

# EXCALIBUR® 308/308L-15

Stainless ▪ AWS E308-15, E308L-15

## KEY FEATURES

- Versatile electrode designed to weld several types of austenitic steels
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online
- Designed with low carbon levels to help eliminate carbide precipitation in high temperature service
- Excellent for all welding positions, including vertical down on pipe

## WELDING POSITIONS

All

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E308-15, E308L-15
<b>ASME SFA-A5.4:</b>	E308-15, E308L-15
<b>ABS:</b>	E308-15, E308L-15

## TYPICAL APPLICATIONS

- 304 and 304L stainless steels
- Common austenitic stainless steels referred to as "18-8" steels

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033087
1/8 (3.2)	12 (300)	ED033088

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b> AWS E308-15 AWS E308L-15	Not Specified Not Specified	550 (80) min 520 (75) min	35 min 35 min	Not Specified Not Specified
<b>Typical Results<sup>(3)</sup> - As-Welded</b>	455 (66)	625 (91)	44	8 -10

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	%C <sup>(4)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements - AWS E308L-15</b>	0.04 max	18.0-21.0	9.0-11.0	0.75 max	0.5-2.5
<b>Typical Results<sup>(3)</sup></b>	≤0.03	≤19.9	9.9-10.2	0.05-0.09	0.7-0.8
	%Si	%P	%S	%Cu	
<b>Requirements - AWS E308L-15</b>	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.69-0.73	≤0.02	≤0.01	≤0.08	

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)	
	3/32 in (2.4 mm)	1/8 in (3.2 mm)
DC+	60-70	90-100

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer <sup>(4)</sup>AWS Requirement for E308-15 is 0.08% max. carbon.

<p>IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED</p> <p>Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.</p> <p>BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.</p>
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# EXCALIBUR® 308L-16

Stainless ▪ AWS E308L-16

## KEY FEATURES

- Flux coating provides smooth arc transfer in all welding positions, except vertical down
- Versatile electrode designed to weld several types of austenitic stainless steels
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E308L-16
<b>ASME SFA-A5.4:</b>	E308L-16
<b>ABS:</b>	E308L-16
<b>CWB/CSA W48-06:</b>	E308L-16
<b>MIL-E-22200/2:</b>	MIL-308L-16

## TYPICAL APPLICATIONS

- Type 302, 304 and 304L stainless steels
- A743 and A744 Type CF-8 cast material

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can	10 lb (4.5 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033079	
1/8 (3.2)	14 (350)		ED033080
5/32 (4.0)	14 (350)		ED033081
3/16 (4.8)	14 (350)		ED033082

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b> - AWS E308L-16	Not Specified	520 (75) min	35 min	Not Specified
<b>Typical Results<sup>(3)</sup></b> - As-Welded	370-420 (54-61)	540-595 (78-86)	50-55	8-9

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	%C	%Cr	%Ni	%Mo	%Mn
<b>Requirements</b> - AWS E308L-16	0.04 max	18.0-21.0	9.0-11.0	0.75 max.	0.5-2.5
<b>Typical Results<sup>(3)</sup></b>	0.02-0.03	19.5-19.8	9.7-10.3	0.04-0.13	0.6-0.9
	%Si	%P	%S	%Cu	
<b>Requirements</b> - AWS E308L-16	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.29-0.36	≤0.03	≤0.02	≤0.10	

## 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)
DC+	40-70	60-100	90-140	120-185
AC	40-70	60-100	90-140	120-185

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 308/308H-16

Stainless ▪ AWS E308-16, E308H-16

## KEY FEATURES

- Flux coating provides smooth transfer for all position except vertical down
- Higher carbon content improves strength in higher temperature applications
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E308-16, E308H-16
<b>ASME SFA-A5.4:</b>	E308-16, E308H-16
<b>ABS:</b>	E308-16, E308H-16
<b>CWB/CSA W48-06:</b>	E308-16, E308H-16
<b>MIL-E-22200/2:</b>	MIL-308-16

## TYPICAL APPLICATIONS

- 304 and 304H stainless steels
- ASTM A743 or A744 Types CF-8 and CF-10
- Common austenitic stainless steels referred to as "18-8" steels

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can	10 lb (4.5 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033083	
1/8 (3.2)	14 (350)		
5/32 (4.0)	14 (350)		ED033084
3/16 (4.8)	14 (350)		ED033085 ED033086

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b> AWS E308-16 AWS E308H-16	Not Specified Not Specified	550 (80) min 550 (80) min	35 min 35 min	Not Specified Not Specified
<b>TTypical Results<sup>(3)</sup> - As-Welded</b>	435-545 (63-79)	595-640 (86-93)	41-48	4-6

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	%C <sup>(4)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements - AWS E308H-16</b>	0.04 - 0.08 <sup>(4)</sup>	18.0 - 21.0	9.0 - 11.0	0.75 max.	0.5 - 2.5
<b>Typical Results<sup>(3)</sup></b>	0.05 - 0.06	19.7 - 20.3	9.9 - 10.1	0.03 - 0.07	0.7 - 0.8
	%Si	%P	%S	%Cu	
<b>Requirements - AWS E308H-16</b>	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.30 - 0.40	≤0.03	≤0.02	≤0.17	

## 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)
DC+	40 - 70	60 - 100	90 - 140	120 - 185
AC	40 - 70	60 - 100	90 - 140	120 - 185

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer <sup>(4)</sup>AWS Requirement for E308-16 is 0.08% max carbon. <sup>(5)</sup>Preferred polarity is listed first.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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# EXCALIBUR® 308/308L-17

Stainless ▪ AWS E308-17, E308L-17

## KEY FEATURES

- Flux coating provides smooth arc transfer in all positions except vertical down on sizes 5/32" and smaller
- Versatile electrode designed to weld several types of austenitic stainless steels
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online
- Designed with low carbon levels to help eliminate carbide precipitation in high temperature service

## WELDING POSITIONS

- 3/16 in (4.8 mm) diameter Flat and Horizontal only
- Diameters up to and including 5/32 in (4.0mm) are designed for all position welding except vertical down

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	1 lb (0.5 kg) Plastic Tube 6 lb (2.7 kg) Master Carton	8 lb (3.6 kg) Easy Open Can	10 lb (4.5 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033093	ED033089	ED033090
1/8 (3.2)	14 (350)			
5/32 (4.0)	14 (350)			
3/16 (4.8)	14 (350)			

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b> AWS E308-17 AWS E308L-17	Not Specified Not Specified	550 (80) min 520 (75) min	35 min 35 min	Not Specified Not Specified
<b>Typical Results<sup>(3)</sup> - As-Welded</b>	425 - 470 (62 - 68)	585 - 635 (85 - 92)	42 - 50	6 - 11

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	%C <sup>(4)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements - AWS E308L-17</b>	0.04 max	18.0 - 21.0	9.0 - 11.0	0.75 max.	0.5 - 2.5
<b>Typical Results<sup>(3)</sup></b>	≤0.03	20.0 - 20.5	9.7 - 9.9	≤0.20	0.6 - 0.7
	%Si	%P	%S	%Cu	
<b>Requirements - AWS E308L-17</b>	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.56 - 0.77	≤0.03	≤0.02	≤0.22	

## 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)
DC+	40 - 80	75 - 110	95 - 150	130 - 200
AC	40 - 80	75 - 110	95 - 150	130 - 200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer <sup>(4)</sup>AWS Requirement for E308-17 is 0.08% max. carbon. <sup>(5)</sup>Preferred polarity is listed first.

