

# Chromet® 1X

AWS E8018-B2

**Chromet® 1X** is a SMAW electrode (1.25%Cr/0.50%Mo deposit) which meets specific requirements for improved temperature embrittlement resistance with prolonged service at 400-600°C (752-1112°F). Relevant trace elements (P, Sn, As, Sb) are controlled to ensure low Bruscato (X) and Watanabe (J) factors.

## KEY FEATURES

- ▶ X-Factor < 15 ppm
- ▶ J-Factor < 180 ppm

## CONFORMANCES

<b>AWS A5.5</b>	E8018-B2 H4
<b>BS EN ISO 3580-A</b>	E CrMo1 B
<b>BS EN ISO 3580-B</b>	E 5516-1CM
<b>BS 2493</b>	1CrMo B H
<b>DIN 8575</b>	ECrMo 1 B 2 6

## APPLICATIONS

- ▶ Designed for prolonged elevated temperatures up to 550°C (1022°F).
- ▶ Refineries where corrosion resistance to sulphur bearing crude oil is at 250-450°C (482-842°F).
- ▶ Petro-Chemical
- ▶ Power Plants
- ▶ Piping
- ▶ Turbine Casting
- ▶ Steam Chests
- ▶ Valve Bodies
- ▶ Boiler Superheaters

## WELDING POSITIONS

All

## DIAMETERS / PACKAGING

Diameter mm (in)	4.2 kg (9.3 lb) Easy Open Can	5.0 kg (11 lb) Easy Open Can	5.6 kg (12.3 lb) Easy Open Can
2.5 (3/32)	ED033570		
3.2 (1/8)		ED033563	
4.0 (5/32)			ED033564
5.0 (3/16)			ED033571

**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)		Hardness HV <sub>10</sub> <sup>(4)</sup> @ PWHT
			4.0 dia.	5.0 dia.	@ 20°C (68°F)	@ -30°C (-22°F)	
<b>Requirements</b> AWS E8018-B2	460	550 (80) min.	19	20	47	–	–
<b>Typical Performance</b> As-Welded 1 hr @ 690°C (1274°F)	525	610	25	21	160	100	300
Stress-Relieved 5 hr @ 690°C (1274°F)	515	610	29	25	200	160	220
5 hr @ 690°C (1274°F) + SC <sup>(7)</sup>	490	595	29	25	200	140	190

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

	%C	%Mn <sup>(5)</sup>	%Si <sup>(5)</sup>	%S	%P	%Cr
<b>Requirements</b> AWS E8018-B2	0.05 - 0.1	0.5 - 0.9	0.15 - 0.3	0.015 max.	0.012 max.	1.00 - 1.40
<b>Typical Results</b>	0.06	0.70	0.25	0.012	0.009	1.25
	%Mo	%Cu	%Sn	%As	%Sb	X-Factor <sup>(6)</sup>
<b>Requirements</b> AWS E8018-B2	0.45 - 0.65	0.15 max.	0.005 max.	0.01 max.	0.005 max.	15 max.
<b>Typical Results</b>	0.55	<0.05	0.002	0.003	<0.002	–

**TYPICAL OPERATING PROCEDURES**

Polarity	Amperage mm (in)			
	2.5 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
DC+ or AC	70 - 110	80 - 140	100 - 180	140 - 240

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <sup>(4)</sup>Industry specific data, not required by AWS. <sup>(5)</sup>Mn+Si < 1.10%. <sup>(6)</sup>X = (10P + 5Sb + 4 Sn + As) / 100 (elements in ppm). <sup>(7)</sup>SC = Step Cooling  
**NOTE:** Additional test data available upon request.

Material Safety Data Sheets (MSDS) are available upon request.

