

Stainless Steel Welding Consumables

FOR CRYOGENIC AND LNG APPLICATIONS



Cryogenic Applications

Extreme cold temperatures can pose major challenges in producing and retaining quality welds. One industry that faces this challenge the most is the power generation industry, specifically Liquefied Natural Gas (or LNG) facilities. Natural gas, for ease of transporting or storing, must be cooled down to cryogenic temperature of -259 degrees Fahrenheit to convert the gas into a liquid state. This severe condition requires storage tanks, vessels, and pipes to have dependable welds. The need for toughness and ductility are critical. In order to achieve these properties, special weld deposit compositions are necessary.

Lincoln Electric offers a full line of low controlled ferrite (CF) austenitic stainless steel welding solutions for SMAW, GMAW, FCAW & GTAW process. Our line of controlled ferrite products perform with the essential mechanical properties to deliver when it is needed the most.

Purpose of Controlled Ferrite

Many metals become brittle in low temperature environment; however, controlled ferrite austenitic stainless filler metals are designed to retain their integrity under these severe conditions.

Our Controlled Ferrite product line bears a Welding Research Council ferrite range from 3-6 designed to:

- Minimize potential weld solidification defects
- Maximize toughness in low temperature applications
- Successfully perform in LNG storage and cryogenic service work environments

Quality Solution

Quality control is an essential part of Lincoln Electric's consumable manufacturing process. Consistency in the steel chemical composition helps ensure reliable electrode performance. As part of these high quality standards, Lincoln Electric analyzes every coil of incoming steel to ensure consistency.

All Lincoln Electric stainless welding consumables are Q2 Lot® tested and certified with actual composition and mechanical properties. For Lincoln CF (controlled ferrite) consumables, each Q2 Lot certificates show actual composition and mechanical properties including impact toughness at -320°F (-196°C) and lateral expansion.



Lincoln Electric Controlled Ferrite Products

Process	Stainless CF Product	Diameter in [mm]	Part Number
SMAW	Ultramet™ 308LCF	3/32 (2.5)	ED034811 / UM308LCF-25*
		1/8 (3.2)	ED034812 / UM308LCF-32*
		5/32 (4.0)	UM308LCF-40
	Ultramet™ 316LCF	3/32 (2.5)	ED034813 / UM316LCF-25*
		1/8 (3.2)	ED034814 / UM316LCF-32*
		5/32 (4.0)	UM316LCF-40
GMAW	Blue Max™ MIG 308/308LCF	0.035 (0.9)	ED034909
		0.045 (1.2)	ED034910
	Blue Max™ MIG 316/316LCF	0.035 (0.9)	ED034925
		0.045 (1.2)	ED034926
FCAW	Supercore™ 308LCF	0.045 (1.2)	ED034815 / SC308LCF-12*
	Supercore™ 316LCF	0.045 (1.2)	ED034816 / SC316LCF-12*
SAW	Lincolnweld® ER308/308LCF	5/64 (2.0)	ED034914
		3/32 (2.5)	ED034915
		1/8 (3.2)	ED034916
	Lincolnweld® ER316/316LCF	5/64 (2.0)	ED034930
		3/32 (2.5)	ED034931
		1/8 (3.2)	ED034932
GTAW	Lincoln® ER308/308LCF	1/16 (1.6)	ED034911
		3/32 (2.5)	ED034912
		1/8 (3.2)	ED034913
	Lincoln® ER316/316LCF	1/16 (1.6)	ED034927
		3/32 (2.5)	ED034928
		1/8 (3.2)	ED034929



*The ED0 numbers for these products will be replaced by the alternative part number listed, once stock is depleted.

Mechanical Properties

Process	Stainless CF Product	Yield Strength mpa (ksi)	Tensile Strength mpa (ksi)	Elongation %	Charpy V-Notch J (ft-lbf) @ -196°C (-320°F)	Lateral Expansion mils (mm)
SMAW	Ultramet™ 308LCF	445 [65]	600 [87]	50	45 [33]	19.7 [0.50]
	Ultramet™ 316LCF	440 [64]	595 [83]	43	30 [22]	18 [0.45]
GMAW ^[1]	Blue Max™ MIG 308/308LCF	430 [63]	600 [88]	35	34 [47]	24 [0.61]
	Blue Max™ MIG 316/316LCF	410 [69]	580 [85]	36	42 [56]	27 [0.69]
FCAW ^[2]	Supercore™ 308LCF	400 [58]	540 [78]	59	36 [27]	28 [0.70]
	Supercore™ 316LCF	410 [69]	550 [80]	40	34 [25]	22 [0.55]
SAW ^[3]	Lincolnweld® ER308/308LCF	410 [59]	570 [82]	32	48 [36]	17 [0.43]
	Lincolnweld® ER316/316LCF	420 [61]	610 [89]	43	53 [39]	20 [0.51]
GTAW ^[4]	Lincoln® ER308/308LCF	430 [63]	590 [86]	42	62 [84]	38 [0.97]
	Lincoln® ER316/316LCF	430 [63]	570 [83]	42	70 [95]	42 [1.1]

^[1] GMAW 98% Ar/2% O₂
^[2] FCAW 80% Ar/20% CO₂
^[3] SAW test results with Lincolnweld P2007 flux
^[4] GTAW 100% Argon

CUSTOMER ASSISTANCE POLICY

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

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