<p>IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED</p> <p>Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.</p> <p>BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.</p>
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# EXCALIBUR® 309/309L-15

Stainless ▪ AWS E309-15, E309L-15

## KEY FEATURES

- Fast freezing coating is great for vertical down welding
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online
- Designed with low carbon levels to help eliminate carbide precipitation

## WELDING POSITIONS

All

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E309-15, E309L-15
<b>ASME SFA-A5.4:</b>	E309-15, E309L-15
<b>ABS:</b>	E309-15, E309L-15

## TYPICAL APPLICATIONS

- Dissimilar joints between stainless steels

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033098
1/8 (3.2)	12 (300)	ED033099

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b> AWS E309-15 AWS E309L-15	Not Specified Not Specified	550 (80) min 520 (75) min	30 min 30 min	Not Specified Not Specified
<b>Typical Results<sup>(3)</sup> - As-Welded</b>	490 (71)	640 (93)	38	6-8

## DEPOSIT COMPOSITION<sup>(1)</sup> - As Required per AWS A5.4/A5.4M

	%C <sup>(4)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements - AWS E309L-15</b>	0.04 max	22.0-25.0	12.0-14.0	0.75 max.	0.5-2.5
<b>Typical Results<sup>(3)</sup></b>	≤0.03	23.6-23.9	13.6-13.8	0.03-0.05	0.7-1.0
	%Si	%P	%S	%Cu	
<b>Requirements - AWS E309L-15</b>	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.74-0.82	≤0.02	≤0.01	≤0.06	

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(5)</sup>	Current (Amps)	
	3/32 in (2.4 mm)	1/8 in (3.2 mm)
DC+	60-70	90-100

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer <sup>(4)</sup>AWS Requirement for E309-15 is 0.15% max. carbon. <sup>(5)</sup>Preferred polarity is listed first.

<p>IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED</p> <p>Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.</p> <p>BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.</p>
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# EXCALIBUR® 309/309L-16

Stainless ▪ AWS E309-16, E309L-16

## KEY FEATURES

- Flux coating provides smooth arc transfer in all welding positions, except vertical down
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E309-16, E309L-16
<b>ASME SFA-A5.4:</b>	E309-16, E309L-16
<b>ABS:</b>	E309-16, E309L-16
<b>CWB/CSA W48-06:</b>	E309-16, E309L-16
<b>MIL-E-22200/2:</b>	MIL-309-16, MIL-309L-16

## TYPICAL APPLICATIONS

- Designed for joining stainless steel to mild or low alloy steel
- Industrial & General Fabrication

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can	10 lb (4.5 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033097	
1/8 (3.2)	14 (350)		
5/32 (4.0)	14 (350)		ED033094
3/16 (4.8)	14 (350)		ED033095 ED033096

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b> AWS E309-16 AWS E309L-16	Not Specified Not Specified	550 (80) min 520 (75) min	30 min 30 min	Not Specified Not Specified
<b>Typical Results<sup>(3)</sup></b> - As-Welded	455-470 (66-68)	580-585 (84-85)	38-47	10-18

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	%C <sup>(4)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements</b> - AWS E309L-16	0.04 max	22.0-25.0	12.0-14.0	0.75 max	0.5-2.5
<b>Typical Results<sup>(3)</sup></b>	0.02-0.04	23.9-24.5	12.6-13.2	0.05-0.09	1.0-1.5
	%Si	%P	%S	%Cu	
<b>Requirements</b> - AWS E309L-16	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.33-0.38	≤0.03	≤0.02	≤0.09	

## 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)
DC+	40-70	60-100	90-140	120-185
AC	40-70	60-100	90-140	120-185

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer <sup>(4)</sup>AWS Requirement for E309-16 is 0.15% max. carbon. <sup>(5)</sup>Preferred polarity is listed first.

<p>IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED</p> <p>Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.</p> <p>BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.</p>
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# EXCALIBUR® 309/309L-17

Stainless ▪ AWS E309-17, E309L-17

## KEY FEATURES

- Flux coating provides for smooth arc transfer in the flat and horizontal positions
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online
- Designed with low carbon levels to help eliminate carbide precipitation

## WELDING POSITIONS

- 5/32 in (4.0 mm) and smaller diameter all except Vertical Down
- 3/16 in (4.8 mm) diameter Flat and Horizontal only

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E309-17, E309L-17
<b>ASME SFA-A5.4:</b>	E309-17, E309L-17
<b>ABS:</b>	E309-17, E309L-17
<b>CWB/CSA W48-06:</b>	E309-17, E309L-17

## TYPICAL APPLICATIONS

- Designed for joining stainless steel to mild or low alloy steel
- Industrial & General Fabrication

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can	10 lb (4.5 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033100	
1/8 (3.2)	14 (350)		ED033101
5/32 (4.0)	14 (350)		ED033102
3/16 (4.8)	14 (350)		ED033103

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b> AWS E309-17 AWS E309L-17	Not Specified Not Specified	550 (80) min 520 (75) min	30 min 30 min	Not Specified Not Specified
<b>Typical Results<sup>(3)</sup> - As-Welded</b>	455-490 (66-71)	585-620 (85-90)	37-45	7-11

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	%C <sup>(4)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements - AWS E309L-17</b>	0.04 max	22.0-25.0	12.0-14.0	0.75 max.	0.5-2.5
<b>Typical Results<sup>(3)</sup></b>	0.02-0.04	23.5-24.0	13.0-13.5	0.05-0.09	0.7-0.9
	%Si	%P	%S	%Cu	
<b>Requirements - AWS E309L-17</b>	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.72-0.77	≤0.03	≤0.01	≤0.17	

## 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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer <sup>(4)</sup>AWS Requirement for E309-17 is 0.15% max. carbon. <sup>(5)</sup>Preferred polarity is listed first.

<p><b>IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED</b></p> <p>Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.</p> <p>BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.</p>
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# EXCALIBUR® 310-16

Stainless ▪ AWS E310-16

## KEY FEATURES

- Used for high operating temperature stainless applications
- Multiple purpose austenitic, heat resistant stainless
- Minimal heat input required during welding

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E310-16
<b>ASME SFA-A5.4:</b>	E310-16

## TYPICAL APPLICATIONS

- Heat Shields
- Furnace Parts
- Ducting
- Welding 310/310s materials

## 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
3/32 (2.4)	12 (305)	ED034993	ED034994 ED034995
1/8 (3.2)	14 (355)		
5/32 (4.0)	14 (355)		

## DEPOSIT COMPOSITION<sup>(1)</sup> - As Required per AWS A5.4/A5.4M

	%C <sup>(3)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements</b> AWS E310-16	0.08 - 0.20	25.0 - 28.0	20.0 - 22.5	0.75 max	1.0 - 2.5
<b>Typical Results<sup>(2)</sup></b>	0.11	25.5	21.0	0.1	2.0
	%Si	%P	%S	%Cu	FN
<b>Requirements</b> AWS E310-16	0.75 max	0.03 max	0.03 max	0.75 max	Not Required
<b>Typical Results<sup>(2)</sup></b>	0.58	0.02	0.01	0.02	-

## 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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer <sup>(3)</sup>AWS Requirement for E310-16 is 0.20% max carbon. <sup>(4)</sup>Preferred polarity is listed first.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.



