CUT LENGTH PRODUCT CATALOG

For Mild and Low Alloy Steel, Stainless Steel, and Aluminum Alloys

LINCOLN® ELECTRIC

THE WELDING EXPERTS®

About The Lincoln Electric Company

Lincoln Electric is the world's leading manufacturer of welding equipment and consumables. Our focus is on helping companies make their welding operations more effective, more efficient, more profitable.

We are dedicated to two equally important goals: exceptional quality and exceptional service. Our field support team — with hundreds of field sales engineers and thousands of knowledgeable and responsive Lincoln distributors in countries all over the world — is the largest in the industry.

Innovative thinking.

A quality, service-first attitude.

Fresh approaches to design, manufacturing, and packaging.

Worldwide strength.

That's Lincoln Electric.

Lincoln Electric® Cut Length Consumables

The Lincoln Electric Company has manufactured the world's most respected welding consumables for almost a century. That expertise in Controlled Chemical Composition, a time-tested employee involvement quality control system and the most carefully selected raw materials in the industry make Lincoln Electric® consumables the frequent performance standard for many arc welding processes. Cut length consumables for TIG and oxy-fuel welding are no different.

Only The Best Will Do

Unlike other manufacturers, Lincoln Electric® does not just request material from a steel or alloy mill that simply meets American Welding Society requirements. Instead, we often specify material chemistry for as many as 15 chemical elements, rather than the more common five required by AWS. In addition, our specification ranges are frequently much tighter than the wide ranges allowed by AWS for some elements. The result is more tightly controlled chemical composition. . . and that provides you with more consistent performance at the arc.

Controlled Chemical Compostion

Buying smarter from the mill is only the beginning. We then test the beginning and end of every coil of incoming material from the mill for up to 28 different elements. Why? Because segregating material to this degree allows us to optimize raw material for different rod diameters and other parameters. Again, the end result is the most consistent performing TIG and oxy-fuel welding consumables on the market. Our pre-process chemical composition tests, in-line diameter monitoring and post-production surface finish checks ensure the last filler rod length performs exactly like the first you pulled from the package, pallet or lot.

Popular Options

Lincoln Electric® cut length consumables are sold in an economical 36" (914 mm) length and are embossed on each end of the rod for easy alloy identification on the job. Each alloy is offered in the most popular packages and rod diameters intended for almost any welding application.

Welding Solutions You Can Trust

You've trusted Lincoln Electric® for years to deliver reliable welding equipment, the best welding consumables and top-notch training and application expertise. You can also count on Lincoln Electric® to provide you with the most consistent rod diameter, operator appeal and puddle control for your critical TIG and oxy-fuel welding applications. Your reputation, as well as ours, depends on it.

CUT LENGTH CONSUMABLES SELECTION GUIDE

Electrode Name	AWS Number	General Description	Page No.
Mild and Low Alloy Steel - Oxy-Fuel Gas Welding			
Lincoln R45	R45	A general purpose, copper coated, low carbon steel, oxy-fuel rod widely used on mild steel. Good ductility and machinability.	4
Lincoln R60	R60	A high strength, copper coated, oxy-fuel welding cut length consumable for welding a variety of steels where additional strength and ductility are needed. Weld deposit responds favorably to heat treatment and flame hardening.	4
Mild and Low Alloy Steel - TIG Welding			
Lincoln ER70S-2	ER70S-2	Triple deoxidized wire containing zirconium, titanium, and aluminum in addition to silicon and manganese. Produces x-ray quality welds over most surface conditions. Recommended for TIG welding on all grades of mild steel.	5
Lincoln ER70S-6	ER70S-6	For TIG welding, Lincoln ER70S-6 has high levels of silicon and manganese to be used on slightly contaminated base materials. Higher levels of silicon and manganese allow for better puddle fluidity and excellent wetting action.	5
Stainless Steel - TIG Welding			
Lincoln ER308/308L	ER308/308L	Most frequently used for base metals of similar composition. The dual classification ensures the maximum carbon content is 0.03% to increase resistance to intergranular corrosion.	6
Lincoln ER309/309L	ER309/309L	Used for welding similar alloys in wrought or cast form. Occasionally used for welding 18-8 base metals when severe corrosion conditions exist, and at times, welding dissimilar steels. Intergranular corrosion resistance is maximized by keeping the carbon content at or below 0.03%.	6
Lincoln ER316/316L	ER316/316L	Used for welding similar alloys (containing approximately 2% molybdenum). Also used for high temperature service applications. The maximum carbon content is maintained at or below 0.03% to increase resistance to intergranular corrosion. Can be used for welding molybdenum-bearing austenitic alloys containing 0.03% maximum carbon.	6
Aluminum - TIG Welding			
SuperGlaze® 4043	ER4043	Aluminum-silicon alloy for use on many weldable cast and wrought aluminum alloys. SuperGlaze® 4043 rod is generally recommended for welding 5052, any 6000 series aluminum alloys, and castings.	7
SuperGlaze® 5356	ER5356	Aluminum-mangesium alloy for use on many weldable cast and wrought aluminum alloys. SuperGlaze® 5356 is generally recommended for welding any 5000 or 6000 series aluminum alloys. Excellent for color matching after anodizing.	7

