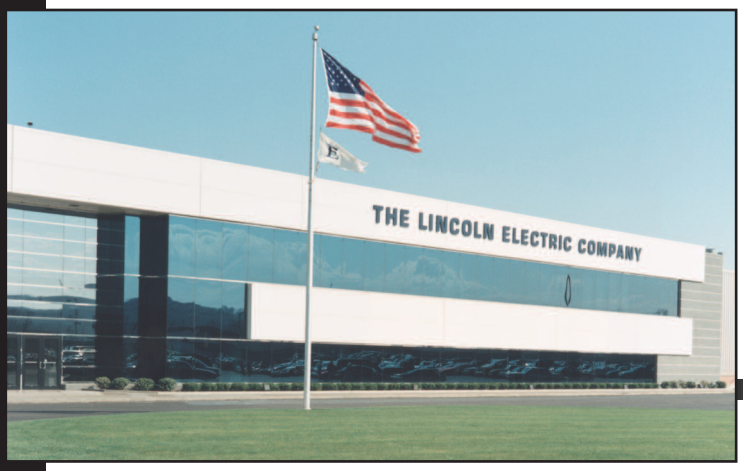
Lincolnweld®

Submerged Arc Consumables Catalog

www.lincolnelectric.com

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 helping companies make their welding operations more effective, more efficient, and 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. For a quality, service-first attitude; innovative design, manufacturing, and packaging; and worldwide strength—Choose Lincoln.

Lincolnweld® Submerged Arc Fluxes & Wires

Combining over 70 years of experience in flux design and manufacturing with our full line of solid and cored wires for subarc welding, the Lincoln Electric Company is your best source for the submerged arc flux and wire combination needed for your application.

Lincoln stands by its name on the plastic bag or hermetically-sealed plastic pail (just to name a few of our packaging choices) and the company's unparalleled welding expertise is in each product.

Better Chemistry

At Lincoln Electric, raw material to be used in our submerged arc wires is meticulously checked for 19 different elements before it enters our manufacturing system. Then we verify the chemistry at more than a dozen separate points during the manufacturing process.

Extensive Product Line

With over 100 flux / wire combinations to choose from, there's a great Lincolnweld® combination for whatever your job demands.

Better Manufacturing Systems

Manufacturing facilities are ISO 9001 and 14001 certified and Lincolnweld® consumables are manufactured to standards for environmental and quality management systems. The result is a flux and wire of consistently superior quality– time after time.

Wide Variety of Lincolnweld® Fluxes

Whether you choose an active flux for improved resistance to porosity, one of our neutral fluxes for multiple pass welding, or an alloy flux, we're confident this catalog will help you choose the right flux and wire for your project.

Lincolnweld®

Contents Page

Built and Backed by the Worldwide Leader in Welding & Cutting

Lincoln Electric submerged arc fluxes and wires are engineered, manufactured, and backed by the most respected welding company in the world. When quality, consistency, and value matter, the world's most demanding welding professionals demand products from Lincoln Electric.

Support

Additional technical support is available at www.lincolnelectric.com or from your local technical sales representative.

Important Information On Our Website

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

Actual Certificate of Chemical Composition:
http://www.mylincolnelectric.com/LEExtranet/MyLincolnCerts/site/ActualResults.aspx

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

Arc Welding Safely Checklist:
http://www.lincolnelectric.com/community/safety/

Safe Practices Article:
http://www.lincolnelectric.com/knowledge/articles/content/lenstaybl.asp

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

Submerged Arc Fluxes

The Lincoln Electric Company manufactures three general types of submerged arc fluxes:

- Active fluxes
- Neutral fluxes
- Alloy fluxes

With all submerged arc fluxes, variations in arc voltage change flux consumption. Higher arc voltages and the resulting longer arc length increase the amount of flux melted or consumed. Consequently, when a flux contains an alloy as an ingredient, increasing the arc voltage increases the amount of alloy recovered in the weld deposit.

Types and General Characteristics

Active Fluxes

American Welding Society (AWS) defines active fluxes as those which contain small amounts of manganese, silicon, or both. These deoxidizers are added to the flux to provide improved resistance to porosity and weld cracking caused by contaminants on or in the base metal.

The primary use for active fluxes is to make single pass welds, especially on oxidized base metal.

Alloy in the weld deposit will vary with changes in the arc voltage. An increase in deposit alloy increases the strength level of the weld metal, but might lower the impact properties. For this reason, voltage must be more tightly controlled for multiple pass welding with active fluxes than when using neutral fluxes. Because of this, Lincoln Electric does not recommend using active fluxes (our 700 series) for multiple pass welding of plates over 25 mm (1 in.) thick.

Neutral Fluxes

The AWS defines neutral fluxes as those which will not produce any significant change in the all-weld metal composition as a result of a large change in the arc voltage, and thus, the arc length.

Neutral fluxes are used in multiple pass welding, especially when the base plate exceeds 25 mm (1 in.) in thickness. They are also used for general welding on clean steel. Note the following considerations concerning neutral fluxes:

1. Since neutral fluxes contain little or no alloy, they have little resistance to cracking and/or porosity caused by contaminants, especially on single pass welds. For this reason, active fluxes are usually the best choice for single pass welding.
2. Even when a neutral flux is used to maintain the weld metal composition through a range of welding voltage, weld properties, such as strength level and impact properties, can change because of changes in cooling rate, penetration, heat input and number of passes.

Alloy Fluxes

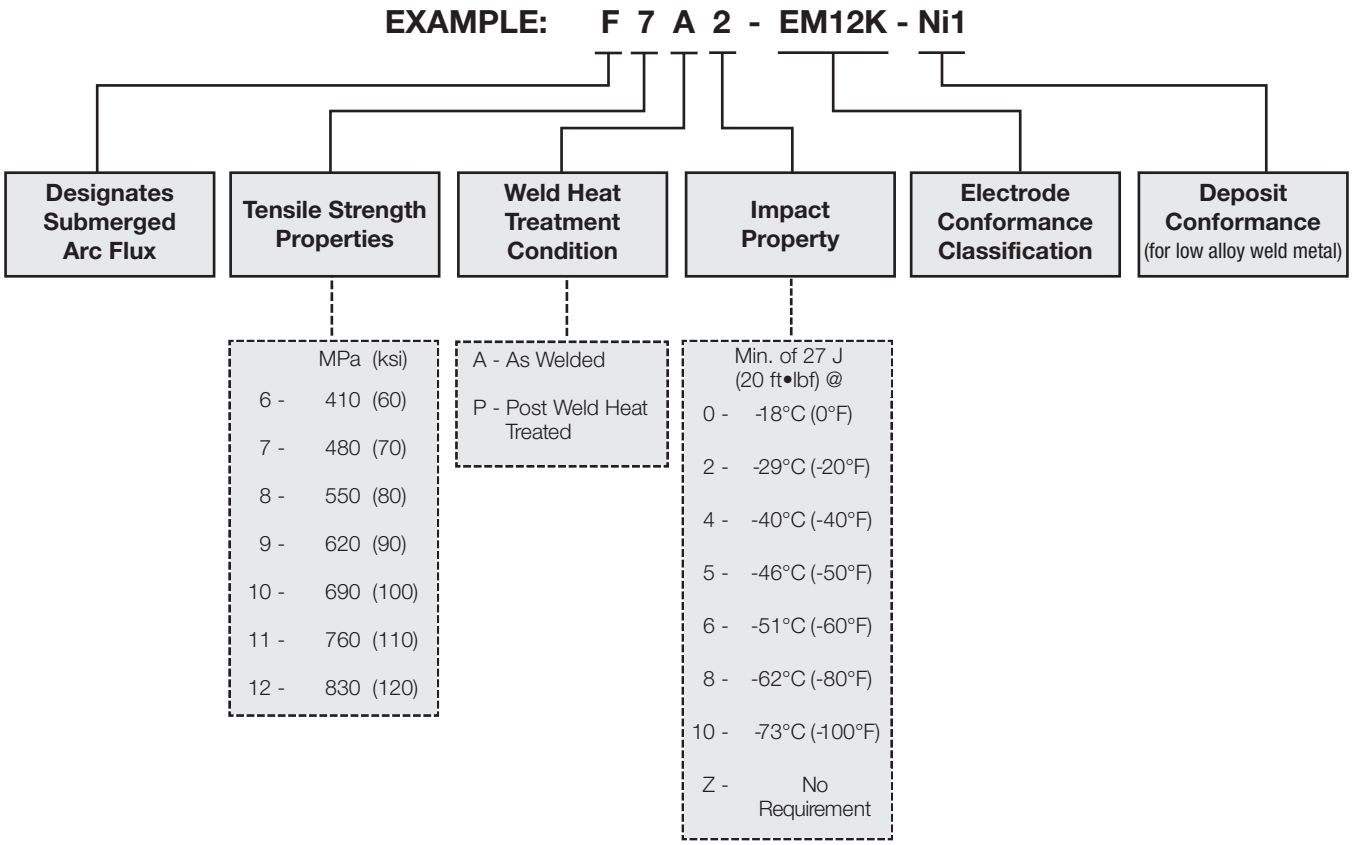
AWS defines alloy fluxes as those which can be used with a plain carbon steel electrode to make an alloy weld deposit. The alloys for the weld deposit are added as ingredients in flux.

The primary use of alloy fluxes is hardfacing applications.

Since the alloy level in the weld deposit is dependent upon the correct arc voltage, and thus arc length, it is very important that the voltage is carefully controlled to ensure that the intended alloy is reached in the deposit.

Flux-Electrode Classifications

For Welding Carbon and High Strength Low Alloy Steels



AWS-ASME Classification System

The number illustrated above designates a flux which, when used with an EM12K electrode, produces an all-weld metal deposit of 780 - 650 MPa (70-95 ksi) tensile, 400 MPa (58 ksi) minimum yield, 22% minimum elongation, and 27 J (20 ft•lbf) minimum @ -29ºC (-20ºF) impacts and the deposited weld metal meets a Ni1 composition when welded and tested in accordance with AWS A5.23.

In situations where it is necessary to determine whether a flux and electrode combination is neutral or active, the Wall Neutrality Number is a convenient relative measure. The Wall Neutrality Number addresses carbon steel weld metals with regard to their manganese and silicon content. It does not address alloy fluxes. For an electrode-flux combination to be considered neutral it should have a Wall Neutrality Number of 35 or lower.

Consult AWS specification A5.17 or A5.23 for information on determining Wall Neutrality Numbers.

Flux/Wire Conformance Testing

Lincoln Electric flux/wire combinations meet the AWS-ASME conformance listed on pages 44-45 when tested in accordance with AWS specifications A5.17 or A5.23 as appropriate.

Selecting Flux/Wire Combinations

Guidelines for Selecting a Submerged Arc Flux/Wire Combination

Lincolnweld® submerged arc electrode and flux combinations come with certificates of conformance. To access these certificates, follow the directions below.

1. Go to the Lincoln Electric homepage at **www.lincolnelectric.com.**
2. Click on “Quick Links” and select “AWS & Lot Test Certs” from the top of the screen. (Image 1)
3. Under “Certificates of Conformance,” you can choose a Product or a Flux Combination. This will bring up the most recent Certificate of Conformance. (Image 2)

How to Look for Flux/Wire Combinations that meet your required Mechanical Properties:

Tensile Strength

1. In the second box under “Certificates of Conformance,” you can “Search by Name / Cert # / Classification.”
2. Enter F#P or F#A. Where # is 10X the required Tensile Strength in ksi. P= Stress Relieved, A= As-Welded.
   a. For example, entering F7P would mean you are looking for a flux/wire combination with 70 ksi Tensile Strength in the Stress Relieved Condition.

Impact Requirements

1. In the list of matches for your required Tensile Strength, you can see which Flux/Wire Combinations also meet your Impact Property Requirements.
2. If you need to meet Impact Requirements at a certain value, note that the digit following the “A” or “P” in the classifications shows the temperature at which the weld metal achieves a minimum of 27 J (20 ft•lbf).
   a. For example, a classification beginning with F7P2 would mean that the flux/wire combination meets 70 ksi Tensile Strength in the Stress Relieved Condition and Impact Requirements of 27 J (20 ft•lbf) at -20°C (-20°F).

In general, if you are familiar with one of the listed fluxes, you might want to choose that option. From an operator’s standpoint, it is easier to change electrode than to re-set procedures for a new flux.

If you are welding high strength or highly restrained steel, you might want to choose a Flux/Wire Combination with a lower diffusible hydrogen level, which is designated by the number following -H in the flux/wire classification.

If you have limits on the compositions of the electrode or the weld metal, click on a Flux/Wire Combination to see the test results. Remember that these results represent undiluted weld metal from a standardized test and may be different from your application, especially if variations in base metal, heat input or pass sequence are present.

Your Lincoln Electric Technical Sales Representatives is there to help you make the best flux/wire selection for your application. Please contact them with any questions.

Selecting Flux/Wire Combinations

Image 1:

At the Lincoln Electric homepage select "AWS & Lot Test Certs" from the Quick Links drop down menu.

Image 2:

At the Certificate Center, enter a product name or search by Name, Cert #, or Classification. Search results will appear below.