# EXCALIBUR® 312-16

Stainless ▪ AWS E312-16

## KEY FEATURES

- Can be used for joining hard to weld materials and dissimilar metals
- Applications should be limited to 800°F (420°C)
- The weld deposits exhibit high tensile strength and offer some resistance to abrasion
- Weld deposits work-hardens and allows for good wear resistance

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

**AWS A5.4/A5.4M:** E312-16  
**ASME SFA-A5.4:** E312-16

## TYPICAL APPLICATIONS

- Tool Steels
- Hard to Weld Steels
- Cast and Wrought Alloys
- Dissimilar Metals

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Master Carton
1/8 (3.2)	14 (355)	ED034996
5/32 (4.0)	14 (355)	ED034997
3/16 (4.8)	14 (355)	ED034998

## DEPOSIT COMPOSITION<sup>(1)</sup> - As Required per AWS A5.4/A5.4M

	%C	%Cr	%Ni	%Mo	%Mn
<b>Requirements</b> AWS E312-16	0.15 max	28.0 - 32.0	8.0 - 10.5	0.75 max	0.5 - 2.5
<b>Typical Results<sup>(2)</sup></b>	0.12	29.4	9.4	0.15	1.4
	%Si	%P	%S	%Cu	FN
<b>Requirements</b> AWS E312-16	1.00 max	0.04 max	0.03 max	0.75 max	Not Required
<b>Typical Results<sup>(2)</sup></b>	0.57	0.02	0.01	0.06	30 - 60

## 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+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 316/316L-15

Stainless ▪ AWS E316-15, E316L-15

## KEY FEATURES

- Flux coating is fast freezing for vertical down welding
- Molybdenum grade for increased corrosion resistance
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online
- Designed with low carbon levels to help eliminate carbide precipitation

## WELDING POSITIONS

All

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E316-15, E316L-15
<b>ASME SFA-A5.4:</b>	E316-15, E316L-15
<b>ABS:</b>	E316-15, E316L-15
<b>CWB/CSA W48-06:</b>	E316-15, E316L-15

## TYPICAL APPLICATIONS

- Molybdenum bearing austenitic stainless steels
- Welding type 316 and 316L stainless steels
- Vertical and overhead welding applications

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033108
1/8 (3.2)	12 (300)	ED033109

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b> AWS E316-15 AWS E316L-15	Not Specified Not Specified	520 (75) min 490 (70) min	30 min 30 min	Not Specified Not Specified
<b>Typical Results<sup>(3)</sup> - As-Welded</b>	470 (68)	620 (90)	38	4 - 12

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	%C <sup>(4)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements - AWS E316L-15</b>	0.04 max	17.0-20.0	11.0-14.0	2.0-3.0	0.05-2.5
<b>Typical Results<sup>(3)</sup></b>	≤0.02	18.6-19.3	12.0-12.4	2.2-2.6	≤0.7
	%Si	%P	%S	%Cu	
<b>Requirements - AWS E316L-15</b>	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.72-0.74	≤0.02	≤0.01	≤0.24	

## TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)	
	3/32 in (2.4 mm)	1/8 in (3.2 mm)
DC+	60-70	90-100

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer <sup>(4)</sup>AWS Requirement for E316-15 is 0.08% max. carbon.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 316/316L-16

Stainless ▪ AWS E316-16, E316L-16

## KEY FEATURES

- Flux coating provides smooth arc transfer in all welding positions, except vertical down
- Molybdenum grade for increased corrosion resistance
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online
- Designed with low carbon levels to help eliminate carbide precipitation

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E316-16, E316L-16
<b>ASME SFA-A5.4:</b>	E316-16, E316L-16
<b>ABS:</b>	E316-16, E316L-16
<b>CWB/CSA W48-06:</b>	E316L-16
<b>MIL-E-22200/2:</b>	MIL-316-16, MIL-316L-16

## TYPICAL APPLICATIONS

- Molybdenum bearing austenitic stainless steels
- Type 316 and 316L stainless steel

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can	10 lb (4.5 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033104	
1/8 (3.2)	14 (350)		ED033105
5/32 (4.0)	14 (350)		ED033106
3/16 (4.8)	14 (350)		ED033107

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b>				
AWS E316-16	Not Specified	520 (75) min	30 min	Not Specified
AWS E316L-16	Not Specified	490 (70) min	30 min	Not Specified
<b>Typical Results<sup>(3)</sup> - As-Welded</b>	425-450 (62-65)	560-585 (81-85)	40-54	7-14

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	%C <sup>(4)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements - AWS E316L-16</b>	0.04 max	17.0-20.0	11.0-14.0	2.0-3.0	0.05-2.5
<b>Typical Results<sup>(3)</sup></b>	0.03-0.04	18.7-19.2	11.4-12.1	2.2-2.4	0.7-0.9
	%Si	%P	%S	%Cu	
<b>Requirements - AWS E316L-16</b>	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.29-0.39	≤0.02	≤0.02	≤0.26	

## 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)
DC+	40-70	60-100	90-140	120-185
AC	40-70	60-100	90-140	120-185

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer <sup>(4)</sup>AWS Requirement for E316-16 is 0.08% max. carbon. <sup>(5)</sup>Preferred polarity is listed first.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 316/316L-17

Stainless ▪ AWS E316-17, E316L-17

## KEY FEATURES

- Substantial ferrite content for crack resistance
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online
- Molybdenum grade for increased corrosion resistance
- Designed with low carbon levels to help eliminate carbide

## WELDING POSITIONS

- All, except vertical down 5/32 in and smaller diameter
- 3/16 in diameter on Flat and Horizontal only

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E316-17, E316L-17
<b>ASME: SFA-A5.4:</b>	E316-17, E316L-17
<b>CWB/CSA W48-06:</b>	E316-17, E316L-17

## TYPICAL APPLICATIONS

- 316 and 316L stainless steel
- ASTM A240 Type 316 and 316L stainless steel
- ASTM A743 or A744 Types CF-8M and CF-3M
- For joining extra low carbon molybdenum bearing austenitic stainless steels

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	8 lb (3.6 kg) Easy Open Can	10 lb (4.5 kg) Easy Open Can
3/32 (2.4)	12 (300)	ED033110	
1/8 (3.2)	14 (350)		ED033111
5/32 (4.0)	14 (350)		ED033112
3/16 (4.8)	14 (350)		ED033113

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
<b>Requirements</b> AWS E316-17 AWS E316L-17	Not Specified Not Specified	520 (75) min. 490 (70) min.	30 min. 30 min.	Not Specified Not Specified
<b>Typical Results<sup>(3)</sup> - As-Welded</b>	469 (68)	590 (85)	45	7-14