**TEST RESULTS**

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

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# Excalibur® 10018-D2 MR®

Low Alloy, Low Hydrogen • AWS E10018-D2 H4R

## Key Features

- ▶ Capable of exceeding 550 MPa (80 ksi) yield strength after 12 hours at 635°C (1175°F) on 4130 AISI steel
- ▶ Premium arc performance
- ▶ Q2 Lot® - Certificate showing actual deposit chemistry available online
- ▶ Easy strike and re-strike
- ▶ Effortless slag removal

## Welding Positions

All, except vertical down

## 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

## 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	ED033163 ED033164
1/8 (3.2)	14 (350)		
5/32 (4.0)	14 (350)		

## 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 Results<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 Results<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>

	%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 Results<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 Results<sup>(3)</sup></b>	≤0.01	0.68-0.77	0.34-0.39	2-3

## 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

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 16. <sup>(4)</sup>Industry specific data, not required by AWS. <sup>(5)</sup>Preferred polarity is listed first.  
NOTE: Additional test data available upon request.

# Chromet® 2X

AWS E9018-B3

**Chromet® 2X** is a SMAW electrode (2.25%Cr/1%Mo deposit) which meets specific requirements for improved high temperature embrittlement resistance with prolonged service at 400-600°C (752-1112°F). Relevant trace elements (P, Sn, As, Sb) are controlled to ensure low Bruscato (X) and Watanabe (J) factors.

## KEY FEATURES

- ▶ X-Factor < 15 ppm
- ▶ J-Factor < 180 ppm

## CONFORMANCES

<b>AWS A5.5</b>	E9018-B3
<b>BS EN ISO 3580-A</b>	E CrMo1 B 3 2
<b>BS EN ISO 3580-B</b>	E 6216-2C1M
<b>BS 2493</b>	2CrMo B H
<b>DIN 8575</b>	ECrMo 2 B 2 6

## APPLICATIONS

- ▶ Designed for prolonged elevated temperatures up to 600°C (1112°F).
- ▶ Refineries where corrosion resistance to sulphur bearing crude oil is at 250-450°C (482-842°F) .
- ▶ Petro-Chemical
- ▶ Power Plants
- ▶ Piping
- ▶ Turbine Casting
- ▶ Steam Chests
- ▶ Valve Bodies
- ▶ Boiler Superheaters

## WELDING POSITIONS

All

## DIAMETERS / PACKAGING

Diameter mm (in)	4.1 kg (9 lb) Easy Open Can	4.6 kg (10 lb) Easy Open Can	5.7 kg (13 lb) Easy Open Can
2.5 (3/32)	ED033572		
3.2 (1/8)		ED033573	
4.0 (5/32)			ED033574
5.0 (3/16)			ED033575

**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)		Hardness HV10 <sup>(4)</sup> AW PWHT
			4.0 dia.	5.0 dia.	@ 20°C (68°F)	@ -30°C (-22°F)	
<b>Requirements</b> AWS E9018-B3	540 min.	630 min.	17 min.	18 min.	47 <sup>(2)</sup> min.	–	–
<b>Typical Performance</b> As-Welded 1 hr @ 690°C (1274°F)	570	670	22	19	140	80	220 - 250
Stress-Relieved 5 hr @ 690°C (1274°F)	560	660	27	24	170	140	195
5 hr @ 690°C (1274°F) + SC <sup>(7)</sup>	550	650	25	20	170	110	205

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

	%C	%Mn <sup>(5)</sup>	%Si <sup>(5)</sup>	%S	%P	%Cr
<b>Requirements</b> AWS E9018-B3	0.05 - 0.10	0.50 - 0.90	0.15 - 0.3	0.015 max.	0.012 max.	2.00 - 2.50
<b>Typical Results</b>	0.06	0.70	0.25	0.012	0.01	2.25
	%Mo	%Cu	%Sn	%As	%Sb	X-Factor <sup>(6)</sup>
<b>Requirements</b> AWS E9018-B3	0.90 - 1.20	0.15 max.	0.005 max.	0.010 max.	0.005 max.	15 max.
<b>Typical Results</b>	1.05	<0.05	0.002	0.003	<0.002	–