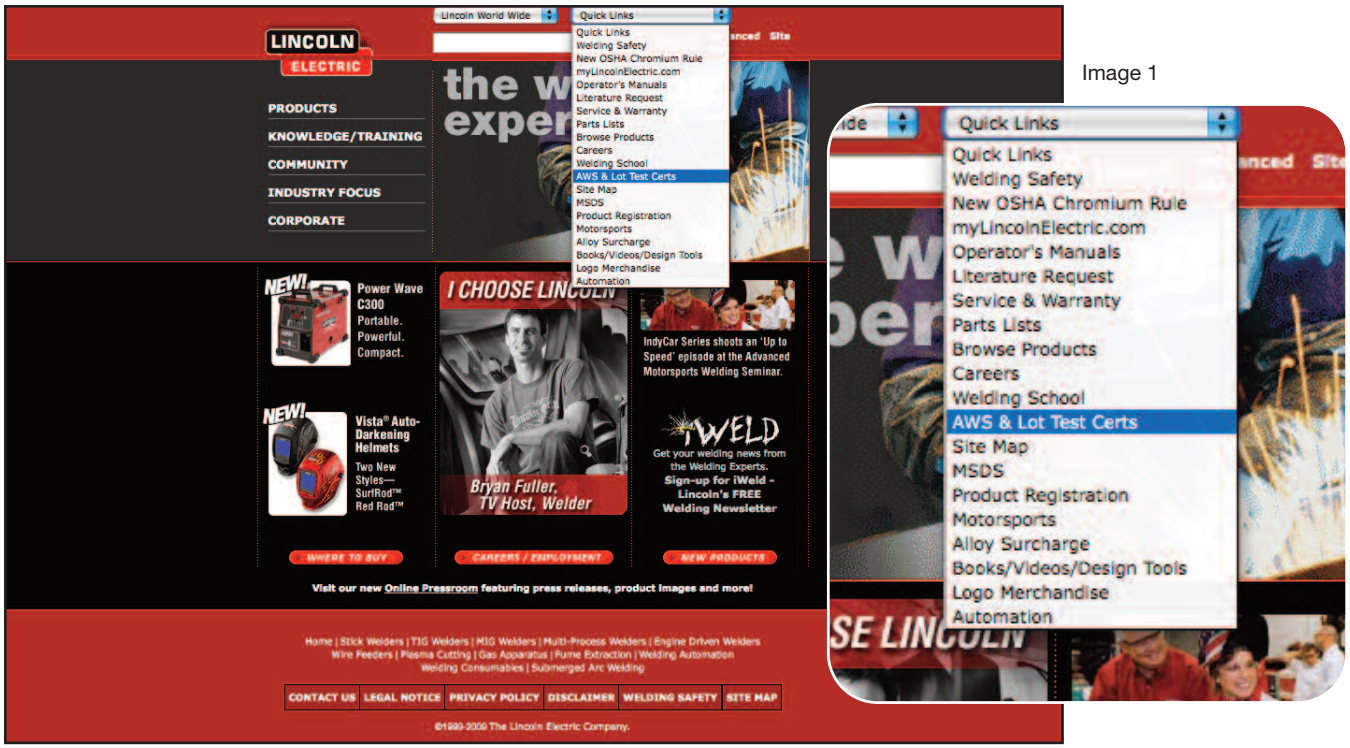


Image 1

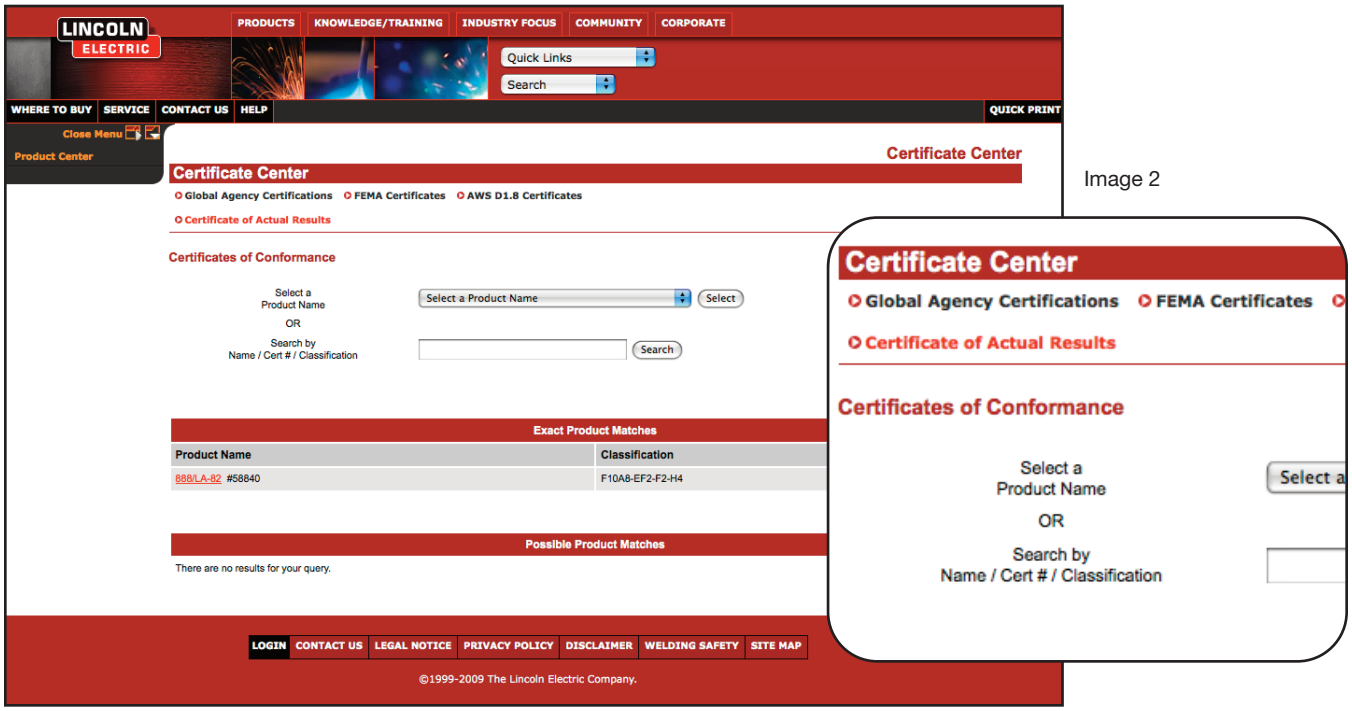


Image 2

LINCOLNWELD® FLUX SELECTION GUIDE

Flux Name	General Description	Page No.
700 Series Active Flux		
Lincolnweld® 760	Lincolnweld® 760 is highly active and designed to handle rust and mill scale. It is recommended for applications where porosity caused by arc blow is a challenge. For excellent bead appearance on flat fillet welds – choose Lincolnweld® 760.	12
Lincolnweld® 761	Lincolnweld® 761 is a manganese alloying and carbon reducing flux designed to provide superior crack resistance. It is recommended for limited pass welding with Lincolnweld® solid electrodes. For good bead appearance – choose Lincolnweld® 761.	13
Lincolnweld® 780	Lincolnweld® 780 features fast freezing slag for easy removal and minimized spilling. When paired with Lincolnweld® L-61 it is recommended for up to three pass welding applications. For low flash-through, excellent bead shape, and easy slag removal – choose Lincolnweld® 780.	14
Lincolnweld® 781	Lincolnweld® 781 features fast follow characteristics that allow for uniform welds at high speeds without undercut or voids. It is recommended for high speed, limited pass welding on clean plate and sheet steel. For good wetting action and uniform welds at high speeds – choose Lincolnweld® 781.	15
800 Series Neutral Flux		
Lincolnweld® 860	Lincolnweld® 860 offers excellent operating characteristics in a variety of general welding applications. For double joining pipe, pressure vessel and general fabrication welding applications – choose Lincolnweld® 860.	16
Lincolnweld® 865	Lincolnweld® 865 is a general purpose flux designed to weld butt joints and flat and horizontal fillets. When used with Lincolnweld® L-50 or L-61, it is capable of producing 480 MPa (70 ksi) tensile strength as welded or after short- or long-term stress relief. For stress relieved applications with Lincolnweld® L-61 electrode – choose Lincolnweld® 865.	17
Lincolnweld® 880	Lincolnweld® 880 is designed to obtain increased de-oxidation and optimal bead appearance when used with solid low alloy steel electrodes with a minimum of 0.20% silicon. It is also recommended for use with Lincolnweld® LAC series of low alloy flux-cored electrodes and many Lincore® flux-cored stainless and hardfacing electrodes. For a smooth bead appearance on low alloy or hardfacing welding applications – choose Lincolnweld® 880.	18
Lincolnweld® 880M	Lincolnweld® 880M is a basic flux which features industry proven results in multiple pass applications. It is recommended for welding with solid mild steel and low alloy electrodes, as well as Lincoln's LAC series of low alloy flux-cored electrodes. For an excellent AC welding flux – choose Lincolnweld® 880M.	19
Lincolnweld® 882	Lincolnweld® 882 is designed for a variety of welding applications and is known for providing good bead appearance and consistent mechanical properties. It is recommended for stainless steel welding and can be paired with both mild and low alloy steel electrodes. For a multi-purpose flux designed to accommodate a wide range of welding applications – choose Lincolnweld® 882.	20
Lincolnweld® 888™	Lincolnweld® 888™ is a basic flux designed for use in critical applications. It is recommended for joining mild steel and low alloy steels in as-welded and stress-relieved applications, typical of the offshore and structural fabrication industries. For a flux capable of low diffusible hydrogen levels and exceptional deep groove slag removal – choose Lincolnweld® 888™.	21-22
Lincolnweld® 8500	Lincolnweld® 8500 is capable of providing impact properties necessary for thick weld joints from root to cap pass. It is recommended for multi-pass welding with mild and low alloy steel electrodes in both single and multiple arc configurations. For superior impact properties with a variety of alloys – choose Lincolnweld® 8500.	23

LINCOLNWELD® FLUX SELECTION GUIDE

Flux Name	General Description	Page No.
800 Series Neutral Flux (continued)		
Lincolnweld® MIL800-H	Lincolnweld® MIL800-H is capable of providing industry leading H2 diffusible hydrogen levels and is designed for low temperature applications. It is recommended for both single and multiple arc welding of both butt and fillet welds. For low diffusible hydrogen capability on a wide variety of submerged arc welding applications – choose Lincolnweld® MIL800-H.	24
Special Neutral Flux		
Lincolnweld® 960	Lincolnweld® 960 is a low cost, general purpose flux designed to weld butt joints and both single and multiple pass fillets. It is recommended for automatic and semiautomatic submerged arc welding. For a versatile, cost-effective flux that can be used with many alloy systems and can be used on A588 weathering steels when combined with Lincolnweld® LA-75 – choose Lincolnweld® 960.	25
Lincolnweld® 980	Lincolnweld® 980 combines many of the features of the 700 and 800 series fluxes and is ideal for semiautomatic submerged arc welding throughout the shop. For exceptional resistance to flash-through and porosity caused by arc blow in a variety of applications – choose Lincolnweld® 980.	26
Lincolnweld® WTX™	Lincolnweld® WTX™ is a neutral submerged arc welding flux designed to meet the specific requirements of wind tower welding applications. It is recommended for use with Lincolnweld® L-61 electrode on both longitudinal and circumferential seam welds. The combination of Lincolnweld® L-61 and WTX™ is capable of exceeding the mechanical property requirements specified for cold weather wind tower applications.	27
Flux for Seam Welding of Pipe		
Lincolnweld® 761-Pipe	Lincolnweld® 761-Pipe features the chemical composition of 761 with a particle size optimized for seam welding. The low-melting slag system produces wide flat welds with superior resistance to cracks and pockmarking. For AC spiral and longitudinal pipe welding applications – choose Lincolnweld® 761-Pipe.	28
Lincolnweld® P223	Lincolnweld® P223 is an industry standard for pipe welding on up to X80 grade pipe. It is recommended for many two-run welding applications, but can also be used in multiple pass welding because it is neutral. For fast freezing slag characteristics ideal for welding small diameter pipe – choose Lincolnweld® P223.	29
Lincolnweld® SPX80™	Lincolnweld® SPX80™ is a pipe welding flux designed to meet the specific requirements of spiral pipe seam welding of up to API X80 grade pipe. It is recommended for both inner and outer diameter welding in two-run applications. For API grade spiral pipe, especially in two-step mills – choose Lincolnweld® SPX80™.	30
Lincolnweld® 995N	Lincolnweld® 995N is a nitrogen limiting flux designed for seam welding of pipe. It is recommended for automatic single pass welding with up to five arcs. For pipe applications requiring a flux capable of producing Charpy V-Notch test results required for arctic grade service – choose Lincolnweld® 995N.	31
High Performance / Alloy Flux		
Lincolnweld® AXXX-10	Lincolnweld® AXXX-10 is an alloy flux designed to produce a nickel bearing weld deposit. It is recommended for use on ASTM A533 Class 1 and A588 weathering steels when combined with Lincolnweld® L-61. For an alloy flux designed for weathering steel applications – choose Lincolnweld® AXXX-10.	32
Lincolnweld® MIL800-HPNi	Lincolnweld® MIL800-HPNi is designed to increase the nickel content of a weld deposit. When used with Lincolnweld® LA-85 the nickel content will increase from a nominal 1% to a minimum 1%. It is recommended for high performance steel applications, including HPS70W or HPS100W. For a flux capable of producing ultra low H2 diffusible hydrogen levels on HPS steels – choose Lincolnweld® MIL800-HPNi.	33

