Specifications on the complete line of Eutectic Stainless Steel EutecTrodes®

Stainless Steel Electrodes

Castolin Eutectic®
Eutectic Castolin

EutecTrode E308L-16
E308L-17

Recommended primarily for welding low-carbon stainless steels such as AISI 304 and 304L. Due to its low carbon content, it can also be used to weld the stabilized grades such as AISI-321 and 347 when used below 750°F (400°C).

Standards

AWS:	A5.4-92	Class. E308L-17
ISO:	3581	Class. E19.9L
DIN:	8556	Class. E19.9LR
		W.-Nr. 1.4316

Typical Composition (%) (undiluted weld metal)

C	0.02
Si	0.8
Mn	1.0
Ni	10.5
Cr	20.0
Fe	Balance

Description
EutecTrode E308L has a rutile-type coating that assures excellent weldability on DCEP and AC. Electrodes produce a steady arc with very little spatter and easy slag control and removal.

Typical Mechanical Properties

Tensile Strength	85,600 psi (590 N/mm^2)
Yield Strength	62,400 psi (430 N/mm^2)
Elongation (1=5d)	40%
Hardness (BHN)	Approximately 200

Metallurgical Structure
Austenitic with approximately 5% ferrite

Welding Parameters (open circuit voltage - min 50)

Diameter	Amperage Range
3/32" (2.5mm)	50-75 amps
1/8" (3.2mm)	70-110
5/32" (4.0mm)	100-150
3/16" (5.0mm)	140-190

Procedure
Use a short arc with DCEP. Avoid using welding currents in excess of the maximum amperage for the selected diameter. Welding speed and current should be selected in order to avoid large molten pools.

EutecTrode E308L-16/VD
E308L-17/VD

Vertical down. Recommended primarily for welding low-carbon stainless steels such as AISI 304 and 304L. Due to its low carbon content, it can also be used to weld the stabilized grades such as AISI-321 and 347 when used below 750°F (400°C).

Standards

AWS:	A5.4-92	Class. E308L-17
ISO:	3581	Class. E19.9L
DIN:	8556	Class. E19.9LR
		W.-Nr. 1.4316

Typical Composition (%) (undiluted weld metal)

C	0.02
Si	0.8
Mn	1.0
Ni	10.0
Cr	19.5
Fe	Balance

Description
EutecTrode E308L/VD has a modified rutile-type coating for all position welding, particularly VERTICAL DOWN. It can be used with both DCEP and AC. Electrodes produce a steady arc and excellent slag control. Restrike and slag removal are excellent as well.

Typical Mechanical Properties

Tensile Strength	85,600 psi (590 N/mm^2)
Yield Strength	62,400 psi (430 N/mm^2)
Elongation (1=5d)	35%
Hardness (BHN)	Approximately 200

Metallurgical Structure
Austenitic with approximately 5% ferrite

Welding Parameters (open circuit voltage - min 50)

Diameter	Amperage Range
3/32" (2.5mm)	50-75 amps
1/8" (3.2mm)	90-105

Procedure
Use a short arc with DCEP. Avoid using welding currents in excess of the maximum amperage for the selected diameter. Welding speed and current should be selected in order to avoid large molten pools. An angle of 60-70° gives the best weldability when used in the vertical down position.

EutecTrode E309L-16
E309L-17

Recommended for welding the heat-resistant types 309/309L stainless steels and for joining stainless steel to carbon and low alloy steels. The product is also excellent for welding AISI types 405, 410, 430 and 442 when pre-heating and post-heating treatments are not practical.

Standards

AWS:	A5.4-92	Class. E309L-17
ISO:	3581	Class. E20.12L
DIN:	8556	Class. E23 12LR
		W.-Nr. 1.4332

Typical Composition (%) (undiluted weld metal)

C	0.02
Si	0.8
Mn	1.0
Ni	13.5
Cr	24.0
Fe	Balance

Description
EutecTrode E309L has a lime-rutile coating that is designed to operate on DCEP or AC in all positions. The arc is very stable and the spatter level is negligible. Strike and re-strike are excellent.