Important Information on our Website

Consumable AWS Certificates:
www.lincolnelectric.com/products/certificates/

Material Safety Data Sheets (MSDS):
www.lincolnelectric.com/products/msds/

ANSI Z49.1 Safety in Welding and Cutting and Arc Welding Safety Checklist:
www.lincolnelectric.com/community/safety/

Request E205 Safety Booklet:
www.lincolnelectric.com/pdfs/products/literature/e205.pdf

Lincoln R45, Lincoln R60

Mild and Low Alloy Steel – Oxy-Fuel Gas Welding (R45, R60)

Lincoln R45
A general purpose, copper coated, low carbon steel, oxy-fuel cut length consumable widely used on mild steel with good ductility and machinability.

Lincoln R60
A high strength, copper coated, oxy-fuel welding rod for welding a variety of steels where additional strength and ductility are needed. Weld deposit responds favorably to heat treatment and flame hardening.

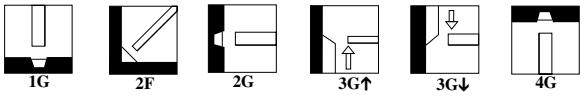
Advantage Lincoln

- 36" (914 mm) cut length rods embossed on each end for ease of alloy identification even after the rod is partially consumed.
- Packaged in 2 lb. (1.0 kg) tubes and 10 lb. (4.5 kg) cartons in a variety of wire diameters for virtually every welding need.
- ISO 14001 and 9001 certified - manufactured to standards for environmental and quality management systems.

Typical Applications

- General purpose applications for oxy-fuel welding of mild and low alloy steels. Not recommended for TIG welding.
- Carbon steel pipes in power plants.
- Process piping.

Welding Positions



Conformance

AWS A5.2: R45, R60
ASME SFA-5.2: R45, R60

ROD COMPOSITION - As required per AWS A5.2[1]

	%C	%Mn	%S	%Si	%P	%Cu	%CR	%NI	%MO	%Al
Lincoln R45 AWS Requirements	0.08 max.	0.50 max.	0.040 max.	0.10 max.	0.035 max.	0.30 max.	0.20 max.	0.30 max.	0.20 max.	0.02 max.
Actual Results	0.07	0.46	0.009	0.03	0.008	0.08	0.03	0.01	0.01	<0.01
Lincoln R60 AWS Requirements	0.15 max.	0.90-1.40	0.035 max.	0.10-.35	0.035 max.	0.30 max.	0.20 max.	0.30 max.	0.20 max.	0.02 max.
Actual Results	0.11	0.92	0.012	0.21	0.005	0.14	0.05	0.06	0.01	0.01

[1] Single values are maximums.

DIAMETERS / PACKAGING

Diameter Inches (mm)	2 lb. (1 kg) Tube 20 lb. (9 kg) Master Carton	10 lb. (4.5 kg) Carton
Lincoln R45		
1/16 (1.6)	ED025392	ED025394
3/32 (2.4)	ED025395	ED025397
1/8 (3.2)	ED025398	ED025400
Lincoln R60		
1/16 (1.6)	ED025401	ED025403
3/32 (2.4)	ED025404	ED025406
1/8 (3.2)	ED025407	ED025409

Lincoln ER70S-2, Lincoln ER70S-6

Mild and Low Alloy Steel – TIG Welding (AWS ER70S-2, ER70S-6)

Lincoln ER70S-2

A general purpose, copper coated, low carbon steel, oxy-fuel cut length consumable widely used on mild steel. Good ductility and machinability.

Lincoln ER70S-6

For TIG welding, Lincoln ER70S-6 has high levels of silicon and manganese to be used on slightly contaminated base materials. Higher levels of silicon and manganese allow for better puddle fluidity and excellent wetting action.

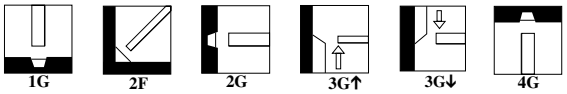
Advantage Lincoln

- Capable of x-ray quality welds.
- 36" (914 mm) cut length rods embossed on each end for ease of alloy identification even after the rod is partially consumed.
- Packaged in 5 lb. (2.3 kg) tubes, and 10 lb. or 50 lb. (4.5 or 22.7 kg) cartons, for the hobbyist through heavy industrial use.
- Available in a variety of electrode diameters for virtually every welding need.
- ISO 14001 and 9001 certified - manufactured to standards for environmental and quality management systems.

