standard in the pipe welding industry

**Typical Applications**

- ▶ Cross country and in-plant pipe welding
- ▶ Steel with moderate surface contaminants
- ▶ Repair welding

**Welding Positions**

All

**Conformances**

AWS A5.1/A5.1M: 2004	E6010
ASME SFA-A5.1:	E6010
ABS:	E6010
CWB/CSA W48-06:	E4310
TUV:	EN ISO 2560-A: E 42 3 C25

**DIAMETERS / PACKAGING**

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton		50 lb (22.7kg) Easy Open Can
		ED032564	ED032565	ED010283
3/32 (2.4)	12 (300)	ED032564	ED032565	ED010283
1/8 (3.2)	14 (350)	ED032565	ED032566	ED010278
5/32 (4.0)	14 (350)	ED032566		ED010285
3/16 (4.8)	14 (350)			ED010281



# Fleetweld® 5P+

(AWS E6010)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E6010	330 (48) min.	430 (60) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	415 - 500 (60 - 73)	500 - 610 (73 - 88)	22 - 29	51 - 93 (38 - 69)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E6010	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.09 - 0.20	0.46 - 0.79	0.10 - 0.32	0.005 - 0.017	0.004 - 0.014
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E6010	0.30 max.	0.20 max.	0.30 max.	0.08 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	≤ 0.04	≤ 0.04	≤ 0.02	≤ 0.01	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)			
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
DC+	50 - 85	75 - 135	100 - 175	140 - 225
DC-	50 - 85	75 - 135	100 - 175	–

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# Pipeliners® 6P+

**Mild Steel, Cellulosic**

AWS E6010

**Key Features**

- ▶ High operator appeal and control
- ▶ Easy slag removal
- ▶ Q2 Lot® - Certificate showing actual deposit chemistry available online
- ▶ Standard in the pipe welding industry

**Typical Applications**

- ▶ Cross country and in-plant pipe welding
- ▶ Root pass on up to X80 grade pipe
- ▶ Hot, fill and cap pass on up to X60 grade pipe

**Welding Positions**

All

**Conformances**

AWS A5.1/A5.1M: 2004	E6010
ASME SFA-A5.1:	E6010
ABS:	E6010
CWB/CSA W48-06:	E4310

**DIAMETERS / PACKAGING**

Diameter mm (in)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Master Carton	50 lb (22.7 kg) Easy Open Can
2.5 (3/32)	12 (300)	ED032609	
3.2 (1/8)	14 (350)	ED032610	ED030848
4.0 (5/32)	18 (450)	ED032611	ED030849

# Pipelin<sup>®</sup> 6P+

(AWS E6010)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E6010	330 (48) min.	430 (60) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	405 - 515 (59 - 75)	495 - 620 (72 - 90)	22 - 36	27 - 85 (20 - 63)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E6010	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.11 - 0.20	0.51 - 0.77	0.15 - 0.32	0.006 - 0.016	0.005 - 0.011
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E6010	0.30 max.	0.20 max.	0.30 max.	0.08 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.01 - 0.04	0.01 - 0.04	0.01 - 0.02	≤ 0.01	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	2.5 mm (3/32)	3.2 mm (1/8)	4.0 mm (5/32)
DC+	50 - 85	75 - 135	100 - 175
DC-	50 - 85	75 - 135	100 - 175

Preferred polarity is listed first.

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# Fleetweld® 180

Mild Steel, Cellulosic  
AWS E6011

INTRODUCTION

### Key Features

- ▶ AC polarity welding
- ▶ Performs on low amperages and OCV
- ▶ Easy to strike arc

### Welding Positions

All

### Typical Applications

- ▶ Small AC welders
- ▶ Sheet metal
- ▶ Edge, corner and butt joints

### Conformances

AWS A5.1/A5.1M: 2004	E6011
ASME SFA-A5.1:	E6011
CWB/CSA W48-06:	E4311

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### DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	1 lb (0.5 kg) Plastic Tube 6 lb (3.6 kg) Carton	5 lb (2.3 kg) Plastic Tube 20 lb (9.1 kg) Carton	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED031152	ED032448	ED010110
1/8 (3.2)	14 (350)	ED031722	ED032449	ED010105
5/32 (4.0)	14 (350)		ED032412	ED010114

# Fleetweld® 180

(AWS E6011)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @-29°C (-20°F)
<b>Requirements</b> AWS E6011	330 (48) min.	430 (60) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	460 - 490 (67 - 71)	570 - 590 (83 - 86)	22 - 32	35 - 72 (26 - 53)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E6011	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.13 - 0.20	0.44 - 0.71	0.23 - 0.45	0.009 - 0.014	0.005 - 0.008
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E6011	0.30 max.	0.20 max.	0.30 max.	0.08 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	≤ 0.03	≤ 0.03	≤ 0.01	≤ 0.01	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)
AC	40 - 90	65 - 120	115 - 150
DC±	40 - 80	60 - 110	105 - 135

Preferred polarity is listed first.

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# Fleetweld® 35

**Mild Steel, Cellulosic**

AWS E6011

**Key Features**

- ▶ Stable arc performance
- ▶ High operator appeal
- ▶ AC and DC welding

**Typical Applications**

- ▶ Sheet metal
- ▶ In-plant pipe welding
- ▶ Steel with moderate surface contaminants

**Welding Positions**

All

**Conformances**

AWS A5.1/A5.1M: 2004	E6011
ASME SFA-A5.1:	E6011
ABS:	E6011
Lloyd's Register:	3M

**DIAMETERS / PACKAGING**

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Carton
3/32 (2.4)	14 (350)	ED028152
1/8 (3.2)	14 (350)	ED028153
5/32 (4.0)	14 (350)	ED028154
3/16 (4.8)	14 (350)	ED028155
7/32 (5.6)	18 (450)	ED032301
1/4 (6.4)	18 (450)	ED028157

# Fleetweld® 35

(AWS E6011)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E6011	330 (48) min.	430 (60) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	385 - 415 (56 - 60)	470 - 510 (68 - 74)	26 - 33	56 - 101 (42 - 75)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E6011	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.11 - 0.16	0.32 - 0.60	0.09 - 0.28	0.006 - 0.011	0.004 - 0.013
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E6011	0.30 max.	0.20 max.	0.30 max.	0.08 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	≤ 0.06	0.01 - 0.04	≤ 0.02	≤ 0.01	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)					
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)	7/32 in (5.6 mm)	1/4 in (6.4 mm)
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

Preferred polarity is listed first.

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METAL-CORED

# Fleetweld® 35LS

**Mild Steel, Cellulosic**

AWS E6011

INTRODUCTION

**Key Features**

- ▶ Use for tack welds under Innershield® deposits
- ▶ Light, easy to remove slag
- ▶ AC and DC welding

**Welding Positions**

All

**Conformances**

AWS A5.1/A5.1M: 2004	E6011
ASME SFA-A5.1:	E6011
CWB/CSA W48-06:	E4311

**Typical Applications**

- ▶ Tack welding
- ▶ Steel with moderate surface contaminants

STICK

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**DIAMETERS / PACKAGING**

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Carton
1/8 (3.2)	14 (350)	ED028158
5/32 (4.0)	14 (350)	ED028159



# Fleetweld® 35LS

(AWS E6011)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E6011	330 (48) min.	430 (60) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	400 - 435 (58 - 63)	495 - 560 (72 - 81)	22 - 31	29 - 64 (22 - 47)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E6011	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.09 - 0.19	0.32 - 0.90	0.03 - 0.13	0.007 - 0.017	0.005 - 0.011
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E6011	0.30 max.	0.20 max.	0.30 max.	0.08 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	≤ 0.06	0.01 - 0.04	≤ 0.02	0.01 max.	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

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

Preferred polarity is listed first.

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METAL-CORED

# Fleetweld® 37

**Mild Steel, Rutile**

AWS E6013

**Key Features**

- ▶ Operable with low amperages on sheet metal
- ▶ Excellent bead appearance
- ▶ Slag control accommodates vertical down welding

**Typical Applications**

- ▶ Sheet metal
- ▶ Irregular short welds that change positions
- ▶ Maintenance or repair welding
- ▶ For use with small AC welders with low OCV

**Welding Positions**

All

**Conformances**

AWS A5.1/A5.1M: 2004	E6013
ASME SFA-A5.1:	E6013
ABS:	E6013
Lloyd's Register:	3M
DNV Grade:	1
GL:	1
BV Grade:	1
CWB/CSA W48-06:	E4313

**DIAMETERS / PACKAGING**

Diameter in (mm)	Length in (mm)	1 lb (0.5 kg) Plastic Tube 6 lb (3.6 kg) Carton	5 lb (2.3 kg) Plastic Tube 20 lb (9.1 kg) Carton	50 lb (22.7 kg) Carton
5/64 (2.0)	12 (300)			ED010170
3/32 (2.4)	12 (300)	ED031726	ED032450	ED010161
1/8 (3.2)	14 (350)	ED031727	ED032451	ED010153
5/32 (4.0)	14 (350)		ED032422	ED010165
3/16 (4.8)	14 (350)			ED010156

# Fleetweld® 37

(AWS E6013)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E6013	330 (48) min.	430 (60) min.	17 min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	400 - 440 (58 - 64)	460 - 515 (67 - 75)	20 - 31	37 - 76 (27 - 56)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E6013	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.04 - 0.07	0.32 - 0.45	0.16 - 0.24	0.01 - 0.02	0.01 - 0.02
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E6013	0.30 max.	0.20 max.	0.30 max.	0.08 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	≤ 0.07	0.02 - 0.04	≤ 0.02	0.01 - 0.02	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)				
	5/64 in (2.0 mm)	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
AC	50 - 80	75 - 105	110 - 140	160 - 200	205 - 260
DC±	45 - 75	70 - 95	100 - 135	145 - 180	190 - 235

Preferred polarity is listed first.