**TYPICAL OPERATING PROCEDURES**

Polarity	Amperage mm (in)			
	2.5 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
DC+ or AC	70 - 110	80 - 140	100 - 180	140 - 240

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <sup>(4)</sup>Industry specific data, not required by AWS. <sup>(5)</sup>Mn+Si < 1.10%. <sup>(6)</sup>X = (10P + 5Sb + 4 Sn + As) / 100 (elements in ppm). <sup>(7)</sup>SC = Step Cooling  
**NOTE:** Additional test data available upon request.

Material Safety Data Sheets (MSDS) are available upon request.

**TEST RESULTS**

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

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# Chromet® 9-B9

AWS E9015-B9

**Chromet® 9-B9** is a SMAW electrode with basic metal powder type made on high purity steel core wire manufactured to the requirements of AWS A5.5 E9015-B9 and BS EN ISO 3580-B. This electrode is designed to weld equivalents / 'Type 91' 9Cr Mo steels modified with small additions of Niobium, Vanadium and Nitrogen for improved long term creep properties.

## KEY FEATURES

- ▶ Improved long term creep properties
- ▶ Can weld equivalent (P91) 9CrMo steels

## CONFORMANCES

<b>AWS A5.5</b>	E9015-B9
<b>BS EN ISO 3580-B</b>	E 6216-9C1MV

## APPLICATIONS

- ▶ Intended for high integrity structural service at elevated temperature
- ▶ Main Steam Piping
- ▶ Power Plants
- ▶ Oil Refineries
- ▶ Coal Liquefaction Plants
- ▶ Gasification Plants

## WELDING POSITIONS

All

## DIAMETERS / PACKAGING

Diameter mm (in)	4.5 kg (10 lb) Easy Open Can	5 kg (11 lb) Easy Open Can	5.5 kg (12 lb) Easy Open Can
2.5 (3/32)	ED033379		
3.2 (1/8)		ED033380	
4.0 (5/32)		ED033381	
5.0 (3/16)			ED033382

**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) @ 20°C (68°F)	Hardness HV10 <sup>(4)</sup> @ PWHT
			4.0 dia.	5.0 dia.		
<b>Requirements</b> AWS E9015-B9	530 (77) min.	620 (90) min.	17 min.	15 min.	–	–
<b>Typical Results<sup>(3)</sup></b> As-Welded 2 hr @ 760°C (1400°F)	590 (86)	710 (103)	22.5	19	75 (55)	450
Stress-Relieved 550°C (1022°F)	>360 (52)	>450 (65)	–	>15	–	–
600°C (1112°F)	>255 (37)	>375 (54)	–	>17	–	–
650°C (1202°F)	>175 (25)	>285 (41)	–	>21	–	–

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

	%C	%Mn <sup>(5)</sup>	%Si <sup>(5)</sup>	%S	%P	%Cr
<b>Requirements</b> AWS E9015-B9	0.08 - 0.12	0.40 - 0.75	0.30 max.	0.01 max.	0.01 max.	8.0 - 10.0
<b>Typical Results<sup>(3)</sup></b>	0.10	0.55	0.25	0.008	0.008	9.0
	%Ni <sup>(5)</sup>	%Mo	%Nb	%V	%Cu	%Al
<b>Requirements</b> AWS E9015-B9	0.2 - 0.4	0.85 - 1.2	0.03 - 0.07	0.15 - 0.25	0.25 max.	0.04 max.
<b>Typical Results<sup>(3)</sup></b>	0.3	1.0	0.04	0.20	0.05	<0.01

**TYPICAL OPERATING PROCEDURES**

Polarity	Amperage mm (in)			
	2.5 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (0.19)
DC+ or AC	70 - 110	80 - 140	100 - 180	140 - 240

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <sup>(4)</sup>Industry specific data, not required by AWS.