LINCOLNWELD® ELECTRODES SELECTION GUIDE

Electrode Name	AWS Classification	General Description	Page No.
Mild Steel Solid Electrodes			
Lincolnweld® L-60	EL12	Lincolnweld® L-60 is a low carbon, low manganese, low silicon general purpose electrode. It provides the lowest hardness and is best suited for use with the Lincolnweld® 700 series of active fluxes.	35
Lincolnweld® L-61	EM12K	Lincolnweld® L-61 is a low carbon, medium manganese, low silicon general purpose submerged arc electrode. It is a good choice for a wide range of applications with single or multiple pass subarc welding.	35
Lincolnweld® L-50	EM13K	Lincolnweld® L-50 is a low carbon, medium manganese, medium silicon wire. Pair it with Lincolnweld® 980 flux for the best flux/wire combination when semiautomatic submerged arc welding.	35
Lincolnweld® L-56	EH11K	Lincolnweld® L-56 is a low carbon, high manganese, very high silicon wire. It can be used with Lincolnweld® 800 series fluxes on welds requiring 480 MPa (70 ksi) tensile strength in stress relieved conditions.	36
Lincolnweld® L-S3 (LNS 133 U, L50M)	EH12K	Lincolnweld® L-S3 is a low carbon, high manganese, medium silicon electrode designed for use with the Lincolnweld® 800 series of neutral fluxes. It is capable of producing impact properties exceeding 27 J (20 ft•lbf) at -62°C (-80°F) when used with Lincolnweld® 888™, 8500, and MIL800-H neutral fluxes.	36
Lincolnweld® LA-71	EM14K	Lincolnweld® LA-71 is a low carbon, medium manganese, medium silicon electrode containing approximately 0.1% titanium. This small addition of titanium allows deposits to be stress-relieved with little loss of strength, even with extended stress relief times. It is also widely used with neutral basic fluxes in both as-welded and post-weld heat treated conditions.	36
Low Alloy Solid Electrodes			
Lincolnweld® L-70	EA1	Lincolnweld® L-70 is a low carbon, medium manganese, low silicon, 1/2% molybdenum wire used for single or multiple pass welds. This electrode is a standard choice for pipe fabrication and other limited pass applications.	37
Lincolnweld® LA-75	ENi1K	Lincolnweld® LA-75 is a low carbon, medium manganese, high silicon, nickel-bearing electrode designed for use with Lincolnweld® neutral fluxes. It is suitable for use in applications requiring less than 1% Ni.	37
Lincolnweld® LA-81 (LNS 140TB)	EG	Lincolnweld® LA-81 is a low carbon, medium manganese, low silicon, 1/2% molybdenum wire containing small additions of titanium and boron for improved fracture toughness. It is generally used in two pass applications for arctic grade line pipe or as a back bead on multiple pass welds. It can be used to weld up to API X90 grade pipe.	37

LINCOLNWELD® ELECTRODES SELECTION GUIDE

Electrode Name	AWS Classification	General Description	Page No.
Low Alloy Solid Electrodes (continued)			
Lincolnweld® LA-82	EF2	Lincolnweld® LA-82 is designed especially for high strength applications. It is recommended when over 620 MPa (90 ksi) tensile strength is required in the as-welded condition or when low temperature impact toughness is required in the stress-relieved condition.	38
Lincolnweld® LA-84 (LNS 164)	EF3	Lincolnweld® LA-84 is a nickel-bearing electrode with 1/2% molybdenum. This electrode is used for higher strength weldements where impact properties exceeding 27 J (20 ft•lbf) at -62°C (-80°F) are required. It is suitable for use where consumables with less than 1% Ni are required.	38
Lincolnweld® LA-85 (LNS 165)	ENi5	Lincolnweld® LA-85 is a nickel-bearing wire with 0.2% molybdenum designed for use on weathering steels. It is capable of exceeding low temperature Charpy V-Notch requirements and 480-550 MPa (70-80 ksi) tensile strength in the as-welded and stress-relieved conditions.	38
Lincolnweld® LA-90	EA3K	Lincolnweld® LA-90 is a low carbon, high manganese, high silicon, 1/2% molybdenum special purpose wire. It is recommended for seam welding of pipe and for the general welding of high strength plate.	39
Lincolnweld® LA-92 (LNS 150)	EB2R	Lincolnweld® LA-92 is designed for welding 1 1/4% chromium, 1/2% molybdenum steels in high temperature service applications such as pressure vessels or piping. The AWS R designator denotes ultra low residuals which will result in a low Bruscato factor.	39
Lincolnweld® LA-93 (LNS 151)	EB3R	Lincolnweld® LA-93 is designed for high temperature applications such as pressure vessels and piping for 2 1/4% chromium, 1% molybdenum steels. The AWS R designator denotes ultra low residuals which will result in a low Bruscato factor.	39
Lincolnweld® LA-100	EM2	Lincolnweld® LA-100 is a low carbon, high manganese wire with nickel and molybdenum designed to weld high strength steels such as HY-80 and HSLA-80. It delivers yield strength greater than 690 MPa (100 ksi) and H2 hydrogen levels can be achieved when used with MIL800-H flux.	40
Low Alloy Cored Electrodes			
Lincolnweld® LAC-B2	ECB2	Lincolnweld® LAC-B2 is a flux-cored wire designed to weld with either single or tandem arcs using a neutral flux. It is a cost-effective choice when welding 1 1/4% chromium, 1/2% molybdenum steels where a low Bruscato factor is not required.	41
Lincolnweld® LAC-M2	ECM2	Lincolnweld® LAC-M2 is capable of delivering 690 MPa (100 ksi) yield strength when welded with Lincolnweld® 880, 880M, 888™ or MIL800-H fluxes.	41
Lincolnweld® LAC-Ni2	ECNi2	Lincolnweld® LAC-Ni2 is a 2% nickel flux-cored wire used primarily in weathering steel applications. When used with 888™ flux, it can product impact properties exceeding 27 J (20 ft•lbf) @ -73°C (-100°F).	41
Mild Steel Cored Electrodes			
Lincolnweld® LC-72	EC1	Lincolnweld® LC-72 is a cored wire designed to increase deposition rates 10-30% when used with 980 flux. It is designed to provide optimal bead shape, penetration, and slag removal in semiautomatic submerged arc welding.	42

Lincolnweld® 760

700 Series Active Flux

(EN 760 – S A MS 1; EN 760 – S A CS 1)

Lincolnweld® 760 is highly active and designed to handle rust and mill scale. It is recommended for applications where porosity caused by arc blow is a challenge. For excellent bead appearance on flat fillet welds – choose Lincolnweld® 760.

Key Features

- Highly active flux for handling rust and mill scale better than other fluxes.
- Excellent resistance to porosity caused by arc blow.
- Slow freezing slag for good weld appearance.

Typical Applications

- Single pass welding of mild steel.
- Flat fillet welds with constant voltage power source.

Product Information

- Basicity Index: 0.8
- Density: 1.2 g/cm^3

Recommended Wires

For Mild Steel

Lincolnweld® L-50, L-60, and L-61

Packaging

- 50 lb (23 kg) Plastic Bag ED032799

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	440 (64)	550 (80)	30	53 (39)	-18 (0)	F7A0-EM13K
L-60	As-welded	390 (57)	490 (71)	30	98 (72)	-29 (-20)	F6A2-EL12
L-61	As-welded	410 (59)	530 (77)	28	69 (51)	-29 (-20)	F7A2-EM12K

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	% Metal Alloys
Lincolnweld® 760	47	33	17	5	2	2	1	6 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® 761

700 Series Active Flux

(EN 760 – S A MS 1; EN 760 – S A CS 1)

Lincolnweld® 761 is a manganese alloying and carbon reducing flux designed to provide superior crack resistance. It is recommended for limited pass welding with Lincolnweld® solid electrodes. For good bead appearance – choose Lincolnweld® 761.

Key Features

- Slow freezing slag for a wide, flat weld.
- Excellent resistance to cracking in single pass applications.

Typical Applications

- Single pass welding of mild steel.
- Large fillets with constant current or variable voltage power sources.

Product Information

- Basicity Index: 0.8
- Density: 1.2 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-50, L-60, and L-61

For Low Alloy Steel
Lincolnweld® L-70

Packaging

- 50 lb (23 kg) Plastic Bag ED032765

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	480 (69)	590 (85)	29	45 (33)	-29 (-20)	F7A2-EM13K-H8
L-60	As-welded	440 (64)	530 (75)	29	64 (47)	-29 (-20)	F7A2-EL12
L-61	As-welded	480 (70)	590 (85)	28	54 (40)	-29 (-20)	F7A2-EM12K-H8
L-70	As-welded	550 (80)	640 (93)	24	58 (43)	-18 (0)	F9A0-EA1-G

FLUX COMPOSITION[1]

	$\%SiO_2$	%MnO	%MgO	$\%CaF_2$	$\%Na_2O$	$\%Al_2O_3$	$\%TiO_2$	%FeO	% Metal Alloys
Lincolnweld® 761	45	19	22	5	2	2	2	1	6 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® 780

700 Series Active Flux

(EN 760 – S A AB 1; EN 760 – S A AR 1)

Lincolnweld® 780 features fast freezing slag for easy removal and minimized spilling. When paired with Lincolnweld® L-61 it is recommended for up to three pass welding applications. For low flash-through, excellent bead shape, and easy slag removal – choose Lincolnweld® 780.

Key Features

- Fast freezing slag minimizes spilling on roundabouts.
- Excellent bead shape and slag removal in a variety of limited pass applications.
- Good resistance to moisture contamination for reduced porosity.

Typical Applications

- Single pass welding of mild steel.
- Roundabouts with minimal spillage.
- Horizontal position welding.

Product Information

- Basicity Index: 0.7
- Density: 1.4 g/cm^3

Recommended Wires

For Mild Steel

Lincolnweld® L-50, L-60 and L-61

Packaging

- 50 lb (23 kg) Bag - ED019586
- 550 lb (249 kg) Steel Drum - ED032007

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	520 (75)	600 (87)	27	65 (48)	-18 (0)	F7A0-EM13K
L-60	As-welded	440 (64)	520 (76)	30	88 (65)	-18 (0)	F7A0-EL12-H8
L-61	As-welded	530 (77)	600 (87)	27	46 (34)	-29 (-20)	F7A2-EM12K-H8

FLUX COMPOSITION[1]

	$\%SiO_2$	%MnO	%MgO	$\%CaF_2$	$\%Na_2O$	$\%Al_2O_3$	%CaO	$\%TiO_2$	% Metal Alloys
Lincolnweld® 780	9	16	2	11	2	45	1	9	6 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® 781

700 Series Active Flux

(EN 760 – S A ZS 1)

Lincolnweld® 781 features fast follow characteristics that allow for uniform welds at high speeds without undercut or voids. It is recommended for high speed, limited pass welding on clean plate and sheet steel. For good wetting action and uniform welds at high speeds – choose Lincolnweld® 781.

Key Features

- Makes uniform welds at high speeds on sheet metal.
- Good wetting action and fast follow characteristics eliminate undercut and voids.

Typical Applications

- Single pass welding – on clean plate and sheet metal up to 4.8 mm (3/16 in.) in thickness.
- Hot water tanks, metal buildings and other applications requiring high speed welds.

Product Information

- Basicity Index: 0.8
- Density: 1.5 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-50, L-60, and L-61

For Low Alloy Steel
Lincolnweld® L-70

Packaging

- 50 lb (23 kg) Bag - ED019587

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	530 (77)	610 (89)	29	38 (28)	-18 (0)	F7A0-EM13K
L-60	As-welded	460 (67)	550 (80)	29	42 (31)	-18 (0)	F7A0-EL12
L-61	As-welded	530 (77)	610 (89)	28	31 (23)	-18 (0)	F7A0-EM12K
L-70	As-welded	590 (85)	660 (96)	25	35 (26)	-18 (0)	F9A0-EA1-G

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%ZrO_2	%TiO_2	%CaO	% Metal Alloys
Lincolnweld® 781	21	17	14	5	2	4	21	12	1	3 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® 860

800 Series Neutral Flux

(EN 760 – S A AB 1)

Lincolnweld® 860 offers excellent operating characteristics in a variety of general welding applications. For double joining pipe, pressure vessel and general fabrication welding applications – choose Lincolnweld® 860.

Key Feature

- Versatile, multi-purpose flux meets a variety of welding applications.
- Excellent operating characteristics.
- Charpy V-Notch test results exceeding 27 J (20 ft•lbf) @ -40°C (-40°F) with Lincolnweld® L-61.

Typical Applications

- AASHTO Fracture Critical applications with Lincolnweld® L-61 wire.
- Pipe and other double ending applications.
- General purpose structural and multiple pass welds.
- Storage tanks using L-61 or LA-85.
- May be used in as-welded or stress-relieved applications.

Product Information

- Basicity Index: 1.1
- Density: 1.4 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-50, L-60, L-61, LA-71, L-S3, L-56

For Low Alloy Steel
Lincolnweld® L-70, LA-75, LA-82, LA-85

Packaging

- 50 lb (23 kg) Bag - ED019589

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa	(ksi)	Tensile Strength MPa	(ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	@ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	430	(62)	520	(75)	30	84 (62)	-29 (-20)	F7A2-EM13K-H8
L-56	As-welded	470	(68)	590	(86)	28	61 (45)	-29 (-20)	F7A2-EH11K
L-56	Stress-relieved[3]	440	(64)	570	(82)	29	80 (59)	-29 (-20)	F7P2-EH11K
L-60	As-welded	370	(54)	450	(65)	34	138 (102)	-29 (-20)	F6A2-EL12-H8
L-61	As-welded	410	(59)	500	(72)	31	58 (43)	-40 (-40)	F7A4-EM12K-H8
L-61	Stress-relieved[3]	340	(490	440	(64)	37	222 (164)	-46 (-50)	F6P5-EM12K-H8
L-S3	As-welded	500	(73)	590	(86)	28	52 (38)	-29 (-20)	F7A2-EH12K
LA-71	As-welded	450	(65)	540	(78)	30	110 (81)	-29 (-20)	F7A2-EM14K-H8
LA-71	Stress relieved[3]	400	(58)	520	(75)	32	119 (88)	-29 (-20)	F7P2-EM14K-H8
L-70	As-welded	450	(65)	550	(80)	28	54 (40)	-29 (-20)	F7A2-EA1-A2-H8
L-70	Stress-relieved[3]	430	(62)	520	(76)	31	47 (35)	-29 (-20)	F7P2-EA1-A2-H8
LA-75	As Welded	460	(66)	550	(80)	32	107 (79)	-29 (-20)	F7A2-ENi1K-Ni1-H8
LA-75	Stress-relieved[3]	410	(60)	540	(79)	30	99 (73)	-29 (-20)	F7P2-ENi1K-Ni1-H8
LA-82	As-welded	660	(96)	740	(107)	24	50 (37)	-40 (-40)	F9A4-EF2-F2-H8
LA-85	As-welded	520	(75)	600	(87)	26	38 (28)	-40 (-40)	E8A4-ENi5-Ni5-H8

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%TiO_2	% Metal Alloys
Lincolnweld® 860	19	11	17	12	2	32	2	2	3 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset. [3] Stress-relieved for 1 hour at 1150°F (621°C).