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# Selection Guide

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<b>Stick (SMAW) Electrode</b>							
<b>Product Name &amp; AWS Class</b>	<b>Key Features</b>	<b>Diameters Available in (mm)</b>					
<b>Low Alloy, Cellulosic</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Shield-Arc® 70+ (E8010-G)	<ul style="list-style-type: none"> <li>• Light slag for minimal arc interference</li> <li>• Deep penetration</li> <li>• Clean, visible weld puddle</li> </ul>		✓	✓	✓		
Pipelinor® 8P+ (E8010-P1)	<ul style="list-style-type: none"> <li>• High productivity in vertical down and out-of-position pipe welding</li> <li>• Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>		✓	✓	✓ <sup>(1)</sup>		
Shield-Arc® 90 (E9010-G)	<ul style="list-style-type: none"> <li>• Light slag for minimal arc interference</li> <li>• Deep penetration</li> <li>• Clean, visible weld puddle</li> </ul>		✓	✓	✓ <sup>(1)</sup>		
<b>Low Alloy, Low Hydrogen</b>		3/32 (2.4)	1/8 (3.2)	5/32 (4.0)	3/16 (4.8)	7/32 (5.6)	1/4 (6.4)
Excalibur® 7018-A1 MR (E7018-A1 H4R)	<ul style="list-style-type: none"> <li>• Designed for welding 0.50% molybdenum steel</li> <li>• Premium arc performance</li> <li>• Square coating burn-off</li> </ul>	✓	✓	✓			
Excalibur® 8018-B2 MR (E8018-B2 H4R)	<ul style="list-style-type: none"> <li>• Designed for welding 1.25% chromium, 0.50% molybdenum steel</li> <li>• Premium arc performance</li> <li>• Square coating burn-off</li> </ul>	✓	✓	✓			
Excalibur® 8018-B2 XF MR (E8018-B2 H4R)	<ul style="list-style-type: none"> <li>• X-Factor &lt; 15 ppm</li> <li>• Premium arc performance and strikeability</li> <li>• Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>	✓	✓	✓			
Excalibur® 8018-C1 MR (E8018-C1 H4R)	<ul style="list-style-type: none"> <li>• Designed to produce a nominal 2-1/4% nickel deposit</li> <li>• Premium arc performance</li> <li>• Square coating burn-off</li> </ul>	✓	✓	✓	✓	✓	✓
Excalibur® 8018-C3 MR (E8018-C3 H4R)	<ul style="list-style-type: none"> <li>• Designed to produce a 1% nickel deposit</li> <li>• Premium arc performance</li> <li>• Square coating burn-off</li> </ul>	✓	✓	✓	✓	✓	✓
Pipelinor® 18P (E8018-G H4)	<ul style="list-style-type: none"> <li>• Low hydrogen, vertical up capability on X70 grade pipe</li> <li>• Charpy V-Notch impact toughness tested to -46°C (-50°F)</li> <li>• Q2 Lot® - Certificate showing actual deposit chemistry available online</li> </ul>		✓	✓			

<sup>(1)</sup> Manufactured to 5.0 mm diameter.

# Fleetweld® 47

Mild Steel, Rutile  
AWS E7014

## Key Features

- ▶ High deposition rates
- ▶ Excellent operator appeal
- ▶ Easy to use
- ▶ Operates on low amperages

## Typical Applications

- ▶ Maintenance and repair welding
- ▶ Sheet metal and fillet welds
- ▶ Heavy sections

## Welding Positions

All

## Conformances

AWS A5.1/A5.1M: 2004	E7014
ASME SFA-A5.1:	E7014
ABS:	E7014
Lloyd's Register:	1M
DNV Grade:	1
GL:	1
BV Grade:	1
CWB:	E4914

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	1 lb (0.5 kg) Plastic Tube 6 lb (3.6 kg) Carton	5 lb (2.3 kg) Plastic Tube 20 lb (9.1 kg) Carton	50 lb (22.7kg) Carton
3/32 (2.4)	14 (350)	ED031713	ED030566	ED010189
1/8 (3.2)	14 (350)	ED031153	ED030567	ED010183
5/32 (4.0)	14 (350)		ED032430	ED010193
3/16 (4.8)	14 (350)			ED010186

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METAL-CORED

**Fleetweld® 47**

(AWS E7014)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E7014	400 (58) min.	490 (70) min.	17 min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	400 - 510 (58 - 74)	490 - 585 (70 - 85)	17 - 29	45 - 103 (33 - 76)

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004**

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E7014	0.15 max.	1.25 max.	0.90 max.	0.035 max.	0.035 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.06 - 0.10	0.25 - 0.67	0.04 - 0.69	0.01 - 0.02	≤ 0.02
	%Ni	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V
<b>Requirements</b> AWS E7014	0.30 max.	0.20 max.	0.30 max.	0.08 max.	1.50 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.02 - 0.09	0.01 - 0.05	≤ 0.02	≤ 0.02	0.37

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)			
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
AC	80 - 100	110 - 155	150 - 225	200 - 285
DC±	75 - 95	100 - 145	135 - 200	185 - 235

Preferred polarity is listed first.

# Jetweld<sup>®</sup> 2

Mild Steel, High Deposition  
AWS E6027

## Key Features

- ▶ High deposition rates
- ▶ Smooth bead appearance
- ▶ Shallow penetration for minimal dilution

## Typical Applications

- ▶ Multiple pass welding
- ▶ Fast-fill single pass welds
- ▶ Fillet and lap welds

## Welding Positions

Flat & Horizontal

## Conformances

AWS A5.1/A5.1M: 2004	E6027
ASME SFA-A5.1:	E6027
ABS:	E6027
Lloyd's Register:	3M
DNV Grade:	3
GL:	3
BV Grade:	3
CWB/CSA W48-06:	E4327

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Carton
3/16 (3.2)	18 (450)	ED010501
1/4 (4.0)	18 (450)	ED010500

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METAL-CORED

# Jetweld<sup>®</sup> 2

(AWS E6027)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E6027	330 (48) min.	430 (60) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	365 - 395 (53 - 57)	435 - 470 (63 - 68)	26 - 34	53 - 80 (39 - 60)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E6027	0.20 max.	1.20 max.	1.00 max.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.02 - 0.05	0.56 - 0.96	0.12 - 0.41	0.016 - 0.024	0.005 - 0.013
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E6027	0.30 max.	0.20 max.	0.30 max.	0.08 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.03 - 0.07	0.02 - 0.05	0.01 - 0.04	≤ 0.002	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)	
	3/16 in (4.8 mm)	1/4 in (6.4 mm)
AC	250 - 300	350 - 450
DC±	230 - 270	315 - 405

Preferred polarity is listed first.

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METAL-CORED



# Jetweld<sup>®</sup> 1

**Mild Steel, High Deposition**

AWS E7024-1

## Key Features

- ▶ High deposition rates
- ▶ Smooth bead appearance
- ▶ Minimal spatter
- ▶ Shallow penetration

## Typical Applications

- ▶ Large welds
- ▶ Slightly downhill (15° max) positions
- ▶ Multiple pass welding

## Welding Positions

Flat &amp; Horizontal

## Conformances

AWS A5.1/A5.1M: 2004	E7024-1
ASME SFA-A5.1:	E7024-1
ABS:	E7024-1
Lloyd's Register:	1M
DNV Grade:	1
GL:	1
BV Grade:	1
CWB/CSA W48-06:	E4924-1

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Carton
1/8 (3.2)	14 (350)	ED010362
5/32 (4.0)	14 (350)	ED010372
3/16 (4.8)	18 (450)	ED010366
7/32 (5.6)	18 (450)	ED010375
1/4 (6.4)	18 (450)	ED010360

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MIG &amp; TIG

METAL-CORED

# Jetweld<sup>®</sup> 1

(AWS E7024-1)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -18°C (0°F)
<b>Requirements</b> AWS E7024-1	400 (58) min.	490 (70) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	455 - 490 (66 - 71)	530 - 565 (77 - 82)	22 - 31	27 - 60 (20 - 44)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E7024-1	0.15 max.	1.21 max.	0.90 max.	0.035 max.	0.035 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.03 - 0.06	0.63 - 1.02	0.13 - 0.68	0.010 - 0.022	0.005 - 0.011
	%Ni	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V
<b>Requirements</b> AWS E7024-1	0.30 max.	0.20 max.	0.30 max.	0.08 max.	1.50 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	≤ 0.06	0.01 - 0.04	≤ 0.02	0.01 max.	0.75

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

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

Preferred polarity is listed first.

# Pipeliners® 16P

Mild Steel, Low Hydrogen  
AWS E7016 H4

## Key Features

- ▶ Hot, fill and cap pass welding up to X60
- ▶ Low hydrogen, vertical up capability on X60 grade pipe
- ▶ Q2 Lot® - Certificate showing actual deposit chemistry available online
- ▶ Charpy V-Notch impact toughness tested to -46°C (-50°F)

## Typical Applications

- ▶ Root pass welding of up to X100 grade pipe

## Welding Positions

All

## Conformances

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

## DIAMETERS / PACKAGING

Diameter mm (in)	Length in (mm)	50 lb (22.7 kg) Easy Open Can
2.5 (3/32)	14 (350)	ED030916
3.2 (1/8)	14 (350)	ED030917
4.0 (5/32)	18 (450)	ED030918

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METAL-CORED

**Pipelinor<sup>®</sup> 16P**

(AWS E7016 H4)

**MECHANICAL PROPERTIES<sup>(1)</sup>** – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -40°C (-40°F)
<b>Requirements</b> AWS E7016 H4	400 (58) min.	490 (70) min.	22 min.	27 (20) min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	435 - 545 (63 - 79)	550 - 640 (80 - 93)	23 - 34	84 - 161 (62 - 119)	65 - 129 (48 - 95)

**DEPOSIT COMPOSITION<sup>(1)</sup>** – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S	%Ni
<b>Requirements</b> AWS E7016 H4	0.15 max.	1.60 max.	0.75 max.	0.035 max.	0.035 max.	0.30 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.04 - 0.08	1.10 - 1.60	0.39 - 0.67	0.005 - 0.020	0.004 - 0.012	< 0.07
	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V	Diffusible Hydrogen mL/100g weld metal	
<b>Requirements</b> AWS E7016 H4	0.20 max.	0.30 max.	0.08 max.	1.75 max.	4.0 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.01 - 0.07	0.01 - 0.03	0.01 - 0.02	1.14 - 1.71	1 - 4	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.**TYPICAL OPERATING PROCEDURES**

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

Preferred polarity is listed first.