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4/A5.4M

	%C <sup>(4)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements - AWS E316L-17</b>	0.04 max	17.0-20.0	11.0-14.0	2.0-3.0	0.5-2.5
<b>Typical Results<sup>(3)</sup></b>	≤0.03	19.1-19.7	11.6-12.7	2.1-2.4	0.8-1.0
	%Si	%P	%S	%Cu	
<b>Requirements - AWS E316L-17</b>	1.00 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(3)</sup></b>	0.61-0.72	≤0.02	≤0.01	≤0.26	

## 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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>Measured with 0.2% offset. <sup>(3)</sup>See test results disclaimer <sup>(4)</sup>AWS Requirement for E316-17 is 0.08% max. carbon. <sup>(5)</sup>Preferred polarity is listed first.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 320LR-16

Stainless ▪ AWS E320LR-16

## KEY FEATURES

- Good corrosion resistance in acidic environments
- Low heat input welding procedures should be used to prevent solidification cracking

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E320LR-16
<b>ASME SFA-A5.4:</b>	E320LR-16

## TYPICAL APPLICATIONS

- Process Piping
- Heat Exchangers
- Welding Alloy 20 and similar materials
- Chemical Processing Plants

## 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
3/32 (2.4)	12 (305)	ED034999	ED035000 ED035001 ED035002
1/8 (3.2)	14 (355)		
5/32 (4.0)	14 (355)		
3/16 (4.8)	14 (355)		

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Cr	%Ni	%Mo	%Nb+Ta	%Mn
<b>Requirements</b> AWS E320LR-16	0.03 max	19.0 - 21.0	32.0 - 36.0	2.0 - 3.0	0.4 max	1.50 - 2.50
<b>Typical Results<sup>(2)</sup></b>	0.02	19.9	33.8	2.3	0.1	1.70
	%Si	%P	%S	%Cu	FN	
<b>Requirements</b> AWS E320LR-16	0.30 max	0.020 max	0.015 max	3.0 - 4.0	Not Required	
<b>Typical Results<sup>(2)</sup></b>	0.16	0.016	0.006	3.2	-	

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(3)</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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer <sup>(3)</sup>Preferred polarity is listed first.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 330-16

Stainless ▪ AWS E330-16

## KEY FEATURES

- Offers good heat and scale resistance to 1800°F (980°C)
- Low heat input welding procedures should be used to prevent solidification cracking
- High sulfur environments adversely affect the high temperature performance

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E330-16
<b>ASME SFA-A5.4:</b>	E330-16

## TYPICAL APPLICATIONS

- Heat Treatment
- Furnace Components
- Welding 330 stainless and similar materials
- High Temperature Environments

## 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
3/32 (2.4)	12 (305)	ED035003	ED035004 ED035005
1/8 (3.2)	14 (355)		
5/32 (4.0)	14 (355)		

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C <sup>(3)</sup>	%Cr	%Ni	%Mo	%Mn
<b>Requirements</b> AWS E330-16	0.18 - 0.25	14.0 - 17.0	33.0 - 37.0	0.75 max	1.0 - 2.5
<b>Typical Results<sup>(2)</sup></b>	0.21	15.5	34.3	0.13	1.7
	%Si	%P	%S	%Cu	FN
<b>Requirements</b> AWS E330-16	1.00 max	0.04 max	0.03 max	0.75 max	Not Required
<b>Typical Results<sup>(2)</sup></b>	0.49	0.02	0.003	0.06	-

## 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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer <sup>(3)</sup>AWS Requirement for E316-17 is 0.08% max. carbon. <sup>(4)</sup>Preferred polarity is listed first.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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# EXCALIBUR® 347-16

Stainless ▪ AWS E347-16

## KEY FEATURES

- Niobium stabilized stainless steel electrodes
- The addition of niobium reduces intergranular corrosion in severe operating conditions
- Q2 Lot® - Certificate showing actual deposit composition and ferrite number (FN) by ferrite scope available online
- High tensile and yield strength results, as well as superior resistance to Stress Cracking (SCC) and pitting corrosion

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E347-16
<b>ASME SFA-A5.4:</b>	E347-16

## TYPICAL APPLICATIONS

- Process Piping
- Power Generation Equipment
- Welding 321 and 347 Stainless Steels
- Powergen
- Refinery Applications

## 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
3/32 (2.4)	12 (305)	ED035006	ED035007 ED035008 ED035009
1/8 (3.2)	14 (355)		
5/32 (4.0)	14 (355)		
3/16 (4.8)	14 (355)		

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Cr	%Ni	%Mo	%Nb+Ta	%Mn
<b>Requirements</b> AWS E347-16	0.08 max	18.0 - 21.0	9.0 - 11.0	0.75 max	8 x C to 1.00 max	0.5 - 2.5
<b>Typical Results<sup>(2)</sup></b>	0.03	19.5	10.1	0.19	0.36	1.5
	%Si	%P	%S	%Cu	FN	
<b>Requirements</b> AWS E347-16	1.00 max	0.04 max	0.03 max	0.75 max	Not Required	
<b>Typical Results<sup>(2)</sup></b>	0.54	0.02	0.01	0.16	2-8	

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(3)</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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer <sup>(3)</sup>Preferred polarity is listed first.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 385-16

Stainless ▪ AWS E385-16

## KEY FEATURES

- The weld metal is fully austenitic
- Minimal heat input welding procedures should be used to avoid solidification cracking

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E385-16
<b>ASME SFA A5.4:</b>	E385-16

## TYPICAL APPLICATIONS

- Welding 904L Stainless Steels
- Papermill Equipment
- Chemical process equipment
- Used in fabrication of equipment and vessels for handling and storage of sulfuric acid and phosphoric acid

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Master Carton
1/8 (3.2)	14 (355)	ED035010
5/32 (4.0)	14 (355)	ED035011

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Cr	%Ni	%Mo	%Mn
<b>Requirements</b> AWS E385-16	0.03 max	19.5 - 21.5	24.0 - 26.0	4.2 - 5.2	1.0 - 2.5
<b>Typical Results<sup>(2)</sup></b>	0.02	20.4	24.9	4.8	1.4
	%Si	%P	%S	%Cu	FN
<b>Requirements</b> AWS E385-16	0.90 max	0.03 max	0.02 max	1.2 - 2.0	Not Required
<b>Typical Results<sup>(2)</sup></b>	0.34	0.01	0.01	1.6	-

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(3)</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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer <sup>(3)</sup>Preferred polarity is listed first.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.