Typical Mechanical Properties

Tensile Strength	85,600 psi (590 N/mm^2)
Yield Strength	62,250 psi (450 N/mm^2)
Elongation (1=5d)	40%
Hardness (BHN)	Approximately 210

Metallurgical Structure
Austenitic with approximately 15% ferrite

Welding Parameters (open circuit voltage - min 50)

Diameter	Amperage Range
3/32" (2.5mm)	50-80 amps
1/8" (3.2mm)	80-120
5/32" (4.0mm)	100-160

Procedure
To keep dilution low, amperage should be set at the lowest practicable level. Maintain a short arc, and keep the molten pool small by travelling slightly faster than normal.

EutecTrode E310-16
E310-17

Used to weld the corresponding heat-resistant grade AISI 310S. It is also useful for joining high hardenable steels; ferritic chromium steels; 14% Mn steels; and for cast and/or rolled armor steels.

Standards

AWS:	A5.4-92	Class. E310-17
ISO:	3581	Class. E25.20
DIN:	8556	Class. E25 20 R29
		W.-Nr. 1.4842

Typical Composition (%) (undiluted weld metal)

C	0.10
Si	0.5
Mn	2.3
Ni	20.5
Cr	26.0
Fe	Balance

Description
EutecTrode E310 is a rutile-type electrode for use with DCEP and AC. The electrode has excellent weldability in all positions. The arc is smooth and steady. Slag is easy to control and remove.

Typical Mechanical Properties

Tensile Strength	87,000 psi (600 N/mm^2)
Yield Strength	58,000 psi (400 N/mm^2)
Elongation (1=5d)	35%
Hardness (BHN)	Approximately 190

Metallurgical Structure
Fully Austenitic

Welding Parameters (open circuit voltage - min 50)

Diameter	Amperage Range
3/32" (2.5mm)	50-75 amps
1/8" (3.2mm)	70-110
5/32" (4.0mm)	100-150

Procedure
When welding full austenitic stainless steel, excessive heat input must be avoided to reduce the risk of cracking. Interpass temperature should not exceed 200°F (100°C). When possible, use the smallest practicable diameter; keep the weld deposits narrow and do not weave. Best results are obtained with DCEP. Use AC when DC current is not available.

EutecTrode E312-16
E312-17

Can be used to weld Mn-steels and tool steels and for joining stainless steel to dissimilar steels. It is excellent for welding abrasion-resistant (AR) steels and high yield steels.

Standards

AWS:	A5.4-92	Class. E312-17
ISO:	3581	Class. E29.9L
DIN:	8556	Class. E129.9
		W.-Nr. 1.4337

Typical Composition (%) (undiluted weld metal)

C	0.10
Si	0.8
Mn	1.0
Ni	9.5
Cr	29.0
Fe	Balance

Description
EutecTrode E312 is an AC/DC electrode for welding difficult-to-weld steels. Excellent crack resistance is imparted due to weld deposits being 2-phase (austenitic-ferritic). The arc is stable on both DCEP and AC, and strike and re-strike is very good. Slag is easily removed, leaving a smooth regular surface.

Typical Mechanical Properties

Tensile Strength	113,000 psi(780 N/mm^2)
Yield Strength	87,000 psi (600 N/mm^2)
Elongation (1=5d)	20%
Hardness (BHN)	Approximately 270

Metallurgical Structure
Austenitic-ferritic with approximately 40% ferrite

Welding Parameters (open circuit voltage - min 50)

Diameter	Amperage Range
5/64" (2.0mm)	35-60 amps
3/32" (2.5mm)	50-80
1/8" (3.2mm)	80-120
5/32" (4.0mm)	100-160

Procedure
Keep the arc length short and avoid using amperages above the advised maximum. Do not use in the 950°-1750°F (500°- 950°C) temperature range in order to avoid embrittlement due to sigma formation.

EutecTrode E316L-16
E316L-17

Recommended when welding types 316 and 616L stainless steels. It can also be used to weld such stabilized steels as 316T and Columbium-bearing stainless steels.