# Excalibur® 7018 MR

Mild Steel, Low Hydrogen  
AWS E7018 H4R

## Key Features

- ▶ Premium arc performance
- ▶ Square coating burn-off
- ▶ Easy strike and re-strike
- ▶ Effortless slag removal
- ▶ Minimal spatter for enhanced operability and clean weld surface

## Typical Applications

- ▶ Mild steel
- ▶ Power generation
- ▶ Petrochemical
- ▶ Pressure vessels
- ▶ Pressure piping

## Welding Positions

All, except vertical down

## Conformances

AWS A5.1/A5.1M: 2004	E7018 H4R
ASME SFA-A5.1:	E7018 H4R
ABS:	3Y H5
Lloyd's Register:	3YM H5
DNV Grade:	3 YH5
GL:	3YH5
BV Grade:	3YHHH
CWB/CSA W48-06:	E4918

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	1 lb (0.5 kg) Plastic Tube 6 lb (3.6 kg) Carton	10 lb (4.5 kg) EO Can 30 lb (13.6 kg) Carton	50 lb (22.7kg) Carton
3/32 (2.4)	14 (350)	ED032086	ED032588	ED028280
1/8 (3.2)	14 (350)	ED031468	ED032589	ED028281
5/32 (4.0)	14 (350)		ED032590	ED028282
3/16 (4.8)	14 (350)			ED028283
7/32 (5.6)	18 (450)			ED028917
1/4 (6.4)	18 (450)			ED028918

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METAL-CORED

**Excalibur® 7018 MR**

(AWS E7018 H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E7018 H4R	400 (58) min.	490 (70) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	430 - 510 (62 - 74)	510 - 605 (74 - 88)	25 - 37	121 - 332 (89 - 246)

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004**

	%C	%Mn	%Si	%P	%S	%Ni
<b>Requirements</b> AWS E7018 H4R	0.15 max.	1.60 max.	0.75 max.	0.035 max.	0.035 max.	0.30 max.
<b>Typical Performance<sup>(3)</sup></b>	0.03 - 0.08	1.01 - 1.55	0.34 - 0.68	0.01 - 0.02	≤ 0.01	0.01 - 0.06
	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V	Diffusible Hydrogen mL/100g weld metal	
<b>Requirements</b> AWS E7018 H4R	0.20 max.	0.30 max.	0.08 max.	1.75 max.	4.0 max.	
<b>Typical Performance<sup>(3)</sup></b>	0.02 - 0.07	≤ 0.05	≤ 0.02	1.04 - 1.75	2 - 3	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)					
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)	7/32 in (5.6 mm)	1/4 in (6.4 mm)
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

Preferred polarity is listed first.

# Jetweld® LH-70

Mild Steel, Low Hydrogen  
AWS E7018 H4R

## Key Features

- ▶ Low hydrogen
- ▶ Smooth arc performance

## Typical Applications

- ▶ General fabrication
- ▶ Military low hydrogen applications

## Welding Positions

All, except vertical down

## Conformances

AWS A5.1/A5.1M: 2004	E7018 H4R
ASME SFA-A5.1:	E7018 H4R
ABS:	E7018, 3Y
Lloyd's Register:	3YM H5
DNV Grade:	3 Y40H5
GL:	3YH5
BV Grade:	3YHHH
CWB/CSA W48-06:	E4918-1
MIL-E-22200/1:	MIL-7018

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	14 (350)	ED010568
1/8 (3.2)	14 (350)	ED010561
5/32 (4.0)	14 (350)	ED010575
3/16 (4.8)	14 (350)	ED010564
7/32 (5.6)	18 (450)	ED010577
1/4 (6.4)	18 (450)	ED010558

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**Jetweld® LH-70**

(AWS E7018 H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E7018 H4R	400 (58) min.	490 (70) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	400 - 485 (58 - 70)	490 - 570 (71 - 83)	23 - 36	156 - 334 (115 - 246)

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004**

	%C	%Mn	%Si	%P	%S	%Ni
<b>Requirements</b> AWS E7018 H4R	0.15 max.	1.60 max.	0.75 max.	0.035 max.	0.035 max.	0.30 max.
<b>Typical Performance<sup>(3)</sup></b>	0.04 - 0.07	0.95 - 1.17	0.30 - 0.53	0.01 - 0.02	≤ 0.02	0.01 - 0.05
	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V	Diffusible Hydrogen mL/100g weld metal	
<b>Requirements</b> AWS E7018 H4R	0.20 max.	0.30 max.	0.08 max.	1.75 max.	4.0 max.	
<b>Typical Performance<sup>(3)</sup></b>	0.03 - 0.06	≤ 0.02	≤ 0.02	1.05	1 - 2	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.**TYPICAL OPERATING PROCEDURES**

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

Preferred polarity is listed first.



# Jet-LH<sup>®</sup> 78 MR

Mild Steel, Low Hydrogen  
AWS E7018 H4R

## Key Features

- ▶ Low hydrogen
- ▶ Smooth arc performance

## Typical Applications

- ▶ General fabrication

## Welding Positions

All, except vertical down

## Conformances

AWS A5.1/A5.1M: 2004	E7018 H4R
ASME SFA-A5.1:	E7018 H4R
ABS:	E7018
Lloyd's Register:	3YM H5
DNV Grade:	3 YH5
GL:	3YH5
BV Grade:	3YHHH
CWB/CSA W48-06	E4918-1

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	5 lb (2.3 kg) Plastic Tube 20 lb (9 kg) Carton	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED030174	ED015161
1/8 (3.2)	14 (350)	ED030175	ED015198
5/32 (4.0)	14 (350)	ED032436	ED015141
3/16 (4.8)	14 (350)		ED015186
1/4 (6.4)	18 (450)		ED015383

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**Jet-LH<sup>®</sup> 78 MR**

(AWS E7018 H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup>** – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E7018 H4R	400 (58) min.	490 (70) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	415 - 570 (60 - 83)	495 - 640 (72 - 93)	22 - 34	156 - 353 (115 - 260)

**DEPOSIT COMPOSITION<sup>(1)</sup>** – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S	%Ni
<b>Requirements</b> AWS E7018 H4R	0.15 max.	1.60 max.	0.75 max.	0.035 max.	0.035 max.	0.30 max.
<b>Typical Performance<sup>(3)</sup></b>	0.04 - 0.07	0.75 - 1.35	0.13 - 0.69	≤ 0.01	≤ 0.01	0.02 - 0.04
	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V	Diffusible Hydrogen mL/100g weld metal	
<b>Requirements</b> AWS E7018 H4R	0.20 max.	0.30 max.	0.08 max.	1.75 max.	4.0 max.	
<b>Typical Performance<sup>(3)</sup></b>	0.02 - 0.06	≤ 0.03	≤ 0.03	0.85	1 - 3	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)				
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)	1/4 in (6.4 mm)
DC+	65 - 100	110 - 160	130 - 200	180 - 270	300 - 400
AC	70 - 105	120 - 170	140 - 230	210 - 290	325 - 420

Preferred polarity is listed first.

# Lincoln® 7018AC

Mild Steel, Low Hydrogen  
AWS E7018 H8

## Key Features

- ▶ AC polarity welding
- ▶ Low open circuit voltage operation
- ▶ Minimal spatter
- ▶ Capable of cold re-strikes

## Typical Applications

- ▶ General fabrication
- ▶ Tack and skip welds
- ▶ Thin sections

## Welding Positions

All, except vertical down

## Conformances

AWS A5.1/A5.1M: 2004	E7018 H8
ASME SFA-A5.1:	E7018 H8
CWB/CSA W48-06:	E4918-H8

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	1 lb (0.5 kg) Plastic Tube 6 lb (3.6 kg) Carton	5 lb (2.3 kg) Plastic Tube 20 lb (9.1 kg) Carton	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	14 (350)	ED031714	ED030568	ED031732
1/8 (3.2)	14 (350)	ED031715	ED030569	ED031734
5/32 (4.0)	14 (350)		ED032444	ED031738

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METAL-CORED

# Lincoln® 7018AC

(AWS E7018 H8)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E7018 H8	400 (58) min.	490 (70) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	435 - 625 (63 - 91)	515 - 685 (75 - 99)	23 - 29	27 - 76 (20 - 56)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S	%Ni
<b>Requirements</b> AWS E7018 H8	0.15 max.	1.60 max.	0.75 max.	0.035 max.	0.035 max.	0.30 max.
<b>Typical Performance<sup>(3)</sup></b>	0.04 - 0.06	1.00 - 1.60	0.32 - 0.63	0.01 - 0.02	≤ 0.01	0.01 - 0.03
	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V	Diffusible Hydrogen mL/100g weld metal	
<b>Requirements</b> AWS E7018 H8	0.20 max.	0.30 max.	0.08 max.	1.75 max.	8.0 max.	
<b>Typical Performance<sup>(3)</sup></b>	0.03 - 0.08	≤ 0.01	0.02 - 0.05	1.13	2 - 4	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

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

Preferred polarity is listed first.