# EXCALIBUR® 410-16

Stainless ▪ AWS E410-16

## KEY FEATURES

- Preheat and interpass temperatures greater than 400°F (200°C) are recommended during welding
- Great for overlay on carbon and low alloy steels

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E410-16
<b>ASME SFA-A5.4:</b>	E410-16

## TYPICAL APPLICATIONS

- Surfacing Steel Mill Rolls
- Furnace and Burner Parts
- Turbine Parts
- Welding 410 and 410s Stainless Steels

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Tube 30 lb (13.6 kg) Master Carton
1/8 (3.2)	14 (355)	ED035012
5/32 (4.0)	14 (355)	ED035013
3/16 (4.8)	14 (355)	ED035014

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Cr	%Ni	%Mo	%Mn
<b>Requirements</b> AWS E410-16	0.12 max	11.0 - 13.5	0.7 max	0.75 max	1.0 max
<b>Typical Results<sup>(2)</sup></b>	0.08	12.2	0.2	0.01	0.7
	%Si	%P	%S	%Cu	
<b>Requirements</b> AWS E410-16	0.90 max	0.04 max	0.03 max	0.75 max	
<b>Typical Results<sup>(2)</sup></b>	0.40	0.02	0.01	0.06	

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(3)</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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer. <sup>(3)</sup>Preferred polarity is listed first.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 410NiMo-16

Stainless ▪ AWS E410NiMo-16

## KEY FEATURES

- This electrode can be used to overlay mild and low alloy steels
- Preheat and inter-pass temperatures greater than 300°F (150°C) are recommended during welding
- Post-weld heat treatment should not exceed 1150°F (620°C) as higher temperatures may result in hardening

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E410NiMo-16
<b>ASME SFA-A5.4:</b>	E410NiMo-16

## TYPICAL APPLICATIONS

- Turbines
- Valve Bodies
- High Pressure Piping
- Offshore
- Power Generation
- Welding CAGNM Stainless Steel

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Master Carton
1/8 (3.2)	14 (355)	ED035015
5/32 (4.0)	14 (355)	ED035016
3/16 (4.8)	14 (355)	ED035018

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Cr	%Ni	%Mo	%Mn
<b>Requirements</b> AWS E410NiMo-16	0.06 max	11.0 - 12.5	4.0 - 5.0	0.40 - 0.70	1.0 max
<b>Typical Results<sup>(2)</sup></b>	0.02	11.7	4.6	0.58	0.5
	%Si	%P	%S	%Cu	FN
<b>Requirements</b> AWS E410NiMo-16	0.90 max	0.04 max	0.03 max	0.75 max	Not Required
<b>Typical Results<sup>(2)</sup></b>	0.37	0.02	0.01	0.07	-

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(3)</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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer. <sup>(3)</sup>Preferred polarity is listed first.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 630-16

Stainless ▪ AWS E630-16

## KEY FEATURES

- A precipitation hardening stainless steel covered electrode used for welding materials such as 17-4 and 17-7
- Can be used in the as welded condition or may be heat treated to obtain higher strength
- Mechanical properties of the alloy are greatly influenced by the heat treatment

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E630-16
<b>ASME SFA-A5.4:</b>	E630-16

## TYPICAL APPLICATIONS

- Hydraulic Equipment
- Impellers
- Pump Shafts
- Welding 17-4 and 17-7 Stainless Steels

## 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
3/32 (2.4)	12 (305)	ED035019	ED035020 ED035021 ED035022
1/8 (3.2)	14 (355)		
5/32 (4.0)	14 (355)		
3/16 (4.8)	14 (355)		

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Cr	%Ni	%Mo	%Nb+Ta
<b>Requirements</b> AWS E630-16	0.05 max	16.00 - 16.75	4.5 - 5.0	0.75 max	0.15 - 0.30
<b>Typical Results<sup>(2)</sup></b>	0.03	16.30	4.8	0.11	0.16
	%Mn	%Si	%P	%S	%Cu
<b>Requirements</b> AWS E630-16	0.25 - 0.75	0.75 max	0.04 max	0.03 max	3.25 - 4.00
<b>Typical Results<sup>(2)</sup></b>	0.62	0.36	0.02	0.01	3.43

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(3)</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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer. <sup>(3)</sup>Preferred polarity is listed first.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 2209-16

Stainless ▪ AWS E2209-16

## KEY FEATURES

- Designed for welding 22% Cr Duplex Stainless Steels
- The welds offer excellent resistance to stress corrosion, cracking and pitting
- High strength welds and good corrosion resistance in a range of environments

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E2209-16
<b>ASME SFA-A5.4:</b>	E2209-16

## TYPICAL APPLICATIONS

- Offshore
- Oil and Gas
- Chemical
- Petrochemical
- Welding 2205 Stainless Steels

## 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
3/32 (2.4)	12 (305)	ED034985	ED034986 ED034987 ED034988
1/8 (3.2)	14 (355)		
5/32 (4.0)	14 (355)		
3/16 (4.8)	14 (355)		

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Cr	%Ni	%Mo	%Mn	%Si
<b>Requirements</b> AWS E2209-16	0.04 max	21.5 - 23.5	8.5 - 10.5	2.5 - 3.5	0.5 - 2.0	1.0 max
<b>Typical Results<sup>(2)</sup></b>	0.02	22.3	9.5	3.2	1.1	0.5
	%P	%S	%N	%Cu	FN	
<b>Requirements</b> AWS E2209-16	0.04 max	0.03 max	0.08 - 0.20	0.75 max	Not Required	
<b>Typical Results<sup>(2)</sup></b>	0.02	0.01	0.16	0.06	30 - 60	

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(3)</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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer. <sup>(3)</sup>Preferred polarity is listed first.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# EXCALIBUR® 2594-16

Stainless ▪ AWS E2594-16

## KEY FEATURES

- A super-duplex grade electrode that provides matching chemistry and mechanical property characteristics to wrought super-duplex alloys such as 2507 and Zeron 100, as well as to super-duplex casting alloys (ATSM A890)
- High tensile and yield strength results, as well as superior resistance to Stress Cracking (SCC) and pitting corrosion
- Great corrosion resistance in a range of environments

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

<b>AWS A5.4/A5.4M:</b>	E2594-16
<b>ASME SFA-A5.4:</b>	E2594-16

## TYPICAL APPLICATIONS

- Process Pipework
- Pumps and Valves
- Pressure Vessels
- Welding 2507 and Zeron 100X Duplex Stainless Steels

## 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
3/32 (2.4)	12 (305)	ED034989	ED034990 ED034991 ED034992
1/8 (3.2)	14 (355)		
5/32 (4.0)	14 (355)		
3/16 (4.8)	14 (355)		

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Cr	%Ni	%Mo	%Mn	%Si
<b>Requirements</b> AWS E2594-16	0.04 max	24.0 - 27.0	8.0 - 10.5	3.5 - 4.5	0.5 - 2.0	1.00 max
<b>Typical Results<sup>(2)</sup></b>	0.02	25.4	9.2	4.2	0.8	0.58
	%P	%S	%N	%Cu	FN	
<b>Requirements</b> AWS E2594-16	0.04 max	0.03 max	0.20 - 0.30	0.75 max	Not Required	
<b>Typical Results<sup>(2)</sup></b>	0.01	0.01	0.22	0.07	30 - 60	

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(3)</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)
DC+	40-80	75-110	95-150	130-200
AC	40-80	75-110	95-150	130-200

<sup>(1)</sup>Typical all weld metal. <sup>(2)</sup>See test results disclaimer. <sup>(3)</sup>Preferred polarity is listed first.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# E16.8.2-15

Stainless ▪ AWS E16-8-2-15

## KEY FEATURES

- Basic pipe welding electrode for 3XXH stainless steel
- Suited to the most demanding vertical and overhead welding applications, including fixed pipework in the ASME 5G/6G positions