Lincolnweld® 865

800 Series Neutral Flux

(EN 760 – S A AR 1; EN 760 – S A AB 1)

Lincolnweld® 865 is a general purpose flux designed to weld butt joints and flat and horizontal fillets. When used with Lincolnweld® L-50 or L-61, it is capable of producing 480 MPa (70 ksi) tensile strength as welded or after short- or long-term stress relief. For stress relieved applications with Lincolnweld® L-61 electrode – choose Lincolnweld® 865.

Key Features

- Can be used in a variety of single pass and multiple pass applications.
- Small loss of strength when used in the stress-relieved condition.

Typical Applications

- Butt joints and flat and horizontal fillets.
- 480 MPa (70 ksi) tensile strength after short- or long-term stress relief.
- Pair with Lincolnweld® L-61 on A516 steels.

Product Information

- Basicity Index: 1.0
- Density: 1.3 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-50, L-61, LA-71

For Low Alloy Steel
Lincolnweld® LA-75

Packaging

- 50 lb (23 kg) Bag - EDS27857

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	500 (72)	580 (84)	27	53 (39)	-29 (-20)	F7A2-EM13K-H8
L-50	Stress-relieved[3]	440 (64)	550 (80)	30	28 (21)	-46 (-50)	F7P5-EM13K-H8
L-61	As-welded	480 (70)	570 (83)	22	85 (63)	-29 (-20)	F7A2-EM12K-H8
L-61	Stress-relieved[3]	450 (65)	550 (80)	30	117 (86)	-29 (-20)	F7P2-EM12K-H8
LA-71	As-welded	540 (78)	630 (91)	26	73 (54)	-29 (-20)	F7A2-EM14K-H8
LA-75	As-welded	520 (76)	600 (87)	23	77 (57)	-29 (-20)	F8A2-ENi1K-G-H8
LA-75	Stress-relieved[3]	500 (73)	610 (88)	27	79 (58)	-29 (-20)	F8P2-ENi1K-G-H8

FLUX COMPOSITION[1]

	$\%SiO_2$	%MnO	%MgO	$\%CaF_2$	$\%Na_2O$	$\%Al_2O_3$	$\%TiO_2$	% Metal Alloys
Lincolnweld® 865	11	1	14	19	2	37	12	3 max

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset. [3] Stress-relieved for 1 hour at 1150°F (621°C).

Lincolnweld® 880

800 Series Neutral Flux

(EN 760 – S A AS 1; EN 760 – S A FB 1)

Lincolnweld® 880 is designed to obtain increased de-oxidation and optimal bead appearance when used with solid low alloy steel electrodes with a minimum of 0.20% silicon. It is also recommended for use with Lincolnweld® LAC series of low alloy flux-cored electrodes and many Lincore® flux-cored stainless and hardfacing electrodes. For a smooth bead appearance on low alloy or hardfacing welding applications – choose Lincolnweld® 880.

Key Features

- Smooth bead appearance.
- Use with both solid and flux cored wires.
- Can be used for both joining and hardfacing welding applications.

Typical Applications

- Applications requiring smooth bead appearance.
- Hardfacing applications.

Product Information

- Basicity Index: 2.0
- Density: 1.4 g/cm^3

Recommended Wires

For Low Alloy Steel
Lincolnweld® LA-75, LA-90, LA-100, LAC-B2, LAC-M2, LAC-Ni2

Packaging

- 50 lb (23 kg) Bag ED027866

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	@ °C (°F)	AWS Classification (A5.17/A5.23)
LA-75	As-welded	430 (62)	530 (77)	30	98 (72)	-62 (-80)	F7A8-ENi1K-Ni1-H8
LA-90	As-welded	540 (79)	640 (93)	28	61 (45)	-40 (-40)	F8A4-EA2K-A4-H8
LA-100	As-welded	630 (92)	700 (101)	28	53 (39)	-40 (-40)	F9A4-EM2-M2-H8
LAC-B2	Stress relieved[3]	480 (70)	590 (85)	26	135 (100)	-29 (-20)	F8P2-ECB2-B2-H8
LAC-M2	As-welded	730 (106)	820 (119)	18	72 (53)	-51 (-60)	F11A6-ECM2-M2-H8
LAC-Ni2	As-welded	460 (66)	540 (79)	29	140 (103)	-51 (-60)	F7A6-ECNi2-Ni2-H8
LAC-Ni2	Stress relieved[4]	430 (63)	540 (78)	30	95 (70)	-73 (-100)	F7P10-ECNi2-Ni2-H8

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%ZrO_2	% Metal Alloys
Lincolnweld® 880	17	27	27	2	16	2	7	5 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.
[3] Stress-relieved for 1 hour at 621°C (1150°F). [4] Stress-relieved for 1 hour at 691°C (1275°F).

Lincolnweld® 880M

800 Series Neutral Flux

(EN 760 – S A FB 1)

Lincolnweld® 880M is a basic flux which features industry proven results in multiple pass applications. It is recommended for welding with solid mild steel and low alloy electrodes, as well as Lincoln's LAC series of low alloy flux-cored electrodes. For an excellent AC welding flux – choose Lincolnweld® 880M.

Key Features

- Excellent choice for single arc AC submerged arc welding.
- Good deep groove slag removal.
- Fracture toughness properties tested to meet or exceed the requirements for many applications.

Typical Applications

- Tandem arc applications for offshore fabrication.
- Jobs requiring 480 MPa (70 ksi) tensile strength after stress relief when used with L-56, L-S3, or LA-71.

Product Information

- Basicity Index: 3.3
- Density: 1.2 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-50, L-56, LA-71, L-S3

For Low Alloy Steel
Lincolnweld® LA-75, LA-85, LA-90, LA-92, LA-93, LA-100, LAC-B2, LAC-M2, LAC-Ni2

Packaging

- 50 lb (23 kg) Plastic Bag ED031853

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa	(ksi)	Tensile Strength MPa	(ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	@ °C	(°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	410	(59)	510	(74)	32	263	(194)	-62 (-80)	F7A8-EM13K-H8
L-56	As-welded	480	(69)	580	(85)	31	121	(89)	-51 (-60)	F7A6-EH11K-H8
L-56	Stress-relieved[3]	400	(58)	540	(78)	32	158	(116)	-51 (-60)	F7P6-EH11K-H8
L-S3	As-welded	400	(58)	510	(74)	32	264	(195)	-51 (-60)	F7A6-EH12K-H8
LA-71	As-welded	480	(70)	570	(82)	29	143	(105)	-62 (-80)	F7A8-EM14K-H8
LA-71	Stress-relieved[3]	430	(63)	550	(80)	31	164	(121)	-62 (-80)	F7P8-EM14K-H8
LA-75	As-welded	440	(64)	550	(80)	31	167	(123)	-62 (-80)	F7A8-ENi1K-Ni1-H8
LA-85	As-welded	520	(76)	610	(88)	24	57	(42)	-51 (-60)	F7A6-ENi5-Ni5-H8
LA-85	Stress-relieved[3]	490	(71)	590	(85)	27	145	(107)	-62 (-80)	F7P8-ENi5-Ni5-H8
LA-90	As-welded	580	(84)	680	(99)	26	68	(50)	-51 (-60)	F9A6-EA3K-A3-H8
LA-90	Stress-relieved[3]	520	(75)	630	(91)	28	145	(107)	-62 (-80)	F8P8-EA3K-A3-H8
LA-92	Stress-relieved[4]	460	(66)	570	(82)	28	178	(131)	-29 (-20)	F7P2-EB2R-B2-H8
LA-93	Stress-relieved[4]	510	(74)	610	(88)	26	214	(158)	-18 (0)	F7P0-EB3R-B3-H8
LA-100	As-welded	680	(98)	730	(106)	25	129	(95)	-51 (-60)	F9A6-EM2-M2-H8
LAC-B2	Stress-relieved[4]	500	(72)	600	(87)	25	144	(106)	-29 (-20)	F8P2-ECB2-B2-H8
LAC-M2	As-welded	760	(110)	820	(119)	23	83	(61)	-51 (-60)	F11A6-ECM2-M2-H8
LAC-Ni2	As-welded	510	(73)	600	(87)	22	77	(57)	-73 (-100)	F7A10-ECNi2-Ni2-H8
LAC-Ni2	Stress-relieved[3]	480	(69)	570	(83)	28	103	(76)	-73 (-100)	F7P10-ECNi2-Ni2-H8

FLUX COMPOSITION[1]

	$\%SiO_2$	%MnO	%MgO	$\%CaF_2$	$\%Na_2O$	$\%Al_2O_3$	%CaO	$\%K_2O$	% Metal Alloys
Lincolnweld® 880M	12	1	29	29	1	18	8	1	1 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.
[3] Stress-relieved for 1 hour at 621°C (1150°F). [4] Stress-relieved for 1 hour at 691°C (1275°F).

Lincolnweld® 882

800 Series Neutral Flux

(EN 760 – S A AS 1; EN 760 – S A AS 2)

Lincolnweld® 882 is designed for a variety of welding applications and is known for providing good bead appearance and consistent mechanical properties. It is recommended for stainless steel welding and can be paired with both mild and low alloy steel electrodes. For a multi-purpose flux designed to accommodate a wide range of welding applications – choose Lincolnweld® 882.

Key Features

- Smooth bead appearance.
- Operates in single wire or tandem welding.

Typical Applications

- Used for welding of stainless, mild and low alloy steel.
- Excellent for multiple pass fillet welds.

Product Information

- Basicity Index: 1.6
- Density: 1.2 g/cm^3

Recommended Wires

For Mild Steel

Lincolnweld® L-50, L-56, L-60, L-61, LA-71, L-S3

For Low Alloy Steel

Lincolnweld® L-70, LA-75, LA-82, LA-85, LA-92, LA-93, LAC-Ni2

Packaging

- 50 lb (23 kg) Plastic Bag ED027859

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	420 (61)	520 (76)	29	130 (96)	-51 (-60)	F7A6-EM13K-H8
L-56	As-welded	500 (73)	600 (87)	28	92 (68)	-40 (-40)	F7A4-EH11K-H8
L-56	Stress-relieved[3]	420 (61)	560 (81)	30	47 (35)	-46 (-50)	F7P5-EH11K-H8
L-60	As-welded	370 (54)	460 (67)	32	207 (153)	-51 (-60)	F6A6-EL12-H8
L-61	As-welded	400 (58)	500 (72)	31	190 (140)	-51 (-50)	F7A6-EM12K-H8
L-S3	As-welded	410 (60)	520 (76)	28	130 (96)	-51 (-60)	F7A6-EH12K-H8
L-S3	Stress-relieved[3]	410 (59)	510 (78)	32	115 (85)	-62 (-80)	F7P8-EH12K-H8
LA-71	As-welded	480 (69)	570 (82)	31	61 (45)	-51 (-60)	F7A6-EM14K-H8
LA-71	Stress-relieved[3]	430 (62)	550 (80)	32	70 (52)	-51 (-60)	F7P6-EM14K-H8
L-70	Stress-relieved[3]	450 (65)	550 (80)	30	76 (56)	-40 (-40)	F7P4-EA1-A2-H8
LA-75	As-welded	430 (62)	540 (79)	32	133 (98)	-40 (-40)	F7A4-ENi1K-Ni1-H8
LA-82	As-welded	660 (95)	740 (108)	26	56 (41)	-51 (-60)	F10A6-EF2-F2-H8
LA-85	As-welded	510 (74)	610 (88)	25	88 (65)	-40 (-40)	F7A4-ENi5-Ni5-H8
LA-85	Stress-relieved[3]	500 (73)	590 (86)	26	102 (75)	-40 (-40)	F7P4-ENi5-Ni5-H8
LA-92	Stress-relieved[4]	520 (75)	610 (89)	27	83 (61)	-29 (-20)	F7P2-EB2R-B2-H8
LA-93	Stress-relieved[4]	610 (88)	700 (101)	23	214 (158)	-18 (0)	F9P0-EB3R-B3-H8
LAC-Ni2	As-welded	570 (83)	660 (95)	20	72 (53)	-40 (-40)	F8A4-ECNi2-Ni2-H8
LAC-Ni2	Stress-relieved[3]	500 (73)	600 (87)	25	100 (74)	-40 (-40)	F7P4-ECNi2-Ni2-H8

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%ZrO_2	% Metal Alloys
Lincolnweld® 882	16	1	22	24	2	24	1	7	3 max.

[1] AWS test results. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.
[3] Stress-relieved for 1 hour at 621°C (1150°F). [4] Stress-relieved for 1 hour at 691°C (1275°F).