<sup>(5)</sup>Ni + Mn < 1.0%. Nickel is below 0.4% (as parent metal) although AWS allows up to 1.0%Ni. See Chromet 9MV-N or Chromet 9MVN+ for variant with 0.4 - 1.0%Ni conforming to BS EN ISO specification.

**NOTE:** Additional test data available upon request.

*Material Safety Data Sheets (MSDS) are available upon request.*

**TEST RESULTS**

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# Pipelin<sup>®</sup> 18P

Low Alloy, Low Hydrogen, Pipe • AWS E8018-G H4

## Key Features

- ▶ Low hydrogen, vertical up capability on X70 grade pipe
- ▶ Charpy V-Notch impact toughness tested to -46°C (-50°F)
- ▶ Q2 Lot<sup>®</sup> - Certificate showing actual deposit chemistry available online

## Conformances

AWS A5.5/A5.5M: 2006	E8018-G H4
ASME SFA-A5.5:	E8018-G H4
ABS:	E8018-G

## Welding Positions

All, except vertical down

## Typical Applications

- ▶ Fill and cap pass welding of up to X70 grade pipe

## DIAMETERS / PACKAGING

Diameter mm (in)	Length in (mm)	10 lb (4.5 kg) Easy Open Can	30 lb (13.6 kg) Master Carton
3.2 (1/8)	14 (350)		ED032620
4.0 (5/32)	14 (350)		ED032621

## MECHANICAL PROPERTIES<sup>(1)</sup>

	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)
Requirements - AWS E8018-G H4	460 (67) min.	550 (80) min.	19 min.	Not Specified	Not Specified
Typical Results <sup>(3)</sup> - As-Welded	515-655 (75-95)	620-710 (90-103)	24-32	96-167 (71-123)	50-121 (37-89)

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

	%C	%Mn	%Si	%P	%S	%Ni <sup>(4)</sup>
Requirements - AWS E8018-G H4	Not Specified	1.00 min.	0.80 min.	0.03 max.	0.03 max.	0.50 min.
Typical Results <sup>(3)</sup>	0.04-0.06	1.28-1.42	0.44-0.58	0.01-0.02	≤ 0.01	0.76-0.85
	%Cr <sup>(4)</sup>	%Mo <sup>(4)</sup>	%V <sup>(4)</sup>	%Cu <sup>(4)</sup>	Diffusible Hydrogen (mL/100g weld deposit)	
Requirements - AWS E8018-G H4	0.30 min.	0.20 min.	0.10 min.	0.20 min.	4.0 max.	
Typical Results <sup>(3)</sup>	0.04-0.06	0.17-0.39	< 0.01	< 0.02	1-4	

## TYPICAL OPERATING PROCEDURES

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

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <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. <sup>(5)</sup>Preferred polarity is listed first.



# 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)

## Typical Applications

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

## 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

## Welding Positions

All, except vertical down

## DIAMETERS / PACKAGING

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

## 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 Results<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
<b>Requirements</b> - AWS E7018-A1 H4R	0.12 max.	0.90 max.	0.80 max.	0.03 max.
<b>Typical Results<sup>(3)</sup></b>	0.04-0.06	0.55-0.80	0.35-0.55	≤ 0.01
	%S	%Mo	Diffusible Hydrogen (mL/100g weld metal)	
<b>Requirements</b> - AWS E7018-A1 H4R	0.03 max.	0.40-0.65	4.0 max.	
<b>Typical Results<sup>(3)</sup></b>	≤ 0.01	0.45-0.65	2-4	

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(5)</sup>	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

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <sup>(4)</sup>Industry Specific Data (Not AWS Requirement). <sup>(5)</sup>Preferred polarity is listed first.