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# Excalibur® 7018-1 MR

Mild Steel, Low Hydrogen  
AWS E7018-1 H4R

## Key Features

- ▶ Premium arc performance
- ▶ Square coating burn-off
- ▶ Effortless slag removal
- ▶ Easy strike and re-strike
- ▶ Impact toughness tested to -46°C (-50°F)

## Typical Applications

- ▶ Power generation
- ▶ Petrochemical
- ▶ Pressure vessels
- ▶ Pressure piping
- ▶ Fill and cap pass welding of up to X65 grade pipe

## Welding Positions

All, except vertical down

## Conformances

AWS A5.1/A5.1M: 2004	E7018-1 H4R
ASME SFA-A5.1:	E7018-1 H4R
ABS:	3Y H5
Lloyd's Register:	3YM H5
DNV Grade:	3 YH5
GL:	3YH5
BV Grade:	3YHHH
CWB/CSA W48-06:	E4918-1
TUV:	DIN EN ISO 2560-A:E

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can 24 lb (11 kg) Carton	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton	50 lb (22.7kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033179		
3/32 (2.4)	14 (350)		ED032591	ED028700
1/8 (3.2)	14 (350)		ED032592	ED028702
5/32 (4.0)	14 (350)			ED028704
3/16 (4.8)	14 (350)			ED028706
7/32 (5.6)	18 (450)			ED028919
1/4 (6.4)	18 (450)			ED028920

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**Excalibur® 7018-1 MR**

(AWS E7018-1 H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup>** – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -46°C (-50°F)
<b>Requirements</b> AWS E7018-1 H4R	400 (58) min.	490 (70) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	405 - 515 (59 - 75)	530 - 605 (77 - 88)	22 - 36	56 - 178 (42 - 131)

**DEPOSIT COMPOSITION<sup>(1)</sup>** – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S	%Ni
<b>Requirements</b> AWS E7018-1 H4R	0.15 max.	1.60 max.	0.75 max.	0.035 max.	0.035 max.	0.30 max.
<b>Typical Performance<sup>(3)</sup></b>	0.04 - 0.07	0.80 - 1.44	0.28 - 0.51	0.006 - 0.019	0.003 - 0.013	0.01 - 0.07
	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V	Diffusible Hydrogen mL/100g weld metal	
<b>Requirements</b> AWS E7018-1 H4R	0.20 max.	0.30 max.	0.08 max.	1.75 max.	4.0 max.	
<b>Typical Performance<sup>(3)</sup></b>	0.01 - 0.07	0.11 - 0.28	≤ 0.01	0.93 - 1.75	2 - 3	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)					
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)	7/32 in (5.6 mm)	1/4 in (6.4 mm)
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

Preferred polarity is listed first.

# Excalibur<sup>®</sup> 7028

Mild Steel, Low Hydrogen  
AWS E7028 H8

## Key Features

- ▶ High deposition rates
- ▶ Premium arc performance
- ▶ High travel speed
- ▶ H8 diffusible hydrogen levels
- ▶ Capable of producing weld deposits with impact toughness exceeding 84 J (60 ft•lbf) at -40°C (-40°F)

## Typical Applications

- ▶ Structural
- ▶ Heavy fabrication
- ▶ Shipbuilding
- ▶ Storage tanks
- ▶ Bridge fabrication

## Welding Positions

Flat & Horizontal

## Conformances

AWS A5.1/A5.1M: 2004	E7028 H8
ASME SFA-A5.1:	E7028 H8
ABS:	E7028, 3Y H10 (Fillet Only)
Lloyd's Register:	3YM H10
DNV Grade:	3 YH10
CWB/CSA W48-06:	E4928 H8

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50lb (22.7kg) Easy Open Can
5/32 (4.0)	14 (350)	ED032636
3/16 (4.8)	18 (450)	ED032790
7/32 (5.6)	18 (450)	ED032638

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# Excalibur® 7028

(AWS E7028 H8)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -18°C (0°F)
<b>Requirements</b> AWS E7028 H8	400 (58) min.	490 (70) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	450 - 470 (66 - 69)	540 - 560 (79 - 82)	27 - 34	84 - 193 (62 - 142)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.1/A5.1M: 2004

	%C	%Mn	%Si	%P	%S	%Ni
<b>Requirements</b> AWS E7028 H8	0.15 max.	1.60 max.	0.90 max.	0.035 max.	0.035 max.	0.30 max.
<b>Typical Performance<sup>(3)</sup></b>	0.03 - 0.06	1.17 - 1.51	0.44 - 0.77	0.007 - 0.014	0.004 - 0.008	0.02 - 0.04
	%Cr	%Mo	%V	%Mn + Ni + Cr + Mo + V	Diffusible Hydrogen mL/100g weld metal	
<b>Requirements</b> AWS E7028 H8	0.20 max.	0.30 max.	0.08 max.	1.75 max.	8.0 max.	
<b>Typical Performance<sup>(3)</sup></b>	0.02 - 0.05	0.01 - 0.03	0.01 max.	1.25 - 1.62	4 - 5	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	5/32 in (4.0 mm)	3/16 in (4.8 mm)	7/32 in (5.6 mm)
AC	130 - 180	190 - 250	250 - 310
DC+	125 - 175	185 - 245	220 - 280

Preferred polarity is listed first.

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# Shield-Arc<sup>®</sup> HYP+

Low Alloy, Cellulosic, Pipe  
AWS E7010-P1

## Key Features

- ▶ Light slag for minimal arc interference
- ▶ Deep penetration
- ▶ Clean, visible weld puddle
- ▶ Superior puddle control

## Typical Applications

- ▶ Root pass welding of up to X80 grade pipe
- ▶ Hot, fill and cap pass of up to X65 grade pipe
- ▶ Vertical down welding

## Welding Positions

All

## Conformances

AWS A5.5/A5.5M: 2006	E7010-P1, E7010-G
ASME SFA-A5.5:	E7010-P1, E7010-G
ABS:	E7010-P1
CWB/CSA W48-06:	E4910-P1
TUV:	DIN EN ISO 2560-A-E

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Easy Open Can
1/8 (3.2)	14 (350)	ED029511
5/32 (4.0)	14 (350)	ED029513
3/16 (4.8)	14 (350)	ED029509

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# Shield-Arc® HYP+

(AWS E7010-P1)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E7010-P1	415 (60) min.	490 (70) min.	22 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	435 - 525 (63 - 76)	525 - 635 (76 - 92)	22 - 28	27 - 56 (20 - 41)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E7010-P1	0.20 max.	1.20 max.	0.60 max.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.13 - 0.17	0.49 - 0.63	0.08 - 0.18	≤ 0.01	≤ 0.01
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E7010-P1	1.00 max.	0.30 max.	0.50 max.	0.50 max.	
<b>Typical Performance<sup>(3)</sup></b>	0.01 - 0.02	0.02	0.27 - 0.31	< 0.01	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

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

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# Pipeliners® 7P+

Low Alloy, Cellulosic, Pipe  
AWS E7010-P1

## Key Features

- ▶ High productivity in vertical down and out-of-position pipe welding
- ▶ Deep penetration
- ▶ Q2 Lot® - Certificate showing actual deposit chemistry available online
- ▶ Clean, visible weld puddle
- ▶ Superior puddle control

## Typical Applications

- ▶ Root pass welding of up to X80 grade pipe
- ▶ Hot, fill and cap pass of up to X65 grade pipe
- ▶ Vertical down welding

## Welding Positions

All

## Conformances

AWS A5.5/A5.5M: 2006	E7010-P1
ASME SFA-A5.5:	E7010-P1
ABS:	E7010-P1

## Notes

- ▶ This product contains micro-alloying elements. Additional information available upon request.

## DIAMETERS / PACKAGING

Diameter mm (in)	Length mm (in)	50 lb (22.7 kg) Easy Open Can
3.2 (1/8)	350 (14)	ED031611
4.0 (5/32)	350 (14)	ED031612
5.0 (3/16)	350 (14)	ED031613

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**Pipelinor® 7P+**

(AWS E7010-P1)

**MECHANICAL PROPERTIES<sup>(1)</sup>** – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -40°C (-40°F)
<b>Requirements</b> AWS E7010-P1	415 (60) min.	490 (70) min.	22 min.	27 (20) min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	455 - 515 (66 - 75)	525 - 635 (76 - 92)	23 - 29	49 - 92 (36 - 68)	31 - 85 (23 - 63)

**DEPOSIT COMPOSITION<sup>(1)</sup>** – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E7010-P1	0.20 max.	1.20 max.	0.60 max.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.09 - 0.20	0.44 - 0.83	0.06 - 0.31	0.01 - 0.02	0.01 - 0.02
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E7010-P1	1.00 max.	0.30 max.	0.50 max.	0.10 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.58 - 0.90	0.02 - 0.05	0.04 - 0.21	≤ 0.01	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)		
	3.2 mm (1/8 in)	4.0 mm (5/32 in)	5.0 mm (3/16 in)
DC+	65 - 130	100 - 165	130 - 210

# Shield-Arc® 85

Low Alloy, Cellulosic, Pipe  
AWS E7010-A1

## Key Features

- ▶ For welding 0.50% molybdenum steel
- ▶ Light slag for minimal arc interference
- ▶ Deep penetration and superior puddle control
- ▶ Clean, visible weld puddle
- ▶ Capable of 480 MPa (70 ksi) tensile strength weld deposits

## Typical Applications

- ▶ API 5L X42 through X56 grade pipe
- ▶ Cross country and in-plant pipe

## Welding Positions

All

## Conformances

AWS A5.5/A5.5M: 2006	E7010-A1
ASME SFA-A5.5:	E7010-A1
ABS:	E7010-A1
CWB/GSA W48-06:	E4910-A1
TUV:	DIN EN ISO 2560-A:E
MIL-E-22200/7:	MIL-7010-A1

## DIAMETERS / PACKAGING

Diameter in (mm)		Length in (mm)	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	12 (300)		ED012893
1/8 (3.2)	14 (350)		ED012885
5/32 (4.0)	14 (350)		ED012896
3/16 (4.8)	14 (350)		ED012889

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**Shield-Arc® 85**

(AWS E7010-A1)