Lincolnweld® 888™

800 Series Neutral Flux

(EN 760 – S A FB 1)

Lincolnweld® 888™ is a basic flux designed for use in critical applications. It is recommended for joining mild steel and low alloy steels in as-welded and stress-relieved applications, typical of the offshore and structural fabrication industries. For a flux capable of low diffusible hydrogen levels and exceptional deep groove slag removal – choose Lincolnweld® 888™.

Key Features

- Optimum deep groove & narrow slag removal.
- H4 diffusible hydrogen levels per AWS A4.3-93.
- Moisture resistant packaging.
- Charpy V-Notch and CTOD test results available for most alloy systems.

Typical Applications

- Excellent operation with multiple arcs.
- Offshore.
- Structural Fabrication.
- Shipbuilding.

Product Information

- Basicity Index: 2.2
- Density: 1.3 g/cm^3

Recommended Wires

For Mild Steel

Lincolnweld® L-50, L-56, L-S3, L-61, LA-71

For Low Alloy Steel

Lincolnweld® L-70, LA-75, LA-82, LA-84, LA-85, LA-90, LA-92, LA-93, LA-100, LAC-Ni2, LAC-M2, LAC-B2, LAC-690

Packaging

- 50 lb (23 kg) Plastic Bag ED031596

***FLUX COMPOSITION*[1]**

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%FeO	%K_2O	% Metal Alloys
Lincolnweld® 888	18	1	27	25	2	19	5	1	2	3 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® 888™

800 Series Neutral Flux

(EN 760 – S A FB 1)

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	@ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	430 (62)	540 (78)	31	122 (90)	-62 (-80)	F7A8-EM13K-H4
L-50	Stress-relieved[3]	370 (53)	510 (74)	32	187 (138)	-62 (-80)	F6P8-EM13K-H4
L-56	As-welded	510 (74)	610 (88)	29	71 (52)	-51 (-60)	F8A6-EH11K-H4
L-56	Stress-relieved[3]	410 (59)	540 (79)	32	118 (87)	-62 (-80)	F7P8-EH11K-H4
L-61	As-welded	420 (61)	520 (75)	31	121 (89)	-51 (-60)	F7A6-EM12K-H4
L-S3	As-welded	480 (70)	570 (83)	33	70 (52)	-62 (-80)	F7A8-EH12K-H4
L-S3	Stress-relieved[3]	370 (54)	510 (74)	33	165 (122)	-62 (-80)	F6P8-EH12K-H4
LA-71	As-welded	520 (75)	610 (89)	28	68 (50)	-51 (-60)	F7A6-EM14K-H4
LA-71	Stress-relieved[3]	410 (60)	540 (78)	32	134 (99)	-62 (-80)	F7P8-EM14K-H4
L-70	As-welded	510 (74)	600 (87)	29	60 (45)	-40 (-40)	F7A4-EA1-A2-H4
L-70	Stress-relieved[3]	470 (69)	570 (83)	31	126 (93)	-40 (-40)	F7P4-EA1-A2-H4
LA-75	As-welded	470 (68)	580 (84)	31	122 (90)	-62 (-80)	F7A8-ENi1K-Ni1-H4
LA-82	As-welded	690 (99)	780 (113)	23	70 (52)	-62 (-80)	F10A8-EF2-F2-H4
LA-82	Stress-relieved[3]	600 (87)	700 (102)	25	9 (58)	-51 (-60)	F9P6-EF2-F2-H4
LA-84	As-welded	630 (92)	720 (105)	23	77 (57)	-62 (-80)	F9A8-EF3-F3-H4
LA-84	Stress-relieved[3]	580 (84)	670 (98)	26	34 (25)	-51 (-60)	F8P6-EF3-F3-H4
LA-85	As-welded	540 (78)	640 (92)	26	79 (58)	-51 (-60)	F8A6-ENi5-Ni5-H4
LA-85	Stress-relieved[3]	500 (72)	590 (86)	27	76 (56)	-51 (-60)	F7P6-ENi5-Ni5-H4
LA-90	As-welded	610 (89)	700 (102)	26	56 (41)	-51 (-60)	F9A6-EA3K-A3-H4
LA-100	As-welded	690 (100)	760 (111)	25	61 (45)	-40 (-40)	F10A4-EM2-M2-H4
LA-100	Stress-relieved[3]	680 (99)	760 (110)	25	52 (38)	-29 (-20)	F10P2-EM2-M2-H4
LAC-B2	Stress-relieved[4]	520 (76)	620 (90)	24	82 (60)	-40 (-40)	F8P4-ECB2-B2-H8
LAC-M2	As-welded	860 (124)	930 (135)	15	63 (46)	-62 (-80)	F12A8-ECG-G-H8
LAC-Ni2	As-welded	540 (78)	630 (92)	20	56 (42)	-62 (-80)	F8A8-ECNi2-Ni2-H8
LAC-Ni2	Stress-relieved[3]	480 (70)	580 (84)	27	64 (47)	-73 (-100)	F7P10-ECNi2-Ni2-H8

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.
[3] Stress-relieved for 1 hour at 621°C (1150°F). [4] Stress-relieved for 1 hour at 691°C (1275°F).

Lincolnweld® 8500

800 Series Neutral Flux

(EN 760 - S A FB 1)

Lincolnweld® 8500 is capable of providing impact properties necessary for thick weld joints from root to cap pass. It is recommended for multi-pass welding with mild and low alloy steel electrodes in both single and multiple arc configurations. For superior impact properties with a variety of alloys – choose Lincolnweld® 8500.

Key Features

- Operates well on AC and multiple arcs.
- Good resistance to nitrogen porosity.
- Low temperature impact properties capable of exceeding 27 J (20 ft•lbf) @ -62°C (-80°F).
- Excellent CTOD's.

Typical Applications

- Fabrication of offshore drilling platforms.
- Multiple pass welding.
- Single and multiple arc welding.

Product Information

- Basicity Index: 2.9
- Density: 1.3 g/cm^3

Recommended Wires

For Mild Steel

Lincolnweld® L-50, L-56, L-61, L-S3, LA-71

For Low Alloy Steel

Lincolnweld® LA-82, LA-85, LA-90, LA-92

Packaging

- 50 lb (23 kg) Plastic Bag ED031854

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	430 (63)	520 (76)	32	129 (95)	-62 (-80)	F7A8-EM13K-H8
L-56	As-welded	470 (68)	570 (82)	31	132 (97)	-62 (-80)	F7A8-EH11K
L-56	Stress-relieved[3]	430 (62)	540 (79)	33	151 (111)	-62 (-80)	F7P8-EH11K
L-61	As-welded	400 (58)	480 (70)	31	168 (124)	-51 (-60)	F7A6-EM12K-H8
L-S3	As-welded	460 (67)	570 (82)	29	91 (67)	-62 (-80)	F7A8-EH12K-H8
LA-71	As-welded	450 (66)	550 (80)	30	155 (115)	-62 (-80)	F7A8-EM14K-H8
LA-71	Stress-relieved	420 (61)	520 (75)	32	220 (162)	-62 (-80)	F7P8-EM14K-H8
LA-82	As-welded	660 (95)	740 (108)	22	87 (64)	-51 (-60)	F9A6-EF2-F2-H8
LA-82	Stress-relieved[3]	610 (89)	700 (102)	24	83 (61)	-51 (-60)	F9P6-EF2-F2-H8
LA-85	As-welded	510 (74)	590 (86)	29	155 (114)	-62 (-80)	F8A8-ENi5-Ni5-H8
LA-85	Stress-relieved[3]	500 (72)	590 (85)	28	134 (99)	-51 (-60)	F7P6-ENi5-Ni5-H8
LA-90	As-welded	670 (97)	590 (85)	24	84 (62)	-29 (-20)	F9A2-EA3K-A3-H8
LA-92	Stress-relieved[4]	550 (80)	640 (93)	26	209 (154)	-18 (0)	F8P0-EB2-B2-H8

FLUX COMPOSITION[1]

	$\%SiO_2$	%MnO	%MgO	$\%CaF_2$	$\%Na_2O$	$\%Al_2O_3$	%CaO	$\%K_2O$	$\%TiO_2$	% Metal Alloys
Lincolnweld® 8500	13	1	30	24	2	19	8	1	1	1 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.
[3] Stress-relieved for 1 hour at 621°C (1150°F). [4] Stress-relieved for 1 hour at 691°C (1275°F).

Lincolnweld® MIL800-H

800 Series Neutral Flux

(EN 760 - S A CS 1; EN 760 - S A FB 1)

Lincolnweld® MIL800-H is capable of providing industry leading H2 diffusible hydrogen levels and is designed for low temperature applications. It is recommended for both single and multiple arc welding of both butt and fillet welds. For low diffusible hydrogen capability on a wide variety of submerged arc welding applications – choose Lincolnweld® MIL800-H.

Key Features

- Capable of producing weld deposits with less than 2 mL diffusible hydrogen per 100 g of weld metal when paired with Lincolnweld® solid electrodes.
- Higher usable deposition rates than standard fluxes.

Typical Applications

- HY-80 and HSLA-80 steels with Lincolnweld® LA-100 wire.
- Horizontal and flat fillet welds.
- Single and multiple arc welding.
- High strength or highly restrained weldments where delayed cracking is a concern.

Product Information

- Basicity Index: 3.2
- Density: 1.3 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-S3, LA-71

For Low Alloy Steel
Lincolnweld® LA-75, LA-82, LA-85, LA-90, LA-93, LA-100

Packaging

- 50 lb (23 kg) Hermetically Sealed Plastic Pail - ED020925

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-S3	As-welded	500 (73)	610 (88)	27	76 (56)	-62 (-80)	F7A8-EH12K-H2
L-S3	Stress-relieved[3]	570 (64)	570 (82)	30	118 (87)	-62 (-80)	F7P8-EH12K-H2
LA-71	As-welded	570 (68)	570 (82)	30	163 (120)	-51 (-60)	F7A6-EM14K-H2
LA-71	Stress-relieved[3]	540 (61)	540 (79)	32	193 (140)	-51 (-60)	F7P6-EM14K-H2
LA-75	As-welded	560 (67)	560 (82)	30	156 (115)	-62 (-80)	F7A8-ENi1K-Ni1-H2
LA-82	As-welded	800 (102)	800 (116)	21	91 (67)	-51 (-60)	F10A6-EF2-F2-H2
LA-82	Stress-relieved[3]	740 (95)	740 (108)	25	76 (56)	-51 (-60)	F10P6-EF2-F2-H2
LA-85	As-welded	660 (82)	660 (95)	25	108 (80)	-62 (-80)	F8A8-ENi5-Ni5-H2
LA-85	Stress-relieved[3]	630 (78)	630 (92)	26	83 (61)	-62 (-80)	F8P8-ENi5-Ni5-H2
LA-90	As-welded	710 (90)	710 (103)	26	77 (57)	-51 (-60)	F9A6-EA3K-A3-H2
LA-90	Stress-relieved[3]	690 (86)	690 (100)	26	84 (62)	-51 (-60)	F9P6-EA3K-A3-H2
LA-93	Stress-relieved[4]	690 (84)	690 (99)	23	34 (25)	-29 (-20)	F9P2-EB3R-B3-H2
LA-100	As-welded	780 (97)	780 (112)	25	107 (79)	-51 (-60)	F10A6-EM2-M2-H2

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%K_2O	% Metal Alloys
Lincolnweld® MIL800-H	13	1	34	23	1	16	8	1	1 max.

[1] AWS test results. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.
[3] Stress-relieved for 1 hour at 621°C (1150°F). [4] Stress-relieved for 1 hour at 691°C (1275°F).

Lincolnweld® 960

Special Neutral Flux

(EN 760 - S A AB 1)

Lincolnweld® 960 is a low cost, general purpose flux designed to weld butt joints and both single and multiple pass fillets. It is recommended for automatic and semiautomatic submerged arc welding. For a versatile, cost-effective flux that can be used with many alloy systems and can be used on A588 weathering steels when combined with Lincolnweld® LA-75 – choose Lincolnweld® 960.

Key Features

- Designed for both automatic and semiautomatic submerged arc welding.
- Meets AASHTO Fracture Critical Requirements.
- Versatile, cost-effective solution for many alloys.

Typical Applications

- Single and multiple pass welding.
- Fillet and butt welds with unlimited plate thickness.
- Can weld steel with heavy scale or rust when used with Lincolnweld® L-50 wire.
- Weathering steels when used with Lincolnweld® LA-75 wire.

Product Information

- Basicity Index: 1.1
- Density: 1.4 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-50, L-61, LA-71

For Low Alloy Steel
Lincolnweld® LA-75, LA-85, LA-93, LA-100

Packaging

- 50 lb (23 kg) Bag - ED022412

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa	Yield Strength[2] (ksi)	Tensile Strength MPa	Tensile Strength (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C	Charpy V-Notch (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	460	(66)	570	(83)	27	58	(43)	-29	(-20)	F7A2-EM13K-H8
L-61	As-welded	420	(61)	520	(75)	32	125	(92)	-29	(-20)	F7A2-EM12K-H8
LA-71	As-welded	460	(66)	570	(82)	29	44	(32)	-29	(-20)	F7A2-EM14K-H8
LA-71	Stress-relieved[3]	420	(61)	540	(79)	31	89	(66)	-29	(-20)	F7P2-EM14K-H8
LA-75	As-welded	480	(69)	600	(87)	30	76	(56)	-29	(-20)	F8A2-ENi1K-Ni1-H8
LA-75	Stress-relieved[3]	420	(61)	550	(80)	29	53	(39)	-51	(-60)	F7P6-ENi1K-Ni1-H8
LA-85	As-welded	520	(76)	640	(93)	24	57	(42)	-29	(-20)	F8A2-ENi5-G-H8
LA-85	Stress-relieved[3]	500	(73)	610	(88)	25	39	(29)	-46	(-50)	F7P5-ENi5-G-H8
LA-93	Stress-relieved[4]	580	(84)	680	(98)	22	65	(48)	-18	(0)	F9P0-EB3R-G-H8
LA-100	As-welded	680	(99)	740	(108)	25	33	(24)	-40	(-40)	F10A4-EM2-G-H8

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%TiO_2	% Metal Alloys
Lincolnweld® 960	21	10	21	10	2	31	1	1	3 max.