# Excalibur<sup>®</sup> 8018-B2 MR<sup>®</sup>

AWS E8018-B2 H4R • Low Alloy, Low Hydrogen

## Typical Applications

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

## Conformances

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

## Welding Positions

All, except vertical down

## 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)

## DIAMETERS / PACKAGING

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

## 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)
Requirements - AWS E8018-B2 H4R	460 (67) min.	550 (80) min.	19 min.	Not Specified
Typical Results <sup>(3)</sup> - 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
Requirements - AWS E8018-B2 H4R	0.05-0.12	0.90 max.	0.80 max.	0.03 max.
Typical Results <sup>(3)</sup>	0.08-0.11	0.65-0.80	0.35-0.55	≤ 0.02
	%S	%Cr	%Mo	Diffusible Hydrogen (mL/100g weld metal)
Requirements - AWS E8018-B2 H4R	0.03 max.	1.00-1.50	0.40-0.65	4.0 max.
Typical Results <sup>(3)</sup>	≤ 0.01	1.05-1.30	0.40-0.60	2-4

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(5)</sup>	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

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <sup>(4)</sup>Industry Specific Data (Not AWS Requirement). <sup>(5)</sup>Preferred polarity is listed first.

# Excalibur® 11018M MR®

AWS E11018M H4R • Low Alloy, Low Hydrogen

## Typical Applications

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

## 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

## 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

## Welding Positions

All, except vertical down

## DIAMETERS / PACKAGING

Diameter in (mm)	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
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

## 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)
Requirements - AWS E11018M H4R	680-760 (98-110)	760 (110) min.	20 min.	27 (20) min.
Typical Results <sup>(3)</sup> - 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
Requirements - AWS E11018M H4R	0.10 max.	1.30-1.80	0.60 max.	0.03 max.	0.03 max.
Typical Results <sup>(3)</sup>	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)	
Requirements - AWS E11018M H4R	1.25-2.50	0.40 max.	0.25-0.50	4.0 max.	
Typical Results <sup>(3)</sup>	2.0-2.5	0.02-0.20	0.40-0.50	1-4	

## 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

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer on pg. 16.

# 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

## Conformances

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

## Welding Positions

All, except vertical down

## 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
1/4 (6.4)	18 (450)	ED030880

## MECHANICAL PROPERTIES<sup>(1)</sup>

	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 Results<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 Results<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 Results<sup>(3)</sup></b> - As-Welded	≤ 0.01	2.00-2.58	1-3	

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(5)</sup>	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	325-430

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <sup>(4)</sup>Industry Specific Data (Not AWS Requirement). <sup>(5)</sup>Preferred polarity is listed first.

# Excalibur® 9018-B3 MR®

AWS E9018-B3 H4R • Low Alloy, Low Hydrogen

## Typical Applications

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

## Conformances

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

## Welding Positions

All, except vertical down

## 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)

## DIAMETERS / PACKAGING

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

## 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)
Requirements - AWS E9018-B3 H4R	530 (77) min.	620 (90) min.	17 min.	Not Specified
Typical Results <sup>(3)</sup> - 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
Requirements - AWS E9018-B3 H4R	0.05-0.12	0.90 max.	0.80 max.	0.03 max.
Typical Results <sup>(3)</sup>	0.07-0.08	0.65-0.79	0.39-0.49	≤0.01
	%S	%Cr	%Mo	Diffusible Hydrogen (mL/100g weld metal)
Requirements - AWS E9018-B3 H4R	0.03 max.	2.00-2.50	0.90-1.20	4.0 max.
Typical Results <sup>(3)</sup>	≤0.01	2.21-2.46	1.03-1.13	2-4

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(5)</sup>	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

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <sup>(4)</sup>Industry Specific Data (Not AWS Requirement). <sup>(5)</sup>Preferred polarity is listed first.