Typical Applications

- General purpose applications for TIG welding a variety of mild and low alloy steel.
- Tubing and sheet metal applications.
- Repairs to mild steel and low alloy steel parts.
- Root pass pipe welding.
- Small diameter piping, tubing.

Welding Positions



Conformance

AWS A5.18: ER70S-2, ER70S-6
ASME SFA-5.18: ER70S-2, ER70S-6

ROD COMPOSITION - As required per AWS A5.18

	%C	%Mn	%S	%Si	%P	%Cu	%Cr	%Ni	%MO	%V	%Al	%Ti	%Zr
Lincoln ER70S-2 AWS Requirements	0.07 max.	0.90-1.40	0.035 max.	0.40-0.70	0.0025 max.	0.50 max.	(1)	(1)	(1)	(1)	0.05-0.15	0.05-0.15	0.02-0.12
Actual Results	0.04	1.08	0.005	0.55	0.003	0.20	0.08	0.08	0.08	<0.002	0.08	0.10	0.07
Lincoln ER70S-6 AWS Requirements	0.06-0.15	1.40-1.85	0.035 max.	0.80-1.15	0.025 max.	0.50 max.	(1)	(1)	(1)	(1)		Not Specified	
Actual Results	0.09	1.63	0.007	0.90	0.007	0.20	0.05	0.05	0.05	0.05	—	—	—

(1) Total 0.50% maximum, combined.

DIAMETERS / PACKAGING

Diameter Inches (mm)	5 lb. (2.3 kg) Tube 20 lb. (9 kg) Master Carton	10 lb. (4.5 kg) Carton	50 lb. (22.7 kg) Carton
Lincoln ER70S-2			
1/16 (1.6)	ED025880	ED025439	ED026649
3/32 (2.4)	ED025881	ED025442	ED026650
1/8 (3.2)	ED025882	ED025445	ED026651
Lincoln ER70S-6			
1/16 (1.6)	ED025877	ED025448	ED026652
3/32 (2.4)	ED025878	ED025451	ED026653
1/8 (3.2)	ED025879	ED025454	ED026654

Lincoln ER308/308L, ER309/309L, ER316/316L

Stainless Steel – TIG Welding (AWS ER308/308L, ER309/309L, ER316/316L)

Lincoln ER308/308L
Most frequently used for base metals of similar composition. The dual classification ensures the maximum carbon content is 0.03% to increase resistance to intergranular corrosion.

Lincoln ER309/309L
Used for welding similar alloys in wrought or cast form. Occasionally used for welding 18-8 base metals when severe corrosion conditions exist, and at times, welding dissimilar steels. Intergranular corrosion resistance is maximized by keeping the carbon content at or below 0.03%.

Lincoln ER316/316L
Used for welding similar alloys (containing approximately 2% molybdenum). Also used for high temperature service applications. The maximum carbon content is maintained at or below 0.03% to increase resistance to intergranular corrosion. Can be used for welding molybdenum-bearing austenitic alloys containing 0.03% maximum carbon.

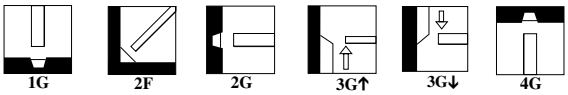
Advantage Lincoln

- Capable of x-ray quality welds.
- Manufactured under lot control. Certificate of Test is available upon request.
- 36" (914 mm) cut length rods embossed on each end for ease of alloy identification even after the rod is partially consumed.
- Packaged in 1 lb. or 5 lb. (0.5 or 2.3 kg) tubes, and 10 lb. or 50 lb. (4.5 or 22.7 kg) cartons, in a variety of wire diameters for virtually every welding application.
- ISO 14001 and 9001 certified - manufactured to standards for environmental and quality management systems.

Typical Applications

- Sheet metal applications on the appropriate stainless steel base metals.
- High pressure piping and tubing.