## WELDING POSITIONS

All

## CONFORMANCES

<b>AWS 5.4</b>	E16-8-2-15
<b>BS EN 1600</b>	(E16 8 2 B)

## TYPICAL APPLICATIONS

- Transfer lines
- Furnace parts
- Thick wall steam piping
- 308H, 316H Materials
- Gas
- Steam turbine plants
- Power Generation industries

## DIAMETERS / PACKAGING

Diameter in (mm)	8.8 lb (4.0 kg) Easy Open Can	10 lb (4.5 kg) Easy Open Can
3/32 (2.5)	E168215-25	E168215-32 E168215-40
1/8 (3.2)		
5/32 (4.0)		

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft·lbf) @-100°C (-148°F)
<b>Requirements</b> AWS E16-8-2-15 As-Welded	-	550 (80)	35 min	-
<b>Typical Results<sup>(3)</sup></b> As-Welded	>420 (61)	>620 (90)	40	50 (37)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4

	%C	%Mn	%Si	%S	%P
<b>Requirements</b> AWS E16-8-2-15	0.04-0.08	0.5-2.5	0.60 max	0.03 max	0.03 max
<b>Typical Results<sup>(3)</sup></b>	0.05	1.8	0.3	0.01	0.02
	%Cr	%Ni	%Mo	%Cu	%FN
<b>Requirements</b> AWS E16-8-2-15	14.5-16.5	7.5-9.5	1.0-2.0	0.5 max	1-6
<b>Typical Results<sup>(3)</sup></b>	15.5	8.5	1.2	0.1	3

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# SUPERMET™ 16.8.2

Stainless ▪ AWS E16-8-2-17

## KEY FEATURES

- Manufactured with controlled hydrogen and moisture resistant flux covering technology to ensure high resistance to weld porosity
- 3XXH Materials

## WELDING POSITIONS

All

## CONFORMANCES

**AWS A5.4** E16-8-2-17  
**BS EN 1600** (E 16 8 2 R)

## TYPICAL APPLICATIONS

- 308H, 316H Materials
- Gas and steam turbine
- Petrochemical
- Chemical process plants
- Power generation industries

## DIAMETERS / PACKAGING

Diameter in (mm)	8.8 lb (4.0 kg) Easy Open Can	10 lb (4.6 kg) Easy Open Can
3/32 (2.5)	SM1682-25	SM1682-32 SM1682-40
1/8 (3.2)		
5/32 (4.0)		

## MECHANICAL PROPERTIES<sup>(1)</sup> – As Required per AWS A5.4

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %		Charpy V-Notch J (ft•lbf)	
			4.0 dia	5.0 dia	@20°C (68°F)	@-50°C (-58°F)
<b>Requirements</b> AWS E16-8-2-17 As-Welded	-	550 (80)	35	25 min	-	-
<b>Typical Results<sup>(3)</sup></b> As-Welded	>410 (60)	>620 (90)	42	42	>70 (52)	>50 (37)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per AWS A5.4

	%C	%Mn	%Si	%S	%P
<b>Requirements</b> AWS E16-8-2-17	0.08 max	2.5 max	0.60 max	0.03 max	0.03 max
<b>Typical Results<sup>(3)</sup></b>	0.05	1.0	0.45	0.01	0.02
	%Cr	%Ni	%Mo	%Cu	FN
<b>Requirements</b> AWS E16-8-2-17	14.5-16.5	7.5-9.5	1.0-2.0	0.75 max	1-6
<b>Typical Results<sup>(3)</sup></b>	15.5	8.5	1.1	0.1	3

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# THERMET™ 22H

Casting High Temperature Alloy

## KEY FEATURES

- Designed to match similar high carbon cast alloys
- High amount of carbon to provide excellent hot strength and oxidation resistance at 950 - 1250°C (1742 - 2282 °F)
- High amount of nickel gives the alloy superior resistance to carburization and sulphidation.

## TYPICAL APPLICATIONS

- Furnace Parts
- Calcining muffles
- Hot abrasion
- Pyrolysis coils

## WELDING POSITIONS

All, except vertical down

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	26.4 lb (12 kg) Carton	30 lb (13.5 kg) Carton
1/8 (3.2)	12.2 (310)	TH22H-32	
5/32 (4.0)	12.2 (310)		TH22H-40

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

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Hardness HV
Test Results <sup>(3)</sup> As-Welded	590 (86)	780 (113)	6	270

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Mn	%Si	%S	%P
Requirements	0.4-0.6	0.5-1.5	0.5-1.2	0.02 max	0.03 max
Typical Results <sup>(3)</sup>	0.50	1	0.7	0.006	0.01
	%Cr	%Ni	%W	%Fe	
Requirements	27.0-30.0	47-54	4.0-6.0	Balance	
Typical Results <sup>(3)</sup>	28	51	5	14	

## TYPICAL OPERATING PROCEDURES

Diameter mm (in)	Polarity	Amp Range
3.2 (1/8)	DC+	85-120A
4.0 (5/32)	DC+	110-160A

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.



# THERMET™ 25.35Nb

Casting High Temperature Alloys

## KEY FEATURES

- Developed to match the composition of heat-resisting castings
- Porosity-free deposits
- Designed to provide high strength and resistance to thermal shock

## TYPICAL APPLICATIONS

- Petrochemical Industry
- Reformer tubes
- Pyrolysis coils

## WELDING POSITIONS

All, except vertical down

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	26.5 lb (12 kg) Carton
1/8 (3.2)	12.6 (320)	TH2535NB-32
5/32 (4.0)	12.6 (320)	TH2535NB-40

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

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %
<b>Minimum Performance</b>	300 (42) min	520 (75) min	20 min
<b>Typical Results<sup>(3)</sup></b> As-Welded	460 (67)	660 (96)	34

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Mn	%Si	%S	%P	%Cr
<b>Requirements</b>	0.08-0.14	2.5-4.0	0.2-1.0	0.02 max	0.03 max	24.0-28.0
<b>Typical Results<sup>(3)</sup></b>	0.12	3.5	0.5	0.01	0.01	26
	%Ni	%Mo	%Nb	%Cu	%Pb	%Sn
<b>Requirements</b>	34.0-39.0	0.5 max	0.5-1.50	0.15 max	0.01 max	0.01 max
<b>Typical Results<sup>(3)</sup></b>	36	0.2	0.8	0.05	<0.001	0.005

## TYPICAL OPERATING PROCEDURES

Diameter mm (in)	Polarity	Amp Range
3.2 (1/8)	DC+	75-120A
4.0 (5/32)	DC+	100-155A

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# THERMET™ 35.45.Nb

High Carbon Austenitic Alloy

## KEY FEATURES

- Superior carburization and oxidation resistance
- Design based on 25% Cr - 35% Ni for service up to 1150°C (2102°F), but with some reduction in creep strength

## TYPICAL APPLICATIONS

- Pyrolysis coils and reformer tubes
- Petrochemical industry

## WELDING POSITIONS

All, except vertical down

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	Carton lbs (kg)	Part Number
1/8 (3.2)	13.78 (350)	23.15 (10.5)	TH3545NB-32
5/32 (4.0)	13.78 (350)	27.78 (12.6)	TH3545NB-40