Standards

AWS:	A5.4-92	Class. E316L-17
ISO:	3581	Class. E19.12L
DIN:	8556	Class. E 19 12 3LR
		W.-Nr. 1.4430

Typical Composition (%) (undiluted weld metal)

C	0.02
Si	0.8
Mn	1.0
Mo	2.8
Ni	11.5
Cr	18.5
Fe	Balance

Description
EutecTrode E316L is a versatile electrode that has excellent weldablity on both DCEP and AC. The arc is very steady and spatter is negligible. Strike and re-strike are easy and deposit slag is easily removed.

Typical Mechanical Properties

Tensile Strength	85,600 psi (590 N/mm^2)
Yield Strength	64,000 psi (440 N/mm^2)
Elongation (1=5d)	40%
Hardness (BHN)	Approximately 210

Metallurgical Structure
Austenitic with approximately 10% ferrite

Welding Parameters (open circuit voltage - min 50)

Diameter	Amperage Range
3/32" (2.5mm)	50-80
1/8" (3.2mm)	80-120
5/32" (4.0mm)	100-160

Procedure
The electrode is best used with a short arc deposition technique. Use the higher end of the amperage range with DCEP - the perferred current polarity. Keep the parts being welded under 200° F (100° C) during multi-pass welding.

EutecTrode E316L-16/VD
E316L-17/VD

Vertical Down. Recommended when welding types 316 and 616L stainless steels. It can also be used to weld such stabilized steels as 316T and Columbium-bearing stainless steels.

Standards

AWS:	A5.4-92	Class. E316L-17
ISO:	3581	Class. E19.12.3L
DIN:	8556	Class. E 19 12 3LR
		W.-Nr. 1.4430

Typical Composition (%) (undiluted weld metal)

C	0.02
Si	0.8
Mn	1.0
Mo	2.8
Ni	12.0
Cr	18.0
Fe	Balance

Description
EutecTrode E316L/VD is a VERTICAL DOWN welding electrode that has excellent weldablity on both DCEP and AC. The arc is very steady and spatter is negligible. Strike and re-strike are easy and deposit slag is easily removed.

Typical Mechanical Properties

Tensile Strength	85,600 psi (590 N/mm^2)
Yield Strength	64,000 psi (440 N/mm^2)
Elongation (1=5d)	35%
Hardness (BHN)	Approximately 210

Metallurgical Structure
Austenitic with approximately 10% ferrite

Welding Parameters (open circuit voltage - min 50)

Diameter	Amperage Range
3/32" (2.5mm)	50-70
1/8" (3.2mm)	90-105

Procedure
The electrode is best used with a short arc deposition technique. Use the higher end of the amperage range with DCEP - the perferred current polarity. An angle of 60-70° gives best weldability when used in the vertical down position.

EutecTrode E317L-16
E317L-17

Recommended primarily for welding types 317 and 317L and where improved corrosion resistance over 316L is required.

Standards

AWS:	A5.4-92	Class. E317L-17
ISO:	3581	Class. E19.13.14
DIN:	8556	Class. E 19 13 4LR
		W.-Nr. 1.4433

Typical Composition (%) (undiluted weld metal)

C	0.02
Si	0.8
Mn	1.0
Mo	3.5
Ni	13.0
Cr	18.5
Fe	Balance

Description
EutecTrode E317L is designed to operate equally on DCEP and AC. it is particularly well-suited for all-position welding. The arc is easy to strike and the slag is easily removed. Weld deposits are smooth and evenly contoured.

Typical Mechanical Properties

Tensile Strength	88,500 psi (610 N/mm^2)
Yield Strength	68,000 psi (470 N/mm^2)
Elongation (1=5d)	35%
Hardness (BHN)	Approximately 210

Metallurgical Structure
Austenitic with approximately 10% ferrite

Welding Parameters (open circuit voltage - min 50)

Diameter	Amperage Range
3/32" (2.5mm)	50-80
1/8" (3.2mm)	80-120
5/32" (4.0mm)	100-160

Procedure
Maintain a short arc and avoid excessively large weld pools. Set the current somewhat tword the higher end of the amperage range, but avoid overheating. Interpass temperature should be kept below 200°F (100°C).