**MECHANICAL PROPERTIES<sup>(1)</sup>** – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E7010-A1	390 (57) min.	490 (70) min.	22 min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	440 - 510 (64 - 74)	540 - 580 (78 - 84)	25 - 30	35 - 43 (26 - 32)

**DEPOSIT COMPOSITION<sup>(1)</sup>** – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S	%Mo
<b>Requirements</b> AWS E7010-A1	0.12 max.	0.60 max	0.40 max	0.03 max	0.03 max	0.40 - 0.65
<b>Typical Performance<sup>(3)</sup></b>	0.07 - 0.12	0.29 - 0.59	0.08 - 0.26	0.01 - 0.02	≤ 0.01	0.40 - 0.62

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.**TYPICAL OPERATING PROCEDURES**

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

# Shield-Arc® 70+

Low Alloy, Cellulosic, Pipe  
AWS E8010-P1

## Key Features

- ▶ Light slag for minimal arc interference
- ▶ Deep penetration
- ▶ Clean, visible weld puddle
- ▶ Superior puddle control

## Typical Applications

- ▶ Relatively high silicon pipe
- ▶ API 5L X56 through X70 grade pipe
- ▶ Cross country and in-plant pipe

## Welding Positions

All

## Conformances

AWS A5.5/A5.5M: 2006	E8010-P1, E8010-G
ASME SFA-A5.5:	E8010-P1, E8010-G
ABS:	E8010-G
CWB/GSA W48-06:	E5510-G
TUV:	DIN EN ISO 2560-A:E

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Easy Open Can
1/8 (3.2)	14 (350)	ED012841
5/32 (4.0)	14 (350)	ED012849
3/16 (4.8)	14 (350)	ED012845

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**Shield-Arc® 70+**

(AWS E8010-G)

**MECHANICAL PROPERTIES<sup>(1)</sup>** – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
<b>Requirements</b> AWS E8010-G	460 (67) min.	550 (80) min.	19 min.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	460 - 620 (67 - 90)	585 - 690 (85 - 100)	19 - 31	37 - 81 (27 - 60)	26 - 64 (19 - 47)

**DEPOSIT COMPOSITION<sup>(1)</sup>** – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S
<b>Requirements<sup>(4)</sup></b> AWS E8010-G	Not Specified	1.00 min.	0.80 min.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.13 - 0.17	0.60 - 1.20	0.05 - 0.30	≤ 0.01	≤ 0.01
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E8010-G	0.50 min.	0.30 min.	0.20 min.	0.10 min.	
<b>Typical Performance<sup>(3)</sup></b>	0.75 - 0.97	0.01 - 0.20	0.05 - 0.15	0.02 - 0.04	

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. <sup>(4)</sup>In order to meet the alloy requirements of the "G" designation, the undiluted weld metal shall have the minimum of at least one of the elements listed.

**TYPICAL OPERATING PROCEDURES**

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



# Pipelin<sup>®</sup>er 8P+

Low Alloy, Cellulosic, Pipe  
AWS E8010-P1

## Key Features

- ▶ High productivity in vertical down and out-of-position pipe welding
- ▶ Deep penetration
- ▶ Q2 Lot<sup>®</sup> - Certificate showing actual deposit chemistry available online
- ▶ Clean, visible weld puddle
- ▶ Superior puddle control

## Typical Applications

- ▶ Root pass welding of up to X80 grade pipe
- ▶ Hot, fill and cap pass of up to X70 grade pipe

## Welding Positions

All

## Conformances

AWS A5.5/A5.5M: 2006	E8010-P1, E8010-G
ASME SFA-A5.5:	E8010-P1, E8010-G
ABS:	E8010-P1
CSA/CWB W48-06:	E5510-P1

## Notes

- ▶ This product contains micro-alloying elements. Additional information available upon request.

## DIAMETERS / PACKAGING

Diameter mm (in)	Length in (mm)	50 lb (22.7 kg) Easy Open Can
3.2 (1/8)	14 (350)	ED030826
4.0 (5/32)	14 (350)	ED030827
5.0 (3/16)	14 (350)	ED030828

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METAL-CORED

**Pipelinor<sup>®</sup> 8P+**

(AWS E8010-P1)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

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

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E8010-P1	0.20 max.	1.20 max.	0.60 max.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.09 - 0.20	0.55 - 0.98	0.07 - 0.27	0.01 - 0.02	0.01 - 0.02
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E8010-P1	1.00 max.	0.30 max.	0.50 max.	0.10 max.	
<b>Typical Performance<sup>(3)</sup></b>	0.73 - 1.00	0.02 - 0.05	0.13 - 0.22	0.01 max.	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9. NOTE 1: This product contains micro-alloying elements. Additional information available on request.

**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)		
	3.2 mm (1/8 in)	4.0 mm (5/32 in)	5.0 mm (3/16 in)
DC+	65 - 120	100 - 165	130 - 210

# Shield-Arc® 90

Low Alloy, Cellulosic, Pipe  
AWS E9010-G

## Key Features

- ▶ Light slag for minimal arc interference
- ▶ Deep penetration
- ▶ Clean, visible weld puddle
- ▶ Superior puddle control

## Welding Positions

All

## Conformances

AWS A5.5/A5.5M: 2006	E9010-G
ASME SFA-A5.5:	E9010-G

## Typical Applications

- ▶ Root and hot pass welding of up to X80 grade pipe, when followed by low hydrogen fill and cap
- ▶ API 5L X70 through X80 grade pipe
- ▶ Cross country pipe

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Easy Open Can
1/8 (3.2)	14 (350)	EDS01693
5/32 (4.0)	14 (350)	EDS01694
3/16 (4.8)	14 (350)	EDS01695

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METAL-CORED

**Shield-Arc<sup>®</sup> 90**

(AWS E9010-G)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
<b>Requirements</b> AWS E9010-G	530 (77) min.	620 (90) min.	17 min.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	530 - 605 (77 - 88)	620 - 690 (90 - 100)	17 - 29	45 - 94 (33 - 69)	28 - 62 (21 - 46)

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	%C	%Mn	%Si	%P	%S
<b>Requirements<sup>(4)</sup></b> AWS E9010-G	Not Specified	1.00 min.	0.80 min.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.13 - 0.18	0.55 - 0.79	0.08 - 0.22	0.01 - 0.02	≤ 0.01
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E9010-G	0.50 min.	0.30 min.	0.20 min.	0.10 min.	
<b>Typical Performance<sup>(3)</sup></b>	0.66 - 0.77	0.01 - 0.06	0.43 - 0.70	≤ 0.01	

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9. <sup>(4)</sup> In order to meet the alloy requirements of the "G" designation, the undiluted weld metal shall have the minimum of at least one of the elements listed.

**TYPICAL OPERATING PROCEDURES**

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

# Excalibur® 7018-A1 MR

Low Alloy, Low Hydrogen  
AWS E7018-A1 H4R

## Key Features

- ▶ Designed for welding 0.50% molybdenum steel
- ▶ Premium arc performance
- ▶ Square coating burn-off
- ▶ Easy strike, re-strike and slag removal
- ▶ Capable of exceeding AWS minimum requirement of 490 MPa (70 ksi) tensile strength after 8 hours of stress-relieving at 620°C (1150°F)

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E7018-A1 H4R
ASME SFA-A5.5:	E7018-A1 H4R
ABS:	E7018-A1 H4R
CWB/CSA W48-06:	E4918-A1

## Typical Applications

- ▶ Fabrication and maintenance welding
- ▶ Pressure vessels and pressure piping

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) E0 Can 24 lb (10.9 kg) Carton	10 lb (4.5 kg) E0 Can 30 lb (13.6 kg) Carton	25 lb (11.3 kg) Easy Open Can	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED032893		ED032875	
1/8 (3.2)	14 (350)		ED032873		ED032876
5/32 (4.0)	14 (350)				ED032877

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**Excalibur® 7018-A1 MR**

(AWS E7018-A1 H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E7018-A1 H4R	390 (57) min.	490 (70) min.	22 min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded				
Stress-Relieved 1 hr @ 620°C (1150°F)	470 - 500 (68 - 72)	565 - 585 (82 - 85)	25 - 32	60 - 130 (46 - 96)
Stress-Relieved 8 hrs @ 620°C (1150°F) <sup>(4)</sup>	450 - 485 (65 - 70)	545 - 570 (79 - 83)	27 - 32	50 - 107 (38 - 79)

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	%C	%Mn	%Si	%P	%S	%Mo	Diffusible Hydrogen
<b>Requirements</b> AWS E7018-A1 H4R	0.12 max.	0.90 max.	0.80 max.	0.03 max.	0.03 max.	0.40 - 0.65	4.0 max.
<b>Typical Performance<sup>(3)</sup></b>	0.04 - 0.06	0.55 - 0.80	0.35 - 0.55	≤ 0.01	≤ 0.01	0.45 - 0.65	2 - 4

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. <sup>(4)</sup>Industry Specific Data (Not AWS Requirement).**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)		
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)
DC+	60 - 110	85 - 160	110 - 210
AC	65 - 120	90 - 170	115 - 220

Preferred polarity is listed first.