Welding Positions



Conformance

AWS A5.9: ER308/308L, ER309/309L, ER316/316L
ASME SFA-5.9: ER308/308L,ER309/309L, ER316/316L

ROD COMPOSITION - As required per AWS A5.9

	%C	%Mn	%S	%Si	%P	%Cu	%Cr	%Ni	%MO	Total Others
Lincoln ER308/308L AWS Requirements	0.03 max.	1.0-2.5	0.03 max.	0.30-0 .65	0.03 max.	0.75 max.	19.5-22.0	9.0-11.0	0.75 max.	0.50 max.
Actual Results	0.02	1.6	0.02	0.44	0.02	0.11	20.2	9.2	0.03	0.03
Lincoln ER309/309L AWS Requirements	0.03 max.	1.0-2.5	0.03 max.	0.30-0.65	0.03 max.	0.75 max.	23.0-25.0	12.0-14.0	0.75 max.	0.50 max.
Actual Results	0.02	1.8	0.01	0.51	0.02	0.05	23.7	13.9	0.04	0.06
Lincoln ER316/316L AWS Requirements	0.03 max.	1.0-2.5	0.03 max.	0.30-0.65	0.03 max.	0.75 max.	18.0-20.0	11.0-14.0	2.0-3.0 max.	0.50 max.
Actual Results	0.01	1.7	0.01	0.49	0.01	0.08	19.2	12.0	2.2	0.04

DIAMETERS / PACKAGING

Diameter Inches (mm)	1 lb. (0.5 kg) Tube 10 lb. (4.5 kg) Master Carton	5 lb. (2.3 kg) Tube 20 lb. (9 kg) Master Carton	10 lb. (4.5 kg) Carton	50 lb. (22.7 kg) Carton
Lincoln ER308/308L				
1/16 (1.6)	ED025410	—	ED025412	ED026655
3/32 (2.4)	ED025413	—	ED025415	ED026656
1/8 (3.2)	ED025416	—	ED025418	ED026657
Lincoln ER309/309L				
1/16 (1.6)	ED025419	—	ED025421	ED026658
3/32 (2.4)	ED025422	—	ED025424	ED026659
1/8 (3.2)	ED025425	—	ED025427	ED026660
Lincoln ER316/316L				
1/16 (1.6)	ED025428	ED025860	ED025430	ED026661
3/32 (2.4)	ED025431	ED025861	ED025433	ED026662
1/8 (3.2)	ED025434	ED025862	ED025436	ED026663

SuperGlaze® 4043, 5356

Aluminum – TIG Welding (ER4043, ER5356)

SuperGlaze® 4043
Aluminum-silicon alloy for use on many weldable cast and wrought aluminum alloys. SuperGlaze® 4043 rod is generally recommended for welding 5052, any 6000 series alloys and castings.

SuperGlaze® 5356
Aluminum-mangesium alloy for use on many weldable cast and wrought aluminum alloys. SuperGlaze® 5356 is generally recommended for welding any 5000 or 6000 series aluminum alloys. Excellent for color matching after anodizing.

Advantage Lincoln

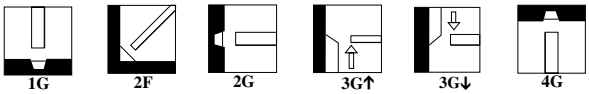
- Pristine surface condition monitored in the manufacturing process to ensure excellent weld quality.
- 36" (914 mm) cut length rods embossed on each end for ease of alloy identification even after the rod is partially consumed.
- Packaged in 10 lb. or 25 lb. (4.5 or 11.3 kg) cartons, in a variety of wire diameters for virtually every welding application.
- ISO 14001 and 9001 certified - manufactured to standards for environmental and quality management systems.

Typical Applications

SuperGlaze® 4043:
- Bicycle frames
- Heat Exchangers
- Electrical bus bars

SuperGlaze® 5356:
- Architectural structures
- Armored vehicles
- Gun mount bases

Welding Positions



Conformance

AWS A5.10: ER4043, ER5356
ASME SFA-5.10: ER4043, ER5356

ROD COMPOSITION - As required per AWS A5.10

	%Si	%Fe	%Cu	%Mn	%Mg	%Zn	%Ti	%Cr	%Be	%Al
SuperGlaze® 4043 AWS Requirements	4.5-6.0	0.8 max.	0.30 max.	0.05 max.	0.05 max.	0.10 max.	0.20 max.	Not Specified	0.0008 max.	Balance
Actual Results	5.01	0.13	0.008	0.009	0.03	0.002	0.007	—	0.0002	Balance
SuperGlaze® 5356 AWS Requirements	0.25 max.	0.40 max.	0.10 max.	0.05-0.20	4.5-5.5	0.10 max.	0.06-0.20	0.05-0.20	0.0008 max.	Balance
Actual Results	0.06	0.09	0.02	0.12	4.84	0.001	0.09	0.12	0.0002	Balance

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 lb. (4.5 kg) Carton	25 lb. (11.3 kg) Carton
SuperGlaze® 4043		
1/16 (1.6)	ED031111	ED026664
3/32 (2.4)	ED031112	ED026665
1/8 (3.2)	ED031113	ED026666
SuperGlaze® 5356		
1/16 (1.6)	ED031108	ED026667
3/32 (2.4)	ED031109	ED026668
1/8 (3.2)	ED031110	ED026669

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CUSTOMER ASSISTANCE POLICY

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