[1] AWS test results. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.
[3] Stress-relieved for 1 hour at 621°C (1150°F). [4] Stress-relieved for 1 hour at 691°C (1275°F).

Lincolnweld® 980

Special Neutral Flux

(EN 760 - S A AB 1; EN 60 - S A AR 1)

Lincolnweld® 980 combines many of the features of the 700 and 800 series fluxes and is ideal for semiautomatic submerged arc welding throughout the shop. For exceptional resistance to flash-through and porosity caused by arc blow in a variety of applications – choose Lincolnweld® 980.

Key Features

- Excellent operating characteristics on semiautomatic submerged arc welding applications.
- Especially high productivity when used with Lincolnweld® LC-72 wire.

Typical Applications

- Semiautomatic, single and multiple pass submerged arc welding.
- General purpose fabrication.
- Fillet welds.

Product Information

- Basicity Index: 0.6
- Density: 1.4 g/cm^3

Recommended Wires

For Mild Steel

Lincolnweld® L-50, L-61, LC-72

For Low Alloy Steel

Lincolnweld® LA-75, LAC-Ni2

Packaging

- 50 lb (23 kg) Bag - ED027861

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-50	As-welded	430 (63)	540 (78)	31	43 (32)	-29 (-20)	F7A2-EM13K-H8
L-61	As-welded	430 (63)	530 (77)	31	37 (27)	-29 (-20)	F7A2-EM12K-H8
LC-72	As-welded	450 (65)	540 (78)	28	43 (32)	-29 (-20)	F7A2-EC1-H8
LA-75	As-welded	510 (74)	600 (87)	28	61 (45)	-29 (-20)	F7A2-ENi1K-Ni1-H8
LAC-Ni2	As-welded	540 (79)	630 (91)	25	110 (81)	-29 (-20	F8A2-ECNi2-Ni2-H8

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%TiO_2	% Metal Alloys
Lincolnweld® 980	11	14	2	12	2	47	7	4 max.

[1] AWS test results. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® WTX™

Special Neutral Flux

(EN 760 SA AB 1)

Lincolnweld® WTX™ is a neutral submerged arc welding flux designed to meet the specific requirements of wind tower welding applications. It is recommended for use with Lincolnweld® L-61 electrode on both longitudinal and circumferential seam welds. The combination of Lincolnweld® L-61 and WTX™ is capable of exceeding the mechanical property requirements specified for cold weather wind tower applications.

Key Features

- Excellent twin and multi-arc AC and DC operation for increased productivity when combined with the Power Wave® AC/DC 1000®.
- Low temperature impact properties capable of exceeding 27 J (20 ft•lbf) @ -62°C (-80°F).
- Weld circumferential and longitudinal butt and fillet welds to achieve optimal results on multiple wind tower seam welding applications.
- Smooth bead profile to achieve excellent toe angles, tie-in, and bead appearance on interior and exterior applications.

Typical Applications

- Wind tower base.
- Wind tower door frame.

Product Information

- Basicity Index: 1.4
- Density: 1.2 g/cm^3

Recommended Wires

For Mild Steel

Lincolnweld® L-61

Packaging

- 50 lb (23 kg) Plastic Bag - ED032990

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-61	As-welded	430 (63)	540 (78)	31	84 (62)	-62 (-80)	F7A8-EM12K-H8

FLUX COMPOSITION[1]

	%SiO_2	%Mn_xO_y	%MgO	%CaF_2	%NaO	%Al_2O_3	%CaO	%ZrO_2	%FeO	%K_2O	%TiO_2
Test Results Lincolnweld® WTX™	21	9	23	13	2	25	5	1	2	1	1

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® 761-Pipe

Flux for Seam Welding of Pipe

(EN 760 S A MS 1; EN 760 S A CS 1)

Lincolnweld® 761-Pipe features the chemical composition of 761 with a particle size optimized for seam welding. The low-melting slag system produces wide flat welds with superior resistance to cracks and pockmarking. For AC spiral and longitudinal pipe welding applications – choose Lincolnweld® 761-Pipe.

Key Features

- Can handle up to 5 arcs or 5,000 amps.
- Low-melting slag produces low, wide bead profiles.

Typical Applications

- Single and multiple arc welding.
- Longitudinal seam welding of API grade pipe.
- Spiral seam welding of API grade or water pipe.

Product Information

- Basicity Index: 0.8
- Density: 1.2 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-61

For Low Alloy Steel
Lincolnweld® L-70

Packaging

- 50 lb (23 kg) Plastic Bag - ED032797

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-61	As-welded	490 (70)	580 (85)	28	54 (40)	-29 (-20)	F7A2-EM12K-H8
L-70	As-welded	550 (80)	640 (93)	24	58 (43)	-18 (0)	F9A0-EA1-G

FLUX COMPOSITION[3]

	$\%SiO_2$	$\%Mn_xO_y$	%MgO	$\%CaF_2$	$\%Na_2O$	$\%Al_2O_3$	$\%TiO_2$	%FeO	% Metal Alloys
Lincolnweld® 761-Pipe	45	19	22	5	2	2	2	1	6 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.
[3] AWS test results. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com.

Lincolnweld® P223

Flux for Seam Welding of Pipe

(EN 760 - S A AB 1)

Lincolnweld® P223 is an industry standard for pipe welding on up to X80 grade pipe. It is recommended for many two-run welding applications, but can also be used in multiple pass welding because it is neutral. For fast freezing slag characteristics ideal for welding small diameter pipe – choose Lincolnweld® P223.

Key Features

- Fast freezing slag provides excellent bead profile.
- Easily removable slag.
- Can be used for limited pass or multiple pass welding with up to 3 arcs.

Typical Applications

- Pipe welding of up to X80 grade pipe.
- Two-pass welding applications for pipe fabrication.
- Multiple pass welding for general construction.

Product Information

- Basicity Index: 1.5
- Density: 1.2 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-56, L-61, LA-71, L-S3

For Low Alloy Steel
Lincolnweld® L-70, LA-90

Packaging

- 50 lb (23 kg) Plastic Bag - ED032764

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-56	As-welded	500 (73)	620 (90)	30	68 (50)	-51 (-60)	F7A6-EH11K-H8
L-56	Stress-relieved[3]	540 (65)	580 (84)	30	66 (49)	-51 (-60)	F7P6-EH11K-H8
L-61	As-welded	430 (63)	530 (77)	31	126 (93)	-40 (40)	F7A4-EM12K
LA-71	As-welded	480 (69)	570 (83)	29	94 (69)	-40 (-40)	F7A4-EM14K-H8
LA-71	Stress-relieved[3]	410 (60)	540 (78)	32	76 (56)	-51 (-60)	F7P6-EM14K-H8
L-S3	As-welded	460 (67)	570 (82)	30	88 (65)	-62 (-80)	F7A8-EH12K-H8
L-S3	Stress-relieved[3]	410 (60)	540 (78)	32	103 (76)	-62 (-80)	F7P8-EH12K-H8
L-70	As-welded	550 (80)	650 (94)	25	53 (39)	-29 (-20)	F8A2-EA1-A2
LA-90	As-welded	630 (91)	720 (105)	25	60 (44)	-18 (0)	F9A0-EA3K-G

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%TiO_2	%K_2O	%FeO	% Metal Alloys
Lincolnweld® P223	23	4	21	21	2	20	4	2	1	1	3 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset. [3] Stress-relieved for 1 hour at 1150°F (621°C).

Lincolnweld® SPX80™

Flux for Seam Welding of Pipe

Lincolnweld® SPX80™ is a pipe welding flux designed to meet the specific requirements of spiral pipe seam welding of up to API X80 grade pipe. It is recommended for both inner and outer diameter welding in two-run applications. For API grade spiral pipe, especially in two-step mills – choose Lincolnweld® SPX80™.

Key Features

- Low temperature impact properties capable of meeting arctic grade toughness requirements with test results exceeding 27 J (20 ft•lbf) @ -51°C (-60°F) with Lincolnweld® LA-81 electrode on API X80 grade steel.
- Smooth bead profile achieves optimal appearance on both inner and outer diameter welds.
- Self-peeling slag allows for clean and easy slag removal for reliable non-destructive testing results.
- High speed welding capability for increased productivity.
- H8 diffusible hydrogen levels for fewer coating defects on high strength steel.

Typical Applications

- Spiral pipe mills.
- Two-run welding applications.
- Weld up to API X80 pipe.

Product Information

- Basicity Index: 1.3
- Density: 1.2 g/cm^3

Recommended Wires

Lincolnweld® L-61, L-70, LA-81, LA-90

Packaging

- 50 lb (23 kg) Plastic Bag - ED032960

AWS TEST RESULTS[1]

Electrode	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17 / A5.23)
L-61	As-Welded	430 (62)	543 (79)	31	94 (69)	-46 (-50)	F7A5-EM12K-H8
L-70	As-Welded	530 (77)	620 (89)	25	68 (50)	-40 (-40)	F8A4-EA1-A4-H8
LA-90	As-Welded	610 (89)	720 (105)	25	39 (29)	-40 (-40)	F9A4-EA3K-G-H8

AWS TEST RESULTS[1] - TWO RUN

Electrode	Steel Type	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation (%)	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17 / A5.23)
L-61	A131	As-welded	460 (67)	600 (87)	30	45 (33)	-18 (0)	F7TA0-EM12K
L-70	A131	As-welded	500 (72)	620 (89)	27	38 (28)	-40 (-40)	F7TA4-EA1
L-70	X65	As-welded	560 (82)	650 (94)	26	88 (65)	-40 (-40)	F8TA4-EA1
LA-81	X65	As-welded	580 (84)	680 (98)	25	43 (32)	-40 (-40)	F9TA4G-EG
LA-81	X80	As-welded	630 (92)	690 (101)	26	114 (84)	-51 (-60)	F9TA6G-EG
LA-90	X65	As-welded	590 (86)	690 (101)	24	37 (27)	-51 (-60)	F9TA6G-EA3K
LA-90	X70	As-welded	580 (85)	700 (102)	27	113 (83)	-40 (-40)	F9TA4G-EA3K
LA-90	X80	As-welded	630 (93)	690 (100)	27	72 (53)	-40 (-40)	F9TA4G-EA3K

FLUX COMPOSITION[1]

	$\%SiO_2$	%MnO	%MgO	$\%CaF_2$	%NaO	$\%Al_2O_3$	%CaO	$\%ZrO_2$	%FeO	$\%TiO_2$
Test Results	23	9	21	14	2	25	2	2	1	1

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® 995N

Flux for Seam Welding of Pipe

(EN 760 - S A AB 1)

Lincolnweld® 995N is a nitrogen limiting flux designed for seam welding of pipe. It is recommended for automatic single pass welding with up to five arcs. For pipe applications requiring a flux capable of producing Charpy V-Notch test results required for arctic grade service – choose Lincolnweld® 995N.

Key Features

- Produces welds with minimal buildup and good penetration.
- Use on seam welding of pipe with up to 5 arcs.

Typical Applications

- Automatic, single pass welding.
- Single or multiple arc welding.
- High speed longitudinal seam welding on a range of pipe steels.
- One side welding requiring impact properties.

Product Information

- Basicity Index: 1.3
- Density: 1.0 g/cm^3

Recommended Wires

For Mild Steel
Lincolnweld® L-61

For Low Alloy Steel
Lincolnweld® L-70, LA-81, LA-90

Packaging

- 50 lb (23 kg) Plastic Bag - ED032831

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-61	As-welded	430 (63)	540 (79)	29	83 (61)	-40 (-40)	F7A4-EM12K-H8
L-70	As-welded	510 (74)	610 (88)	24	73 (54)	-29 (-20)	F8A2-EA1-A4
LA-81	As-welded	590 (96)	660 (96)	26	58 (43)	-29 (-20)	F9A2-EG-G
LA-90	As-welded	600 (87)	700 (102)	25	54 (40)	-29 (-20)	F9A2-EA3K-G

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%ZrO_2	%FeO	%TiO_2	% Metal Alloys
Lincolnweld® 995N	19	11	16	14	3	27	5	2	1	1	3 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® AXXX-10

Alloy Flux

Lincolnweld® AXXX-10 is an alloy flux designed to produce a nickel bearing weld deposit. It is recommended for use on ASTM A533 Class 1 and A588 weathering steels when combined with Lincolnweld® L-61. For an alloy flux designed for weathering steel applications—choose Lincolnweld® AXXX-10.

Key Features

- Can switch from conventional structural steel to weathering steel with just a change of the flux when using Lincolnweld® L-61 electrode.
- Produces Ni1 deposit with Lincolnweld® L-61 wire.

Typical Applications

- Welding of A588 weathering steels and ASTM A533-Class 1.

  NOTE: Since the alloy level in the weld deposit depends upon the arc voltage, and thus the arc length, always maintain a consistent arc voltage. If more flexibility in procedure is necessary, use 960 flux and LA-75 electrode.

Product Information

- Basicity Index: 1.0
- Density: 1.4 g/cm^3

Recommended Wires

For Low Alloy
Lincolnweld® L-61

Packaging

- 50 lb (23 kg) Bag - ED027862

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
L-61	As-welded	460 (67)	570 (83)	30	85 (63)	-40 (-40)	F7A4-EM12K-Ni1-H8

FLUX COMPOSITION[1]

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%ZrO_2	%TiO_2	% Metal Alloys
Lincolnweld® AXXX-10	18	5	22	11	2	19	22	1	5 max.