# Excalibur® 8018-B2 MR

Low Alloy, Low Hydrogen  
AWS E8018-B2 H4R

## Key Features

- ▶ Designed for welding 1.25% chromium, 0.50% molybdenum steel
- ▶ Premium arc performance
- ▶ Square coating burn-off
- ▶ Easy strike, re-strike and slag removal
- ▶ Capable of exceeding AWS minimum requirement of 550 MPa (80 ksi) tensile strength after 8 hours of stress-relieving at 690°C (1275°F)

## Typical Applications

- ▶ Power generation
- ▶ Pressure vessels
- ▶ Petrochemical
- ▶ Process piping

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E8018-B2 H4R
ASME SFA-A5.5:	E8018-B2 H4R
CWB/CSA W48-06:	E5518-B2

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) EO Can 24 lb (10.9 kg) Carton	10 lb (4.5 kg) EO Can 30 lb (13.6 kg) Carton	25 lb (11.3 kg) Easy Open Can	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED032878	ED032879	ED032881	ED032882 ED032883
1/8 (3.2)	14 (350)				
5/32 (4.0)	14 (350)				

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**Excalibur® 8018-B2 MR**

(AWS E8018-B2 H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)
<b>Requirements</b> AWS E8018-B2 H4R	460 (67) min.	550 (80) min.	19 min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded				
Stress-Relieved 1 hr @ 690°C (1275°F)	540 - 585 (78 - 85)	640 - 685 (93 - 99)	24 - 26	71 - 127 (52 - 94)
Stress-Relieved 8 hrs @ 690°C (1275°F) <sup>(4)</sup>	495 - 540 (72 - 78)	605 - 640 (88 - 93)	25 - 28	64 - 127 (47 - 83)

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	%C	%Mn	%Si	%P
<b>Requirements</b> AWS E8018-B2 H4R	0.05 - 0.12	0.90 max.	0.80 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.08 - 0.11	0.65 - 0.80	0.35 - 0.55	≤ 0.02
	%S	%Cr	%Mo	Diffusible Hydrogen
<b>Requirements</b> AWS E8018-B2 H4R	0.03 max.	1.00 - 1.50	0.40 - 0.65	4.0 max.
<b>Typical Performance<sup>(3)</sup></b>	≤ 0.01	1.05 - 1.30	0.40 - 0.60	2 - 4

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. <sup>(4)</sup>Industry Specific Data (Not AWS Requirement).**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)		
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)
DC+	60 - 110	85 - 160	110 - 210
AC	65 - 120	90 - 170	115 - 220

Preferred polarity is listed first.



# Excalibur<sup>®</sup> 8018-B2 XF MR

Low Alloy, Low Hydrogen  
AWS E8018-B2 H4R

## Key Features

- ▶ X-Factor < 15 ppm
- ▶ Premium arc performance and strikeability
- ▶ Q2 Lot<sup>®</sup> - Certificate showing actual deposit chemistry available online
- ▶ Easy strike, re-strike and slag removal
- ▶ Square coating burn-off and easy slag removal

## Typical Applications

- ▶ 1.25% chromium, 0.50% molybdenum steels
- ▶ High temperature
- ▶ Step-cooling
- ▶ Petrochemical
- ▶ Pressure vessels

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E8018-B2 H4R
ASME SFA-A5.5:	E8018-B2 H4R
CWB/CSA W48-06:	E5518-B2

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can 24 lb (10.9 kg) Carton		10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton	
		ED033165		ED033166 ED033167	
3/32 (2.4)	12 (300)				
1/8 (3.2)	14 (350)			ED033166	
5/32 (4.0)	14 (350)			ED033167	

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**Excalibur® 8018-B2 XF MR**

(AWS E8018-B2 H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)	Hardness <sup>(4)</sup> HV <sub>10</sub>
<b>Requirements</b> AWS E8018-B2 H4R	460 (67) min.	550 (80) min.	19 min.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded					
Stress-Relieved					
1 hr @ 690°C (1275°F)	550 - 580 (80 - 84)	650 - 680 (95 - 99)	22 - 26	91 - 131 (67 - 97)	199 - 219
8 hrs @ 690°C (1275°F) <sup>(4)</sup>	495 - 520 (72 - 76)	600 - 630 (87 - 92)	25 - 27	107 - 127 (79 - 94)	193 - 195

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	%C	%Mn	%Si	%P
<b>Requirements</b> AWS E8018-B2 H4R	0.05 - 0.12	0.90 max	0.80 max	0.03 max
<b>Typical Performance<sup>(3)</sup></b>	0.08 - 0.11	0.60 - 0.86	0.35 - 0.71	0.0075 - 0.0104
	%S	%Cr	%Mo	%Sb
<b>Requirements</b> AWS E8018-B2 H4R	0.03 max	1.00 - 1.50	0.40 - 0.65	Not Specified
<b>Typical Performance<sup>(3)</sup></b>	≤0.01	1.25 - 1.42	0.49 - 0.57	0.0005 - 0.0008
	%Sn	%As	Diffusible Hydrogen (mL/100g weld deposit)	X-Factor <sup>(4,5)</sup>
<b>Requirements</b> AWS E8018-B2 H4R	Not Specified	Not Specified	4.0 max	≤15
<b>Typical Performance<sup>(3)</sup></b>	0.0005 - 0.0036	0.0029 - 0.0040	1 - 2	9 - 12

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. <sup>(4)</sup>Industry specific data, not required by AWS. <sup>(5)</sup>X = (10 P + 5 Sb + 4 Sn + As) / 100 (elements in ppm).  
NOTE: Additional test data available upon request.

**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)		
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)
DC+	60 - 110	85 - 160	110 - 210
AC	65 - 120	90 - 170	115 - 220

Preferred polarity is listed first.

# Excalibur® 8018-C1 MR

Low Alloy, Low Hydrogen  
AWS E8018-C1 H4R

## Key Features

- ▶ Designed to produce a nominal 2 1/4% nickel deposit
- ▶ Premium arc performance
- ▶ Square coating burn-off
- ▶ Easy strike, re-strike and slag removal
- ▶ Capable of exceeding AWS minimum requirement of 550 MPa (80 ksi) tensile strength after 1 hour of stress-relieving at 610°C (1125°F)

## Typical Applications

- ▶ Low temperature applications
- ▶ Refrigerated ammonia tanks
- ▶ Liquefied gas storage, piping and transportation
- ▶ Weathering steels

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E8018-C1 H4R
ASME SFA-A5.5:	E8018-C1 H4R
CWB/CSA W48-06:	E5518-C1

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	14 (350)	ED030876
1/8 (3.2)	14 (350)	ED030877
5/32 (4.0)	14 (350)	ED030878
3/16 (4.8)	14 (350)	ED030879
7/32 (5.6)	18 (450)	ED030881
1/4 (6.4)	18 (450)	ED030880

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# Excalibur® 8018-C1 MR

(AWS E8018-C1 H4R)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -59°C (-75°F)
<b>Requirements</b> AWS E8018-C1 H4R	460 (67) min.	550 (80) min.	19 min.	20 (27) min.
<b>Typical Performance<sup>(3)</sup></b> Stress-Relieved 1 hr @ 610°C (1125°F) <sup>(4)</sup>	460 - 525 (67 - 76)	565 - 615 (82 - 89)	24 - 32	79 - 129 (58 - 95)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P
<b>Requirements</b> AWS E8018-C1 H4R	0.12 max.	1.25 max.	0.80 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.05 - 0.09	0.89 - 1.25	0.17 - 0.53	≤ 0.02
	%S	%Ni	Diffusible Hydrogen (mL/100g weld deposit)	
<b>Requirements</b> AWS E8018-C1 H4R	0.03 max.	2.00 - 2.75	4.0 max.	
<b>Typical Performance<sup>(3)</sup></b> As-Welded	≤ 0.01	2.00 - 2.58	1 - 3	

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9. <sup>(4)</sup> Industry Specific Data (Not AWS Requirement).

## TYPICAL OPERATING PROCEDURES

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

Preferred polarity is listed first.

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# Excalibur® 8018-C3 MR

Low Alloy, Low Hydrogen  
AWS E8018-C3 H4R

## Key Features

- ▶ Designed to produce a 1% nickel deposit
- ▶ Premium arc performance
- ▶ Square coating burn-off
- ▶ Easy strike and re-strike
- ▶ Effortless slag removal

## Typical Applications

- ▶ Shipbuilding
- ▶ Piping and gas storage tanks
- ▶ Weathering steels
- ▶ Cross country pipe repair

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E8018-C3 H4R
ASME SFA-A5.5:	E8018-C3 H4R
ABS:	E8018-C3 H4R
CWB/CSA W48-06:	E5518-C3

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	14 (350)	ED032599	ED030892
1/8 (3.2)	14 (350)	ED032600	ED030893
5/32 (4.0)	14 (350)		ED030894
3/16 (4.8)	14 (350)		ED030895
7/32 (5.6)	18 (450)		ED030897
1/4 (6.4)	18 (450)		ED030896

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# Excalibur® 8018-C3 MR

(AWS E8018-C3 H4R)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -40°C (-40°F)
<b>Requirements</b> AWS E8018-C3 H4R	470 - 550 (68 - 80)	550 (80) min.	24 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	505 - 590 (73 - 86)	550 - 675 (80 - 98)	24 - 32	81 - 163 (60 - 120)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E8018-C3 H4R	0.12 max.	0.40 - 1.25	0.80 max.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.04 - 0.07	0.40 - 1.25	0.23 - 0.46	≤ 0.01	≤ 0.009
	%Ni	%Cr	%Mo	%V	Diffusible Hydrogen (mL/100g weld deposit)
<b>Requirements</b> AWS E8018-C3 H4R	0.80 - 1.10	0.15 max.	0.35 max.	0.05 max.	4.0 max.
<b>Typical Performance<sup>(3)</sup></b>	0.81 - 1.09	0.04 - 0.06	0.07 - 0.27	≤ 0.01	1 - 2

<sup>(1)</sup> Typical all weld metal. <sup>(2)</sup> Measured with 0.2% offset. <sup>(3)</sup> See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)					
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)	7/32 in (5.6 mm)	1/4 in (6.4 mm)
AC	70 - 110	90 - 160	130 - 210	180 - 300	250 - 330	300 - 400
DC±	80 - 120	100 - 160	140 - 210	200 - 300	270 - 370	325 - 425

Preferred polarity is listed first.