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

	Tensile Strength MPa (ksi)	0.2% Proof Stress MPa (ksi)	Elongation %	Hardness HV
Typical Results <sup>(3)</sup> As-Welded	740 (107)	550 (80)	6	270

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Mn	%Si	%S	%P	%Cr
Requirements	0.40-0.50	0.5-1.5	1.0-1.6	0.01 max	0.01 max	34-38
Typical Results <sup>(3)</sup> - (Weld metal wt. %)	0.45	0.9	1.2	0.005	<0.01	35
	%Ni	%Nb	%Mo	%Ti	%Fe	
Requirements	44-50	0.60-1.30	0.25 max	0.04-0.15	Balance	
Typical Results <sup>(3)</sup> - (Weld metal wt. %)	47	0.8	0.05	0.07	13	

## TYPICAL OPERATING PROCEDURES

Diameter mm (in)	Polarity	Amp Range
3.2 (1/8)	DC+	85-120A
4.0 (5/32)	DC+	110-160A

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# THERMET™ 800Nb

Austenitic Heat Resisting Consumable

## KEY FEATURES

- Controlled carbon and niobium for optimum corrosion resistance and creep performance
- Designed to eliminate thermal fatigue and shock resistance at temperatures up to 1000°C (1832°F)
- Designed to meet deposit composition of type 800 cast at wrought alloys

## TYPICAL APPLICATIONS

- Fabrication of muffles, radiant tubes, and heat treatment trays
- Petrochemical industry
- Nuclear engineering industries
- Welding alloy 800, 800H, 800HT

## WELDING POSITIONS

All, except vertical down

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	Carton lbs (kg)	Part Number
1/8 (3.2)	13.78 (350)	29.76 (13.5)	TH800NB-32
5/32 (4.0)	13.78 (350)	29.76 (13.5)	TH800NB-40
3/16 (5.0)	17.72 (450)	39.68 (18.0)	TH800NB-50

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

	Tensile Strength MPa (ksi)	0.2% Proof Stress MPa (ksi)	Elongation %	Reduction of area	Impact energy +20°C J	Hardness HV
<b>Typical Results<sup>(3)</sup></b> As-Welded	615 (107)	410 (80)	>32	46	>55	170-220

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Mn	%Si	%S	%P
<b>Requirements</b>	0.06-0.12	1.6-4.5	0.6 max	0.02 max	0.03 max
<b>Typical Results<sup>(3)</sup></b> - (Weld metal wt. %)	0.1	2.5	0.3	0.007	0.015
	%Cr	%Ni	%Nb	%Mo	%Cu
<b>Requirements</b>	19.0-23.0	30.0-35.0	0.8-1.5	0.5 max	0.5 max
<b>Typical Results<sup>(3)</sup></b> - (Weld metal wt. %)	21	32	1.3	0.4	0.15

## TYPICAL OPERATING PROCEDURES

Diameter mm (in)	Polarity	Amp Range
3.2 (1/8)	DC+	75-120A
4.0 (5/32)	DC+	100-155A
5.0 (3/16)	DC+	130-210A

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# THERMET™ HP40Nb

High Carbon Austenitic Alloys ▪ BS 25.35.H.Nb.B

## KEY FEATURES

- Excellent hot strength and creep resistance from 900 - 1000°C (1650 - 1830°F)
- High levels of Cr and Ni provide good resistance to oxidation and carburization
- Designed to prevent embrittlement

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

BS:2926

25.35.H.Nb.B

## TYPICAL APPLICATIONS

- Pyrolysis coils and reformer tubes for ethylene production
- Petrochemical industry

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	Carton kg (lbs)	Part Number
1/8 (3.2)	12.6 (320)	27.12 (12.3)	THHP40NB-32
5/32 (4.0)	12.6 (320)	26.46 (12.0)	THHP40NB-40
3/16 (5.0)	12.6 (320)	27.12 (12.3)	THHP40NB-50

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

	Tensile Strength MPa (ksi)	0.2% Proof Stress MPa (ksi)	Elongation %	Reduction of area	Hardness HV
Typical Results <sup>(3)</sup> - As-Welded	740 (107)	560 (81)	15	17	240

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Mn	%Si	%S	%P
Requirements - 25.35.H.Nb.B	0.35-0.50	0.5-2.0	0.2-1.3	0.03 max	0.04 max
Typical Results <sup>(3)</sup> - (Weld metal wt. %)	0.43	1.7	0.9	0.010	0.010
	%Cr	%Ni	%Nb	%Mo	%Ti
Requirements - 25.35.H.Nb.B	23.0-27.0	32.0-36.0	0.75-1.50	0.5 max	0.02-0.20
Typical Results <sup>(3)</sup> - (Weld metal wt. %)	25.0	35.0	1.1	0.1	0.08

## TYPICAL OPERATING PROCEDURES

Diameter mm (in)	Polarity	Amp Range
3.2 (1/8)	DC+	75-120A
4.0 (5/32)	DC+	100-155A
5.0 (3/16)	DC+	130-210A

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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# THERMET™ HP50WCO

High Carbon Austenitic Alloys

## KEY FEATURES

- Additions of cobalt and tungsten for maintaining matrix strength
- High carbon, high alloy for excellent hot strength and oxidation resistance at service temperatures of 950 - 1250 °C (1740 - 2280 °F)

## TYPICAL APPLICATIONS

- Highly stressed furnace parts, sintering and calcining muffles
- Cement kiln components resistant to hot abrasion, radiant tubes, and pyrolysis coils

## WELDING POSITIONS

All, except vertical down

## DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	Carton lbs (kg)	Part Number
1/8 (3.2)	12.6 (320)	26.46 (12.0)	THHP50WCO-32
5/32 (4.0)	12.6 (320)	29.10 (13.2)	THHP50WCO-40

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

	Tensile Strength MPa (ksi)	0.2% Proof Stress MPa (ksi)	Elongation %	Reduction of area	Hardness HV
Test Results <sup>(3)</sup> As-Welded	840 (122)	610 (88)	8.5	6	265

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Mn	%Si	%S	%P	%Cr
Requirements	0.40-0.60	0.5-1.5	0.2-1.2	0.02 max	0.03 max	24.0-28.0
Test Results <sup>(3)</sup> (Weld metal wt. %)	0.50	0.6	0.5	0.008	0.010	25
	%Ni	%Co	%W	%Mo	%Cu	%Fe
Requirements	34.0-40.0	13.0-18.0	4.0-6.0	0.5 max	0.5 max	Balance
Test Results <sup>(3)</sup> (Weld metal wt. %)	35	14	4.6	0.05	0.05	19

## TYPICAL OPERATING PROCEDURES

Diameter mm (in)	Polarity	Amp Range
3.2 (1/8)	DC+	85-120A
4.0 (5/32)	DC+	110-160A

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

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Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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# ULTRAMET® 308LCF

Stainless ▪ AWS E308L-16

## KEY FEATURES

- Controlled Low Ferrite (Range 3-6)
- Charpy V-Notch test results capable of exceeding 27 J (20 ft•lbf) @ -196 °C (-320 °F)
- Exceeds 15 mils (0.38 mm) of lateral expansion @ -196 °C (-320 °F)
- Q2 Lot® - Certificates showing actual wire composition available online
- Batch Managed Inventory

## WELDING POSITIONS

All

## CONFORMANCES

<b>AWS 5.4:</b>	E308L-16
<b>ASME SFA 5.4:</b>	E308L-16

## TYPICAL APPLICATIONS

- LNG Storage
- Cryogenic Vessels and Piping

## TYPICAL BASE METALS

- 304L stainless steel
- 18/8 steels with service temperatures down to -196 °C (-320 °F)

## DIAMETERS / PACKAGING

Diameter in (mm)	25 lb (11.4 kg) Carton	29lb (13.5kg) Carton	10 lb (4.5 kg) Carton
3/32 (2.5) 1/8 (3.2) 5/32 (4.0)	ED034811, UM308LCF-25*	ED034812, UM308LCF-32*	UM308LCF-40

\*The Metrode part number will be replacing the current EDO numbers after the inventory has been depleted.