# Excalibur® 8018-C3 MR®

AWS E8018-C3 H4R • Low Alloy, Low Hydrogen

## Typical Applications

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

## 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
EN ISO 2560-B:	E5518-N2 A U H5

## Key Features

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

## Welding Positions

All, except vertical down

## DIAMETERS / PACKAGING

Diameter in (mm)	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
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

## 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)
Requirements - AWS E8018-C3 H4R	470-550 (68-80)	550 (80) min.	24 min.	27 (20) min.
Typical Results <sup>(3)</sup> - 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
Requirements - AWS E8018-C3 H4R	0.12 max.	0.40-1.25	0.80 max.	0.03 max.	0.03 max.
Typical Results <sup>(3)</sup>	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)
Requirements - AWS E8018-C3 H4R	0.80-1.10	0.15 max.	0.35 max.	0.05 max.	4.0 max.
Typical Results <sup>(3)</sup>	0.81-1.09	0.04-0.06	0.07-0.27	≤ 0.01	1-2

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(4)</sup>	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	325-425

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <sup>(4)</sup>Preferred polarity is listed first.

# 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

## Conformances

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

## Welding Positions

Vertical Down

## DIAMETERS / PACKAGING

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

## 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 Results</b> <sup>(3)</sup> - 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 Results</b> <sup>(3)</sup> - 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 Results</b> <sup>(3)</sup> - As-Welded	0.70-1.00	≤ 0.08	0.40-0.50	≤ 0.01	2-4

## 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

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

# Pipelin<sup>®</sup> 19P

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

## Typical Applications

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

## Conformances

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

## Welding Positions

All, except vertical down

## 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

## DIAMETERS / PACKAGING

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

## 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)
Requirements - AWS E10018-G H4R	600 (87) min.	690 (100) min.	15 min.	Not Specified	Not Specified
Typical Results <sup>(3)</sup> - 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>
Requirements - AWS E10018-G H4R	Not Specified	1.00 min.	0.80 min.	0.03 max.	0.03 max.	0.50 min.
Typical Results <sup>(3)</sup> - 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)	
Requirements - AWS E10018-G H4R	0.30 min.	0.20 min.	0.10 min.	0.20 min.	4.0 max.	
Typical Results <sup>(3)</sup> - As-Welded	0.02-0.07	0.37-0.47	0.01-0.02	0.01-0.07	2-3	

## TYPICAL OPERATING PROCEDURES

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

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer below. <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.  
<sup>(5)</sup>Preferred polarity is listed first.



# Pipeliner<sup>®</sup> LH-D80

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

## Typical Applications

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

## Conformances

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

## Welding Positions

Vertical Down

## Key Features

- ▶ Low hydrogen, vertical down capability on up to X70 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

## DIAMETERS / PACKAGING

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

## 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)
Requirements - AWS E8045-P2 H4R	460 (67) min.	550 (80) min.	19 min.	27 (20) min.	Not Specified
Typical Results <sup>(3)</sup> - 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
Requirements - AWS E8045-P2 H4R	0.12 max.	0.90-1.70	0.80 max.	0.03 max.	0.03 max.
Typical Results <sup>(3)</sup> - 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)
Requirements - AWS E8045-P2 H4R	1.00 max.	0.20 max.	0.50 max.	0.05 max.	4.0 max.
Typical Results <sup>(3)</sup> - As-Welded	≤ 0.04	≤ 0.05	≤ 0.02	≤ 0.01	2-4

## 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

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

# Pipelin<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

## Conformances

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

## Welding Positions

Vertical Down

## DIAMETERS / PACKAGING

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

## 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)
Requirements - AWS E9045-P2 H4R	530 (77) min.	620 (90) min.	17 min.	27 (20) min.	Not Specified
Typical Results <sup>(3)</sup> - 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
Requirements - AWS E9045-P2 H4R	0.12 max.	0.90-1.70	0.80 max.	0.03 max.	0.03 max.
Typical Results <sup>(3)</sup> - 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)
Requirements - AWS E9045-P2 H4R	1.00 max.	0.20 max.	0.50 max.	0.05 max.	4.0 max.
Typical Results <sup>(3)</sup> - 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

## 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

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