[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® MIL800-HPNi

Alloy Flux

(EN 760 - S A CS 1; EN 760 - S A FB 1)

Lincolnweld® MIL800-HPNi is designed to increase the nickel content of a weld deposit. When used with Lincolnweld® LA-85 the nickel content will increase from a nominal 1% to a minimum 1%. It is recommended for high performance steel applications, including HPS70W or HPS100W. For a flux capable of producing ultra low H2 diffusible hydrogen levels on HPS steels – choose Lincolnweld® MIL800-HPNi.

Key Features

- Use with Lincolnweld® LA-100 for yield strength test results exceeding 690 MPa (100 ksi).
- Extremely low H2 levels of diffusible hydrogen for welding high performance steels.
- Excellent resistance to arc blow.

Typical Applications

- Bridge fabrication with HPS70W steel, when used with LA-85 wire.
- Single or multiple wire arc welding.
- Butt and fillet welds on alloy steels.

Product Information

- Basicity Index: 3.1
- Density: 1.3 g/cm^3

Recommended Wires

For Low Alloy Steel

Lincolnweld® LA-75, LA-85, LA-100

Packaging

- 50 lb (23 kg) Hermetically Sealed Plastic Pail - ED028657

AWS TEST RESULTS[1]

Flux/Wire Combination	Weld Condition	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf)	Charpy V-Notch @ °C (°F)	AWS Classification (A5.17/A5.23)
LA-75	As-welded	560 (81)	640 (93)	28	145 (107)	-51 (-60)	F8A6-ENi1K-G-H2
LA-85	As-welded	600 (88)	690 (100)	25	143 (105)	-40 (-40)	F9A4-ENi5-G-H2
LA-100	As-welded	800 (116)	850 (123)	23	91 (67)	-40 (-40)	F11A4-EM2-G-H2

FLUX COMPOSITION[1]

	%SiO_2	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%TiO_2	%K_2O	%FeO	% Metal Alloys
Lincolnweld® MIL800-HPNi	13	34	22	1	16	8	2	1	1	3 max.

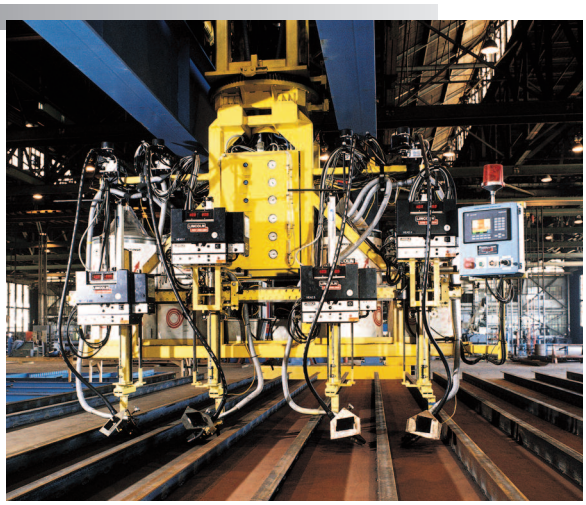
[1] See test results disclaimer on pg. 49. For the most up-to-date AWS certificates of conformances please visit www.lincolnelectric.com. [2] Measured with 0.2% offset.

Lincolnweld® Electrodes

Carbon and Low Alloy Steel

For Welding Carbon and High Strength Low Alloy Steels

AWS Classification numbers for electrodes do not specify the results obtained when used with a particular flux (see AWS A5.17 and A5.23). The classification of an electrode should only be used as a guide to determine whether an electrode is suitable for a specific application.



LINCOLNWELD® CARBON STEEL ELECTRODES (CHEMISTRY)

Lincoln® Electrode Classifications per AWS A5.17/A5.17M:1997

Wire	AWS ASME Class	AWS Wire Composition Limits[1]													
		%C	%Mn	%Si	%Cr	%Ni	%Mo	%Ti	%Zr	%Al	%V	%S	%B	%P	%Cu
L-50	EM13K	.06 - .16	.90 - 1.40	.35 - .75	–	–	–	–	–	–	–	.030	–	.030	.35
L-56	EH11K	.06 - .15	1.40 - 1.85	.80 - 1.15	–	–	–	–	–	–	–	.030	–	.030	.35
L-60	EL12	.04 - .14	.25 - .60	.10	–	–	–	–	–	–	–	.030	–	.030	.35
L-61	EM12K	.05 - .15	.80 - 1.25	.10 - .35	–	–	–	–	–	–	–	.030	–	.030	.35
LA-71	EM14K	.06 - .19	.90 - 1.40	.35 - .75	–	–	–	.03 - .17	–	–	–	.025	–	.025	.35
LC-72[2,3]	EC1	.15	1.80	.90	–	–	–	–	–	–	–	.035	–	.035	.35
L-S3	EH12K	.06 - .15	1.50 - 2.0	.25 - .65	–	–	–	–	–	–	–	.025	–	.025	.35

LINCOLNWELD® LOW ALLOY ELECTRODES (CHEMISTRY)

Lincoln® Electrode Classifications per AWS A5.23/A5.23M:2007

Wire	AWS ASME Class	AWS Wire Composition Limits[1]													
		%C	%Mn	%Si	%Cr	%Ni	%Mo	%Ti	%Zr	%Al	%V	%S	%B	%P	%Cu
L-70	EA1	.05 - .15	.65 - 1.00	.20	–	–	.45 - .65	–	–	–	–	.025	–	.025	.35
LA-75	ENi1	.12	.80 - 1.40	.40 - .80	–	.75 - 1.25	–	–	–	–	–	.020	–	.020	.35
LA-81[4]	EG	.05	1.2	.2	–	–	.5	.1	–	–	–	–	.01	–	.20
LA-82	EF2	.10 - .18	1.70 - 2.40	.2	–	.40 - .80	.40 - .65	–	–	–	–	.025	–	.025	.35
LA-84	EF3	.10 - .18	1.75 - 2.20	.15 - .25	–	.80 - 1.0	.45 - .60	–	–	–	–	.010 - .020	–	.010 - .020	.05 - .15
LA-85	ENi5	.12	1.20 - 1.60	.05 - .30	–	.75 - 1.25	.10 - .30	–	–	–	–	.025	–	.020	.35
LA-90	EA3K	.05 -.15	1.60 - 2.10	.50 - .80	–	–	.40 - .60	–	–	–	–	.025	–	.025	.35
LA-92	EB2R	.07 -.15	.45 - 1.00	.05 - .30	1.00 - 1.75	–	.45 - .65	–	–	–	–	.025	–	.025	.35
LA-93	EB3R	.05 -.15	.40 - .80	.05 - .30	2.25 - 3.00	–	.90 - 1.10	–	–	–	–	.025	–	.025	.35
LA-100	EM2	.10	1.25 - 1.80	.20 - .60	.30	1.40 - 2.10	.25 - .55	.10	.10	.10	.05	.015	–	.010	.25

[1] Single values are maximums. [2] LC-72 is a flux-cored electrode. [3] Limits are for weld metal deposited with a particular flux. [4] No AWS limits. Values are typical.

Lincolnweld® L-60

Mild Steel Solid Electrode
(AWS: EL12; EN 756: S 1)

Lincolnweld® L-60 is a low carbon, low manganese, low silicon general purpose electrode. It provides the lowest hardness and is best suited for use with the Lincolnweld® 700 series of active fluxes.

Recommended Fluxes

Lincolnweld® 760, 761, 780, 781, 860, 882

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	600 Lb (272 kg) Speed Feed® Drum	1000 Lb (453 kg) Speed Feed® Drum
5/64 (2.0)	ED011762	EDS11760	ED011761
3/32 (2.4)	ED011752	EDS11750	ED011751
1/8 (3.2)	ED011743	EDS11741	ED011742
5/32 (4.0)	ED011758		ED011757
3/16 (4.8)	ED011749		ED011748

Lincolnweld® L-61

Mild Steel Solid Electrode
(AWS: EM12K; EN 756: S 2Si)

Lincolnweld® L-61 is a low carbon, medium manganese, low silicon general purpose submerged arc electrode. It is a good choice for a wide range of applications with single or multiple pass subarc welding.

Recommended Fluxes

Lincolnweld® 760, 761, 780, 781, 860, 865, 882, 888™, 761-Pipe, P223, 960, 980, WTX™, AXXX-10, 995N, SPX80™

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	300 Lb (136 kg) Speed Feed® Drum	600 Lb (272 kg) Speed Feed® Drum	750 Lb (340 kg) Speed Feed® Reel	1000 Lb (453 kg) Speed Feed® Drum
1/16 (1.6)	ED011803				
5/64 (2.0)	ED011825		EDS11823	EDS11826	ED011824
3/32 (2.4)	ED011815		EDS11813	EDS11817	ED011814
1/8 (3.2)	ED011807	EDS01117	EDS11805	EDS11809	ED011806
5/32 (4.0)	ED011821	ED030628	EDS11819	ED030012	ED011820
3/16 (4.8)	ED011812				ED011811

Lincolnweld® L-50

Mild Steel Solid Electrode
(AWS: EM13K)

Lincolnweld® L-50 is a low carbon, medium manganese, medium silicon wire. Pair it with Lincolnweld® 980 flux for the best flux/wire combination when semiautomatic submerged arc welding.

Recommended Fluxes

Lincolnweld® 760, 761, 780, 781, 860, 865, 880M, 882, 888™, 8500, 960, 980, P223

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	600 Lb (272 kg) Speed Feed® Drum	1000 Lb (453 kg) Speed Feed® Reel	1000 Lb (453 kg) Speed Feed® Drum	1000 Lb (453 kg) Accu-Trak® Reel	1000 Lb (453 kg) Accu-Trak® Drum
1/16 (1.6)	ED011317	ED011316	ED011650		ED029222	ED029083
5/64 (2.0)	ED011335			ED011334		
3/32 (2.4)	ED011328			ED011327		
1/8 (3.2)	ED011323			ED011322		
5/32 (4.0)	ED011332			ED011331		
3/16 (4.8)	ED015469			ED015352		

Lincolnweld® L-56

Mild Steel Solid Electrode
(AWS: EH11K)

Lincolnweld® L-56 is a low carbon, high manganese, very high silicon wire. It can be used with Lincolnweld® 800 series fluxes on welds requiring 480 MPa (70 ksi) tensile strength in stress relieved conditions.

Recommended Fluxes

Lincolnweld® 860, 880M, 882, 888, 8500, P223

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	600 Lb (272 kg) Accu-Trak® Drum	1000 Lb (453 kg) Speed Feed® Reel	1000 Lb (453 kg) Accu-Trak® Drum
1/16 (1.6)	ED011666	ED029225	ED011737	ED029085
5/64 (2.0)	ED011678		EDS01631	
3/32 (2.4)	ED011674			
1/8 (3.2)	ED011671			
5/32 (4.0)	EDS11677			

Lincolnweld® L-S3 (LNS 133 U, L50M)

Mild Steel Solid Electrode
(AWS: EH12K; EN 756: S 3Si)

Lincolnweld® L-S3 is a low carbon, high manganese, medium silicon electrode designed for use with the Lincolnweld® 800 series of neutral fluxes. It is capable of producing impact properties exceeding 27 J (20 ft•lbf) at -62°C (-80°F) when used with Lincolnweld® 888™, 8500, and MIL800-H neutral fluxes.

Recommended Fluxes

Lincolnweld® 860, 880M, 882, 888™, 8500, MIL800-H, P223

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	300 Lb (136 kg) Speed Feed® Drum	1000 Lb (453 kg) Speed Feed® Drum
1/8 (3.2)	ED016767		
5/32 (4.0)	ED016248	ED030576	ED029226
3/16 (4.8)			EDS01652

Lincolnweld® LA-71

Mild Steel Solid Electrode
(AWS: EM14K)

Lincolnweld® L-A71 is a low carbon, medium manganese, medium silicon electrode containing approximately 0.1% titanium. This small addition of titanium allows deposits to be stress-relieved with little loss of strength, even with extended stress relief times. It is also widely used with neutral basic fluxes in both as-welded and post-weld heat treated conditions.

Recommended Fluxes

Lincolnweld® 860, 865, 880M, 882, 888™, 8500, MIL800-H, 960, P223

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	1000 Lb (453 kg) Speed Feed® Drum
5/64 (2.0)	EDS11054	
3/32 (2.4)	ED011052	
1/8 (3.2)	ED011051	EDS30781
5/32 (4.0)	ED011053	EDS30782

Lincolnweld® L-70

Low Alloy Solid Electrode
(AWS: EA1; EN 756: S 2Mo)

Lincolnweld® L-70 is a low carbon, medium manganese, low silicon, 1/2% molybdenum wire used for single or multiple pass welds. This electrode is a standard choice for pipe fabrication and other limited pass applications.

Recommended Fluxes

Lincolnweld® 761, 781, 860, 882, 888™, 995N, 761-Pipe, P223, SPX80™

DIAMETERS/PACKAGING		
Diameters in. (mm)	60 Lb (27.2 kg) Coil	1000 Lb (453 kg) Speed Feed® Drum
5/64 (2.0)	ED012054	
1/8 (3.2)	ED012051	ED021192
5/32 (4.0)	ED012053	ED021193
3/16 (4.8)	ED012052	EDS21194

Lincolnweld® LA-75

Low Alloy Solid Electrode
(AWS: ENi1K)

Lincolnweld® LA-75 is a low carbon, medium manganese, high silicon, nickel-bearing electrode designed for use with Lincolnweld® neutral fluxes. It is suitable for use in applications requiring less than 1% Ni.