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

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lb) -196 °C (-320 °F)	Lateral Expansion mm (mils) -196 °C (-320 °F)
<b>Requirements</b> AWS 5.4: E308L-16	Not Specified	520 (75) min	30 min	Not Specified	Not Specified
<b>Typical Results<sup>(3)</sup></b>	445 (65)	600 (87)	50	45 (33)	0.50 (19.7)

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Mn	%Si	%S	%P
<b>Requirements</b>	0.04 max	0.5 - 2.5	1.00 max	0.03 max	0.03 max
<b>Typical Results<sup>(3)</sup></b>	< 0.025	1.0	0.60	0.01	0.02
	%Cr	%Ni	%Mo	%Cu	%FN
<b>Requirements</b>	18.0-21.0	9.0-11.0	0.75 max	0.75 max	Not Specified
<b>Typical Results<sup>(3)</sup></b>	18.5	10.0	0.1	<0.1	3

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(4)</sup>	Current (Amps)	
	2.5 mm (3/32 in)	3.2 mm (1/8 in)
DC+	60-90	75-120
AC	40-80	75-120

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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# ULTRAMET® 316LCF

Stainless ▪ AWS E316L-16

## KEY FEATURES

- Controlled Low Ferrite (Range 3-5)
- Charpy V-Notch test results capable of exceeding 27 J (20 ft•lbf) @ -196 °C (-320 °F)
- Exceeds 15 mils (0.38 mm) of lateral expansion @ -196 °C (-320 °F)
- Q2 Lot® - Certificates showing actual wire chemistry available online
- Batch Managed Inventory

## WELDING POSITIONS

All

## CONFORMANCES

<b>AWS 5.4:</b>	E316L-16
<b>ASME SFA 5.4:</b>	E316L-16

## TYPICAL APPLICATIONS

- LNG Storage
- Cryogenic Vessels and Piping

## TYPICAL BASE METALS

- 316L stainless steel

## DIAMETERS / PACKAGING

Diameter in (mm)	25 lb (11.4 kg) Carton	29 lb (13.5 kg) Carton	10 lb (4.5 kg) Carton
3/32 (2.5)	ED034813, UM316LCF-25*	ED034814, UM316LCF-32*	UM316LCF-40
1/8 (3.2)			
5/32 (4.0)			

\*The Metrode part number will be replacing the current EDO numbers after the inventory has been depleted.

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

	Yield Strength <sup>(2)</sup> MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lb) -196 °C (-320 °F)	Lateral Expansion mm (mils) -196 °C (-320 °F)
<b>Requirements</b> AWS 5.4 E316L-16	Not Specified	490 (70)	30 min	Not Specified	Not Specified
<b>Typical Performance<sup>(3)</sup></b>	440 (64)	595 (83)	43	30 (22)	0.45 (18)

## DEPOSIT COMPOSITION<sup>(1)</sup>

	%C	%Mn	%Si	%S	%P
<b>Requirements</b>	0.04 max	0.5 - 2.5	1.00 max	0.03 max	0.04 max
<b>Typical Results<sup>(3)</sup></b>	<0.03	1.0	0.60	0.01	0.02
	%Cr	%Ni	%Mo	%Cu	%FN
<b>Requirements</b>	17.0-20.0	11.0-14.0	2.0-3.0	0.75 max	Not Specified
<b>Typical Results<sup>(3)</sup></b>	18.0	12.0	2.2	<0.1	3

## TYPICAL OPERATING PROCEDURES

Polarity <sup>(4)</sup>	Current (Amps)	
	2.5 mm (3/32 in)	3.2 mm (1/8 in)
DC+	60-90	75-120
AC	40-80	75-120

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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# ULTRAMET B™ 316NF

Stainless ▪ Similar to AWS A5.4 (E316LMn-15) ▪ E 18 15 3 L B 4 2

## KEY FEATURES

- Controlled carbon and niobium for optimum corrosion resistance and creep performance
- Designed to eliminate thermal fatigue and shock resistance at temperatures up to 1000°C (1832°F)

## WELDING POSITIONS

All, except vertical down

## CONFORMANCES

BS EN 1600

E 18 15 3 L B 4 2

\* Similar to E316LMn-15

## TYPICAL APPLICATIONS

- Fabrication of fittings for minesweepers
- Offshore industry – Downhole instrument collars
- LPG & LNG storage vessels

## DIAMETERS / PACKAGING

Diameter mm (in)	Length mm (in)	Carton kg (lbs)	Part Number
3.2 (1/8)	350 (13.78)	13.5 (29.76)	UMB316NF-32
4.0 (5/32)	350 (13.78)	13.5 (29.76)	UMB316NF-40
5.0 (3/16)	-	16.5 (36.4)	UMB316NF-50

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

	Tensile Strength MPa (ksi)	0.2% Proof Stress MPa (ksi)	Elongation %	Reduction of area	Impact Energy -196°C (-320°F) J	Lateral Expansion -196°C (-320°F) mm (mils)
<b>Typical Results<sup>(3)</sup></b> As-Welded	610 (89)	440 (64)	38	50	50	0.6 (24)

## DEPOSIT COMPOSITION<sup>(1)</sup> – As Required per Similar to AWS A5.4

	%C	%Mn	%Si	%S	%P
<b>Requirements</b> per E 18 15 3 L B 4 2	0.04 max	2.5-4.0	0.9 max	0.025 max	0.030 max
<b>Typical Results<sup>(3)</sup></b> (Weld metal wt. %)	<0.03	3.5	0.4	0.01	0.02
	%Cr	%Ni	%Mo	%Cu	%N
<b>Requirements</b> per E 18 15 3 L B 4 2	16.5-19.5	14.0-17.0	2.5-3.5	0.5 max	0.1-0.2
<b>Typical Results<sup>(3)</sup></b> (Weld metal wt. %)	18	16	2.8	<0.1	0.15

## TYPICAL OPERATING PROCEDURES

Diameter mm (in)	Polarity	Amp Range
3.2 (1/8)	DC+	75-120A
4.0 (5/32)	DC+	100-155A
5.0 (3/16)	DC+	130-210A

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

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

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