EutecTrode E347-16
E347-17

Used to weld the columbium and titanium-bearing steels such as types 321 and 347

Standards

AWS:	A5.4-92	Class. E347-17
ISO:	3581	Class. E19.9 Nb
DIN:	8556	Class. E 19 9 Nb R W.-Nr. 1.4551

Typical Composition (%) (undiluted weld metal)

C	0.02
Si	0.8
Mn	1.0
Ni	10.0
Cr	19.0
Cb	10 x C approximately
Fe	Balance

Description

EutecTrode E347 is a columbium-stabilized electrode with a modified rutile-lime coating. It is easy to use on either DCEP or AC and produces a smooth weld deposit surface with easy slag removal.

Typical Mechanical Properties

Tensile Strength	92,700 psi (640 N/mm^2)
Yield Strength	68,000 psi (470 N/mm^2)
Elongation (1=5d)	35%
Hardness (BHN)	Approximately 225

Metallurgical Structure

Austenitic with approximately 10% ferrite

Welding Parameters (open circuit voltage - min 50)

Diameter	Amperage Range
3/32" (2.5mm)	50-80
1/8" (3.2mm)	80-120
5/32" (4.0mm)	100-160

Procedure

Although contact welding can be done, a short arc will give a more uniform weld deposit. Avoid overheating, as titanium and columbium-containing steels are somewhat sensitive to hot cracking. It is recommended that the interpass temperature not exceed 200°F (100°C).

EutecTrodes: The Best in Stainless Steel

A wide variety of EutecTrode alloys are available for Shielded Metal Arc fabrication and maintenance of type 300 stainless steels. Compared to ordinary electrodes, EutecTrode stainless steel alloys allow you to reduce your cost by eliminating overheating and excess fuming. You get improved productivity from easier slag removal and less wasted material.

Quick Selection Guide

PRODUCT	FOR USE WITH AISI 300 SERIES GRADES	APPLICATION INDUSTRIES
EutecTrode E308L-17	304, 304L, 308, 308L	Food, Dairy, Brewing, Railway and Trucking
EutecTrode E309L-17	309, 309L	Petroleum, Food and Chemical processing
EutecTrode E310-17	310,310S	Chemical processing, Petroleum and Transportation
EutecTrode E312-17	Cast and wrought 29 Cr 9Ni steels and for dissimilar combinations.	Mining, Construction and Transportation
EutecTrode E316L-17	316, 316Ti, 318, 319L	Pulp and paper industries, Chemical, Marine, Food and Brewing
EutecTrode E317L-17	317, 317L, 316Li	Chemical, Paper and Textile
EutecTrode E347-17	347,321	Oil refining, Chemical processing and Petroleum

Notes for Welding the 300 Grade Stainless Steels

• The 300 Series of stainless steels have coefficients of expansion 50% higher than those of mild steel. Allowance should, therefore, be made for greater thermal expansion by increasing joint spacing when welding. This may help reduce undesirable warping.

• Stainless steels also have much higher electrical resistance than mild steel. To reduce electrode overheating problems, do not exceed the maximum recommended amperage for a selected diameter.

• Because the thermal conductivity of the 300 Series stainless steels is only half that of mild steel, distortion becomes even more of a problem. To prevent excessive heat build-up and resultant stressing and distortion, always use the smallest diameter rod that will do the job.

YOUR RESOURCE FOR PROTECTION, REPAIR AND JOINING SOLUTIONS

Castolin Eutectic®
Eutectic Castolin

Eutectic Corporation
N94 W14355 Garwin Mace Drive
Menomonee Falls, WI 53051 USA
P 800-558-8524 • F 262-255-5542
www.eutectic.com

Eutectic Services
12300 Carmen Avenue
Milwaukee, WI 53225 USA
P 800-558-8524 • F 262-255-5542

Whertec Technology Center
5409 Highway Avenue
Jacksonville, FL 32254 USA
P 866-207-6503 • F 904-213-8126
www.whertec.com