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# Shield-Arc® 70+

Low Alloy, Cellulosic, Pipe  
AWS E8010-G

## Key Features

- ▶ Light slag for minimal arc interference
- ▶ Deep penetration
- ▶ Clean, visible weld puddle
- ▶ Superior puddle control

## Typical Applications

- ▶ Relatively high silicon pipe
- ▶ API 5L X56 through X70 grade pipe
- ▶ Cross country and in-plant pipe

## Welding Positions

All

## Conformances

AWS A5.5/A5.5M: 2006	E8010-G, E8010-P1*
ASME SFA-A5.5:	E8010-G, E8010-P1*
ABS:	E8010-G
CWB/CSA W48-06:	E5510-G
TUV:	DIN EN ISO 2560-A:E

\* This product is classified as an E8010-G; however, it also meets the requirements of an E8010-P1.

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50 lb (22.7 kg) Easy Open Can
1/8 (3.2)	14 (350)	ED012841
5/32 (4.0)	14 (350)	ED012849
3/16 (4.8)	14 (350)	ED012845

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**Shield-Arc<sup>®</sup> 70+**

(AWS E8010-G)

**MECHANICAL PROPERTIES<sup>(1)</sup>** – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
<b>Requirements</b> AWS E8010-G	460 (67) min.	550 (80) min.	19 min.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	460 - 620 (67 - 90)	585 - 690 (85 - 100)	19 - 31	37 - 81 (27 - 60)	26 - 64 (19 - 47)

**DEPOSIT COMPOSITION<sup>(1)</sup>** – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S
<b>Requirements<sup>(4)</sup></b> AWS E8010-G	Not Specified	1.00 min.	0.80 min.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.13 - 0.17	0.60 - 1.20	0.05 - 0.30	≤ 0.01	≤ 0.01
	%Ni	%Cr	%Mo	%V	
<b>Requirements</b> AWS E8010-G	0.50 min.	0.30 min.	0.20 min.	0.10 min.	
<b>Typical Performance<sup>(3)</sup></b>	0.75 - 0.97	0.01 - 0.20	0.05 - 0.15	0.02 - 0.04	

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. <sup>(4)</sup>In order to meet the alloy requirements of the "G" designation, the undiluted weld metal shall have the minimum of at least one of the elements listed.

**TYPICAL OPERATING PROCEDURES**

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



# Excalibur® 9018-B3 MR

Low Alloy, Low Hydrogen  
AWS E9018-B3 H4R

## Key Features

- ▶ Designed for all-position welding of 2.25% chromium, 1% molybdenum low alloy steels
- ▶ Premium arc performance
- ▶ Square coating burn-off
- ▶ Easy strike, re-strike and slag removal
- ▶ Capable of exceeding AWS minimum requirements of 620 MPa (90 ksi) tensile strength after 8 hours of stress-relieving at 690°C (1275°F)

## Typical Applications

- ▶ 2.25% chromium, 1% molybdenum steels
- ▶ Petrochemical
- ▶ Pressure vessels
- ▶ Power generation
- ▶ Process piping

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E9018-B3 H4R
ASME SFA-A5.5:	E9018-B3 H4R
CWB/CSA W48-06:	E6218-B3

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) EO Can 24 lb (10.9 kg) Carton	10 lb (4.5 kg) EO Can 30 lb (13.6 kg) Carton	25 lb (11.3 kg) Easy Open Can	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED032884		ED032887	
1/8 (3.2)	14 (350)		ED032885		ED032888
5/32 (4.0)	14 (350)				ED032889

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# Excalibur® 9018-B3 MR

(AWS E9018-B3 H4R)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -40°C (-40°F)
<b>Requirements</b> AWS E9018-B3 H4R	530 (77) min.	620 (90) min.	17 min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded				
Stress-Relieved 1 hr @ 690°C (1275°F)	595 - 605 (86 - 88)	705 - 715 (102 - 104)	20 - 23	57 - 72 (42 - 53)
Stress-Relieved 8 hrs @ 690°C (1275°F) <sup>(4)</sup>	530 - 580 (77 - 84)	650 - 685 (94 - 99)	20 - 24	43 - 107 (32 - 79)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P
<b>Requirements</b> AWS E9018-B3 H4R	0.05 - 0.12	0.90 max.	0.80 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.07 - 0.08	0.65 - 0.79	0.39 - 0.49	≤0.01
	%S	%Cr	%Mo	Diffusible Hydrogen
<b>Requirements</b> AWS E9018-B3 H4R	0.03 max.	2.00 - 2.50	0.90 - 1.20	4.0 max.
<b>Typical Performance<sup>(3)</sup></b>	≤0.01	2.21 - 2.46	1.03 - 1.13	2 - 4

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. <sup>(4)</sup> Industry Specific Data (Not AWS Requirement).

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)
DC+	60 - 110	85 - 160	110 - 210
AC	65 - 120	90 - 170	115 - 220

Preferred polarity is listed first.

# Excalibur® 9018M MR

Low Alloy, Low Hydrogen  
AWS E9018M H4R

## Key Features

- ▶ Designed to produce weld deposits with 620 MPa (90 ksi) tensile strength
- ▶ Premium arc performance
- ▶ Square coating burn-off
- ▶ Easy strike and re-strike
- ▶ Effortless slag removal

## Typical Applications

- ▶ High strength steel, such as HY-80, HY-90 and ASTM A514
- ▶ Cross country pipe repair
- ▶ DC welding

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E9018M H4R
ASME SFA-A5.5:	E9018M H4R
ABS:	E9018M H4R
CWB/CSA W48-06:	E6218-M H4R (9018M H4R)

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	14 (350)	ED032602	ED030868
1/8 (3.2)	14 (350)	ED032603	ED030869
5/32 (4.0)	14 (350)		ED030870
3/16 (4.8)	14 (350)		ED030871

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# Excalibur® 9018M MR

(AWS E9018M H4R)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -50°C (-60°F)
<b>Requirements</b> AWS E9018M H4R	540 - 620 (78 - 90) min.	620 (90) min.	24 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	540 - 620 (78 - 90)	620 - 705 (90 - 102)	24 - 37	27 - 122 (20 - 90)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E9018M H4R	0.10 max.	0.60 - 1.25	0.80 max.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.04 - 0.07	0.90 - 1.10	0.30 - 0.50	0.01 - 0.02	≤ 0.01
	%Ni	%Cr	%Mo	Diffusible Hydrogen (mL/100g weld deposit)	
<b>Requirements</b> AWS E9018M H4R	1.40 - 1.80	0.15 max.	0.35 max.	4.0 max.	
<b>Typical Performance<sup>(3)</sup></b>	1.50 - 1.80	0.05 - 0.12	0.25 - 0.35	1 - 3	

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9.

## TYPICAL OPERATING PROCEDURES

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

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# Excalibur® 10018-D2 MR

Low Alloy, Low Hydrogen  
AWS E10018-D2 H4R

## Key Features

- ▶ Capable of producing weld deposits that exceed 690 MPa (100 ksi) yield strength after 12 hours at 635°C (1175°F)
- ▶ Premium arc performance
- ▶ Q2 Lot® - Certificate showing actual deposit chemistry available online
- ▶ Easy strike and re-strike
- ▶ Effortless slag removal

## Typical Applications

- ▶ Chromium-molybdenum and other low alloy steels, including AISI 4130, 4140, 8630 and ASTM A182 and A336 Grades F22
- ▶ Carbon-manganese and other low alloy steels
- ▶ Offshore and subsea components
- ▶ Process piping
- ▶ Meets NACE MR0175/ISO15156-2

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E10018-D2 H4R
ASME SFA-A5.5:	E10018-D2 H4R
ABS:	3YQ620 H5
Lloyd's Register:	3Y62 H5
DNV Grade:	3Y62 H5
CWB/CSA W48-06:	E6918-D2

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	25 lb (11.3 kg) Easy Open Can	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033162	
1/8 (3.2)	14 (350)		ED033163
5/32 (4.0)	14 (350)		ED033164

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**Excalibur® 10018-D2 MR**

(AWS E10018-D2 H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -51°C (-60°F)	Hardness <sup>(4)</sup> HV <sub>10</sub>
<b>Requirements</b> AWS E10018-D2 H4R	600 (87) min.	690 (100) min.	16 min.	27 (20) min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> Stress-Relieved 1 hr @ 620°C (1150°F)	650 - 715 (94 - 104)	725 - 780 (105 - 113)	22 - 25	56 - 69 (41 - 51)	219 - 242
<b>Welded on AISI 4130 Steel</b>					
<b>Typical Performance<sup>(3)</sup></b> Stress-Relieved 12 hrs @ 620°C (1150°F) <sup>(4)</sup>	560 - 580 (81 - 84)	650 - 675 (94 - 98)	24 - 25	47 - 68 (35 - 50)	210 - 214

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	%C	%Mn	%Si	%P
<b>Requirements</b> AWS E10018-D2 H4R	0.15 max.	1.65 - 2.00	0.80 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.08 - 0.12	1.69 - 1.91	0.35 - 0.49	0.01 - 0.02
	%S	%Ni	%Mo	Diffusible Hydrogen (mL/100g weld deposit)
<b>Requirements</b> AWS E10018-D2 H4R	0.03 max.	0.90 max.	0.25 - 0.45	4.0 max.
<b>Typical Performance<sup>(3)</sup></b>	≤0.01	0.68 - 0.77	0.34 - 0.39	2 - 3

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. <sup>(4)</sup>Industry specific data, not required by AWS. NOTE: Additional test data available upon request.

**TYPICAL OPERATING PROCEDURES**

Polarity	Current (Amps)		
	3/32 in (2.4 mm)	1/8 in (3.2 mm)	5/32 in (4.0 mm)
DC+	60 - 110	85 - 160	110 - 210
AC	65 - 120	90 - 170	115 - 220

Preferred polarity is listed first.

# Excalibur® 11018M MR

Low Alloy, Low Hydrogen  
AWS E11018M H4R

## Key Features

- ▶ Capable of producing weld deposits with 760 MPa (110 ksi) tensile strength
- ▶ Premium arc performance
- ▶ Square coating burn-off
- ▶ Easy strike and re-strike
- ▶ Effortless slag removal

## Typical Applications

- ▶ Quenched and tempered steels, such as A514, A517 and A709
- ▶ General fabrication of high strength steels
- ▶ Crane booms
- ▶ Trailer frames

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E11018M H4R
ASME SFA-A5.5:	E11018M H4R
ABS:	4YQ690 H5
DNV Grade:	4 YM69 H5
CWB/CSA W48-06:	E7618-M H4R

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton	50 lb (22.7 kg) Easy Open Can
3/32 (2.4)	14 (350)		ED031975
1/8 (3.2)	14 (350)	ED032607	ED031976
5/32 (4.0)	14 (350)	ED032608	ED031977
3/16 (4.8)	14 (350)		ED031978

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**Excalibur® 11018M MR**

(AWS E11018M H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -50°C (-60°F)
<b>Requirements</b> AWS E11018M H4R	680 - 760 (98 - 110) min.	760 (110) min.	20 min.	27 (20) min.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	690 - 758 (100 - 110)	765 - 807 (111 - 117)	20 - 26	76 - 103 (56 - 76)

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E11018M H4R	0.10 max.	1.30 - 1.80	0.60 max.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b>	0.04 - 0.05	1.55 - 1.80	0.40 - 0.55	≤ 0.02	0.01 - 0.03
	%Ni	%Cr	%Mo	Diffusible Hydrogen (mL/100g weld deposit)	
<b>Requirements</b> AWS E11018M H4R	1.25 - 2.50	0.40 max.	0.25 - 0.50	4.0 max.	
<b>Typical Performance<sup>(3)</sup></b>	0.35 - 0.50	1.90 - 2.50	0.01 - 0.02	1 - 4	

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9.**TYPICAL OPERATING PROCEDURES**

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



# Pipeliners® LH-D80

Low Alloy, Low Hydrogen, Pipe  
AWS E8045-P2 H4R

## Key Features

- ▶ Low hydrogen, vertical down capability on up to X70 pipe
- ▶ High productivity
- ▶ Q2 Lot® - Certificate showing actual deposit chemistry available online
- ▶ Touch start tapered tip
- ▶ Meets H4R diffusible hydrogen level and moisture resistance

## Typical Applications

- ▶ Fill and cap pass welding on up to X70 grade pipe
- ▶ Pipe repair
- ▶ Hot tapping

## Welding Positions

Vertical Down

## Conformances

AWS A5.5/A5.5M: 2006	E8045-P2 H4R
ASME SFA-A5.5:	E8045-P2 H4R
CWB/CSA W48-06:	E8045-P2 H4R

## Notes

- ▶ This product contains micro-alloying elements. Additional information available upon request.

## DIAMETERS / PACKAGING

Diameter mm (in)	Length mm (in)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton
3.2 (1/8)	350 (14)	ED032626
4.0 (5/32)	350 (14)	ED032627
4.5 (11/64)	350 (14)	ED032628

INTRODUCTION

STICK

MIG &amp; TIG

METAL-CORED

# Pipeliners® LH-D80

(AWS E8045-P2 H4R)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

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

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E8045-P2 H4R	0.12 max.	0.90 - 1.70	0.80 max.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.04 - 0.06	1.10 - 1.25	0.35 - 0.50	≤ 0.01	≤ 0.01
	%Ni	%Cr	%Mo	%V	Diffusible Hydrogen (mL/100g weld deposit)
<b>Requirements</b> AWS E8045-P2 H4R	1.00 max.	0.20 max.	0.50 max.	0.05 max.	4.0 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	≤ 0.04	≤ 0.05	≤ 0.02	≤ 0.01	2 - 4

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. NOTE: This product contains micro-alloying elements. Additional information available on request.

## 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

INTRODUCTION

STICK

MIG & TIG

METAL-CORED

# Pipeliners<sup>®</sup> LH-D90

Low Alloy, Low Hydrogen, Pipe  
AWS E9045-P2 H4R

## Key Features

- ▶ Low hydrogen, vertical down capability on up to X80 pipe
- ▶ High productivity
- ▶ Q2 Lot<sup>®</sup> - Certificate showing actual deposit chemistry available online
- ▶ Touch start tapered tip
- ▶ Meets H4R diffusible hydrogen level and moisture resistance

## Typical Applications

- ▶ Fill and cap pass welding of up to X80 grade pipe
- ▶ Pipe repair
- ▶ Hot tapping

## Welding Positions

Vertical Down

## Conformances

AWS A5.5/A5.5M: 2006	E9045-P2 H4R
ASME SFA-A5.5:	E9045-P2 H4R
CWB/CSA W48-06:	E9045-P2 H4R

## Notes

- ▶ This product contains micro-alloying elements. Additional information available upon request.

## DIAMETERS / PACKAGING

Diameter mm (in)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton
3.2 (1/8)	14 (350)	ED032629
4.0 (5/32)	14 (350)	ED032630
4.5 (11/64)	14 (350)	ED032631

INTRODUCTION

STICK

MIG &amp; TIG

METAL-CORED

# Pipelinor® LH-D90

(AWS E9045-P2 H4R)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
<b>Requirements</b> AWS E9045-P2 H4R	530 (77) min.	620 (90) min.	17 min.	27 (20) min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	550 - 600 (80 - 87)	625 - 670 (91 - 97)	26 - 31	75 - 125 (55 - 92)	50 - 95 (37 - 70)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E9045-P2 H4R	0.12 max.	0.90 - 1.70	0.80 max.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.04 - 0.06	1.15 - 1.35	0.35 - 0.55	≤ 0.01	≤ 0.01
	%Ni	%Cr	%Mo	%V	Diffusible Hydrogen (mL/100g weld deposit)
<b>Requirements</b> AWS E9045-P2 H4R	1.00 max.	0.20 max.	0.50 max.	0.05 max.	4.0 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.25 - 0.30 <sup>(4)</sup> 0.80 - 1.00 <sup>(5)</sup>	≤ 0.05	0.15 - 0.25	≤ 0.01	2 - 4

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. <sup>(4)</sup>Range for 3.2 mm (1/8 in) size only. <sup>(5)</sup>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.

## 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

# Pipeliners<sup>®</sup> 19P

Low Alloy, Low Hydrogen, Pipe  
AWS E10018-G H4R

## Key Features

- ▶ Low hydrogen, vertical up capability on X80 grade pipe
- ▶ Charpy V-Notch impact toughness tested to -46°C (-50°F)
- ▶ Q2 Lot<sup>®</sup> - Certificate showing actual deposit chemistry available online

## Typical Applications

- ▶ Fill and cap pass welding of up to X80 grade pipe

## Welding Positions

All, except vertical down

## Conformances

AWS A5.5/A5.5M: 2006	E10018-G H4R
ASME SFA-A5.5:	E10018-G H4R

## DIAMETERS / PACKAGING

Diameter mm (in)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton
3.2 (1/8)	14 (350)	ED032622
4.0 (5/32)	14 (350)	ED032623

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# Pipeliners<sup>®</sup> 19P

(AWS E10018-G H4R)

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
<b>Requirements</b> AWS E10018-G H4R	600 (87) min.	690 (100) min.	15 min.	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	660 - 740 (96 - 107)	740 - 825 (107 - 120)	20 - 26	91 - 129 (69 - 95)	81 - 111 (60 - 82)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006

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

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. <sup>(4)</sup>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.

## 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

Preferred polarity is listed first.

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MIG & TIG

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# Pipeliners® LH-D100

Low Alloy, Low Hydrogen, Pipe  
AWS E10045-P2 H4R

## Key Features

- ▶ Low hydrogen, vertical down capability on up to X90 pipe
- ▶ High productivity
- ▶ Q2 Lot® - Certificate showing actual deposit chemistry available online
- ▶ Touch start tapered tip
- ▶ Meets H4R diffusible hydrogen level and moisture resistance

## Typical Applications

- ▶ Fill and cap pass welding of up to X90 grade pipe
- ▶ Pipe repair
- ▶ Hot tapping

## Welding Positions

Vertical Down

## Conformances

AWS A5.5/A5.5M: 2006	E10045-P2 H4R
ASME SFA-A5.5:	E10045-P2 H4R
CWB/GSA W48-06:	E10045-P2 H4R

## Notes

- ▶ This product contains micro-alloying elements. Additional information available upon request.

## DIAMETERS / PACKAGING

Diameter mm (in)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Carton
3.2 (1/8)	14 (350)	ED032632
4.0 (5/32)	14 (350)	ED032633
4.5 (11/64)	14 (350)	ED032634

INTRODUCTION

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METAL-CORED

**Pipeliners® LH-D100**

(AWS E10045-P2 H4R)

**MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	
				@ -29°C (-20°F)	@ -46°C (-50°F)
<b>Requirements</b> AWS E10045-P2 H4R	600 (87) min.	690 (100) min.	16 min.	27 (20) min.	Not Specified
<b>Typical Performance<sup>(3)</sup></b> As-Welded	620 - 690 (90 - 100)	705 - 750 (102 - 109)	21 - 28	75 - 110 (55 - 81)	56 - 85 (41 - 63)

**DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.5/A5.5M: 2006**

	%C	%Mn	%Si	%P	%S
<b>Requirements</b> AWS E10045-P2 H4R	0.12 max.	0.90 - 1.70	0.80 max.	0.03 max.	0.03 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.04 - 0.06	1.25 - 1.65	0.35 - 0.55	≤ 0.01	≤ 0.01
	%Ni	%Cr	%Mo	%V	Diffusible Hydrogen (mL/100g weld deposit)
<b>Requirements</b> AWS E10045-P2 H4R	1.00 max.	0.20 max.	0.50 max.	0.05 max.	4.0 max.
<b>Typical Performance<sup>(3)</sup></b> As-Welded	0.70 - 1.00	≤ 0.08	0.40 - 0.50	≤ 0.01	2 - 4

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 9. NOTE: This product contains micro-alloying elements. Additional information available on request.**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