Recommended Fluxes

Lincolnweld® 860, 865, 880, 880M, 882, 888™, MIL800-H, MIL800-HPNi, 960, 980

DIAMETERS/PACKAGING		
Diameters in. (mm)	60 Lb (27.2 kg) Coil	1000 Lb (453 kg) Speed Feed® Drum
5/64 (2.0)	ED011066	
3/32 (2.4)	ED011064	ED027225
1/8 (3.2)	ED011062	
5/32 (4.0)	ED011065	ED027224

Lincolnweld® LA-81 (LNS 140TB)

Low Alloy Solid Electrode
(AWS: EG)

Lincolnweld® LA-81 is a low carbon, medium manganese, low silicon, 1/2% molybdenum wire containing small additions of titanium and boron for improved fracture toughness. It is generally used in two pass applications for arctic grade line pipe or as a back bead on multiple pass welds. It can be used to weld up to API X90 grade pipe.

Recommended Fluxes

Lincolnweld® 995N, SPX80™

DIAMETERS/PACKAGING		
Diameters in. (mm)	60 Lb (27.2 kg) Coil	(453 kg) Speed Feed® Drum
5/32 (4.0)	ED023163	EDS31060

Lincolnweld® LA-82

Low Alloy Solid Electrode
(AWS: EF2)

Lincolnweld® LA-82 is designed especially for high strength applications. It is recommended when over 620 MPa (90 ksi) tensile strength is required in the as-welded condition or when low temperature impact toughness is required in the stress-relieved condition.

Recommended Fluxes

Lincolnweld® 860, 882, 888™, 8500, MIL800-H

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil
3/32 (2.4)	EDS30785
1/8 (3.2)	ED026958
5/32 (4.0)	ED026959

Lincolnweld® LA-84 (LNS 164)

Low Alloy Solid Electrode
(AWS: EF2; EN 756: S3 Ni1Mo)

Lincolnweld® LA-84 is a nickel-bearing electrode with 1/2% molybdenum. This electrode is used for higher strength weldements where impact properties exceeding 27 J (20 ft•lbf) at -62°C (-80°F) are required. It is suitable for use where consumables with less than 1% Ni are required.

Recommended Fluxes

Lincolnweld® 860, 880M, 882, 888™, P223, MIL800-H, MIL800-HPNi

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	1000 Lb (453 kg) Speed Feed® Drum
3/32 (2.4)	ED031871	ED031872

Lincolnweld® LA-85 (LNS 165)

Low Alloy Solid Electrode
(AWS: ENi5)

Lincolnweld® LA-85 is a nickel-bearing wire with 0.2% molybdenum designed for use on weathering steels. It is capable of exceeding low temperature Charpy V-Notch requirements and 480-550 MPa (70-80 ksi) tensile strength in the as-welded and stress-relieved conditions.

Recommended Fluxes

Lincolnweld® 860, 880M, 882, 888™, 8500, MIL800-H, MIL800-HPNi, 960

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	1000 Lb (453 kg) Speed Feed® Drum
3/32 (2.4)	ED023166	ED029965
1/8 (3.2)	ED023167	
5/32 (4.0)	ED023168	
3/16 (4.8)	ED023169	

Lincolnweld® LA-90

Low Alloy Solid Electrode
(AWS: EA3K)

Lincolnweld® LA-90 is a low carbon, high manganese, high silicon, 1/2% molybdenum special purpose wire. It is recommended for seam welding of pipe and for the general welding of high strength plate.

Recommended Fluxes

Lincolnweld® 880, 880M, 888™, 8500, MIL800-H, 995N, P223, SPX80

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	750 Lb (340 kg) Speed Feed® Reel	1000 Lb (453 kg) Speed Feed® Drum
1/16 (1.6)	ED013999		
5/64 (2.0)	ED011086		
3/32 (2.4)	ED011084		
1/8 (3.2)	EDS11083		
5/32 (4.0)	EDS11085	EDS01154	EDS01152

Lincolnweld® LA-92 (LNS 150)

Low Alloy Solid Electrode
(AWS: EB2R; EN 12070: Cr Mo1)

Lincolnweld® LA-92 is designed for welding 1 1/4% chromium, 1/2% molybdenum steels in high temperature service applications such as pressure vessels or piping. The AWS R designator denotes ultra low residuals which will result in a low Bruscato factor.

Recommended Fluxes

Lincolnweld® 880M, 882, 888™, MIL800-H, 960

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil
3/32 (2.4)	EDS30783
1/8 (3.2)	EDS26960
5/32 (4.0)	EDS26961

Lincolnweld® LA-93 (LNS 151)

Low Alloy Solid Electrode
(AWS: EB3R; EN 12070: Cr Mo2)

Lincolnweld® LA-93 is designed for high temperature applications such as pressure vessels and piping for 2 1/4% chromium, 1% molybdenum steels. The AWS R designator denotes ultra low residuals which will result in a low Bruscato factor.

Recommended Fluxes

Lincolnweld® 880M, 882, 888™, MIL800-H, 960

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil
3/32 (2.4)	EDS30784
1/8 (3.2)	EDS26962
5/32 (4.0)	EDS26963

Lincolnweld® LA-100

Low Alloy Solid Electrode
(AWS: EM2)

Lincolnweld® LA-100 is a low carbon, high manganese wire with nickel and molybdenum designed to weld high strength steels such as HY-80 and HSLA-80. It delivers yield strength greater than 690 MPa (100 ksi) and H2 hydrogen levels can be achieved when used with MIL800-H flux.

Recommended Fluxes

Lincolnweld® 880, 880M, 888™, MIL800-H, MIL800-HPNi, 960

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil
1/16 (1.6)	ED010996
5/64 (2.0)	ED011002
3/32 (2.4)	ED010999
1/8 (3.2)	ED010998
5/32 (4.0)	EDS11001

Lincolnweld® LAC-B2

Low Alloy Cored Electrode
(AWS: ECB2)

Lincolnweld® LAC-B2 is a flux-cored wire designed to weld with either single or tandem arcs using a neutral flux. It is a cost-effective choice when welding 1 1/4% chromium, 1/2% molybdenum steels where a low Bruscato factor is not required.

Recommended Fluxes

Lincolnweld® 880, 880M, 888™

DIAMETERS/PACKAGING

Diameters in. (mm)	60 Lb (27.2 kg) Coil	600 Lb (272 kg) Speed Feed® Drum
3/32 (2.4)	ED010954	ED019581
5/32 (4.0)	ED010955	ED019582

Lincolnweld® LAC-M2

Low Alloy Cored Electrode
(AWS: ECM2)

Lincolnweld® LAC-M2 is capable of delivering 690 MPa (100 ksi) yield strength when welded with Lincolnweld® 880, 880M, 888™ or MIL800-H fluxes.

Recommended Fluxes

Lincolnweld® 880, 880M, 888™, MIL800-H

DIAMETERS/PACKAGING

Diameters in. (mm)	50 Lb (23 kg) Coil
3/32 (2.4)	ED010981
5/32 (4.0)	ED010982

Lincolnweld® LAC-Ni2

Low Alloy Cored Electrode
(AWS: ECNi2)

Lincolnweld® LAC-Ni2 is a 2% nickel flux-cored wire used primarily in weathering steel applications. When used with 888™ flux, it can product impact properties exceeding 20 ft•lbf (27 J) @ -100°F (-73°C).

Recommended Fluxes

Lincolnweld® 880, 880M, 882, 888™, 980

DIAMETERS/PACKAGING

Diameters in. (mm)	50 Lb (23 kg) Coil
3/32 (2.4)	ED010986

Lincolnweld® LC-72

Mild Steel Cored Electrode
(AWS: EC1)

Lincolnweld® LC-72 is a cored wire designed to increase deposition rates 10-30% when used with 980 flux. It is designed to provide optimal bead shape, penetration, and slag removal in semiautomatic submerged arc welding.

Recommended Fluxes

Lincolnweld® 980

DIAMETERS/PACKAGING

Diameters in. (mm)	50 Lb (23 kg) Coil	300 Lb (136 kg) Speed Feed® Reel	600 Lb (272 kg) Speed Feed® Reel	600 Lb (272 kg) Speed Feed® Drum
5/64 (2.0)	ED011099			
3/32 (2.4)	ED011098	EDS01186	EDS27184	EDS01187

Packaging

STANDARD ELECTRODE COILS			
		Lincolnweld® Solid Wires	LAC and Lincore® Flux-Cored Wires
Coil Weight		60 lb (27 kg)	50 lb (23 kg)
Coil Size	O.D.	16-1/2 in. (419 mm) Max.	16-1/2 in. (419 mm) Max.
	I.D.	11-7/8 in. (302 mm)	11-7/8 in. (302 mm)
	Width	4-5/8 in. (117 mm)	4-5/8 in. (117 mm)
Coils/Pallet		54	60
Packaging		All packed inside water-repellent cartons.	

1. Speed-Feed® Drum
2. Speed-Feed® Stem
3. Speed-Feed® Reel
4. 50 lb Flux Bags
5. Solid Wire Coil
6. Cored Wire Coil
7. Solid Wire Drum
8. 2,600-3,000 lb Bulk Flux Bag

Speed-Feed® Drums and Speed-Feed® Stems

All drums are palletized for shipping. A turntable is recommended for proper feeding. Reusable hats which fit inside the drum core for kink-free uncoiling are a necessary accessory. Product number is ED020219. For drum weights and sizes specific to your offering, please see pricebook or Lincoln Electric sales representative.

Speed-Feed® Reels

Many electrode sizes and types are wound onto standard AWS reels. Appropriate uncoiling equipment is required to horizontally rotate the reel for proper feeding. All reels are palletized for shipping.

Flux Bags or Pails

Flux is shipped in 50 lb (23 kg) moisture repellent bags. For added protection, fluxes may be ordered in 50 lb (23 kg) hermetically sealed plastic pails. Bulk bags and 550 lb (23 kg) drums are also available with certain fluxes upon request through your Lincoln Electric sales representative.

(1) Each pallet contains only one type and size of electrode or flux. Electrode pallets are 47" x 31-1/2" (1193 mm x 800 mm). Flux pallets are 42" x 42" (1067 mm x 1067 mm). Pallets are not supplied for mixed assortments. Pallets can be stacked 2-high (maximum).

AWS Certifications
Flux/Wire Combinations

To find Flux/Wire Combinations to meet specific AWS Classifications use the chart below.

LINCOLNWELD® FLUX-ELECTRODE CERTIFICATIONS - MILD STEEL CLASSIFICATION

As Required Per AWS A5.17

AWS / ASME Classification	Flux / Electrode	AWS / ASME Classification	Flux / Electrode
F6A2-EL12	760 / L-60	F7A6-EM12K-H8	882 / L-61
F6A2-EL12-H8	860 / L-60	F7A6-EH12K-H8	882 / L-S3
F6A6-EL12-H8	882 / L-60	F7A6-EM12K-H4	888™ / L-61
F6P5-EM12K-H8	860 / L-61 (SR)	F7A6-EM12K-H8	8500 / L-61
F6P8-EH12K-H4	888™ / L-S3 (SR)	F7A6-EM13K-H8	882 / L-50
F6P8-EM13K-H4	888™ / L-50 (SR)	F7A6-EM14K-H2	MIL800-H / LA-71
F7A0-EL12	781 / L-60	F7A6-EM14K-H4	888™ / LA-71
F7A0-EL12-H8	780 / L-60	F7A6-EM14K-H8	882 / LA-71
F7A0-EM12K	781 / L-61	F7A8-EH11K	8500 / L-56
F7A0-EM13K	760 / L-50	F8A6-EH11K-H4	888™ / L-56
F7A0-EM13K	780 / L-50	F7A8-EH12K-H2	MIL800-H / L-S3
F7A0-EM13K	781 / L-50	F7A8-EH12K-H4	888™ / L-S3
F7A2-EC1-H8	980 / LC-72	F7A8-EH12K-H8	8500 / L-S3
F7A2-EH11K	860 / L-56	F7A8-EH12K-H8	P223 / L-S3
F7A2-EH12K	860 / L-S3	F7A8-EM12K-H8	WTX™/L-61
F7A2-EL12	761 / L-60	F7A8-EM13K-H4	888™ / L-50
F7A2-EM12K	760 / L-61	F7A8-EM13K-H8	880M / L-50
F7A2-EM12K-H8	761 / L-61	F7A8-EM13K-H8	8500 / L-50
F7A2-EM12K-H8	780 / L-61	F7A8-EM14K-H8	880M / LA-71
F7A2-EM12K-H8	865 / L-61	F7A8-EM14K-H8	8500 / LA-71
F7A2-EM12K-H8	960 / L-61	F7P2-EH11K	860 / L-56 (SR)
F7A2-EM12K-H8	980 / L-61	F7P2-EM12K-H8	865 / L-61 (SR)
F7A2-EM13K-H8	761 / L-50	F7P2-EM14K-H8	860 / LA-71 (SR)
F7A2-EM13K-H8	860 / L-50	F7P2-EM14K-H8	865 / LA-71 (SR)
F7A2-EM13K-H8	865 / L-50	F7P2-EM14K-H8	960 / LA-71 (SR)
F7A2-EM13K-H8	960 / L-50	F7P5-EH11K-H8	882 / L-56 (SR)
F7A2-EM13K-H8	980 / L-50	F7P5-EM13K-H8	865 / L-50 (SR)
F7A2-EM14K-H8	860 / LA-71	F7P6-EH11K-H8	880M / L-56 (SR)
F7A2-EM14K-H8	865 / LA-71	F7P6-EH11K-H8	P223 / L-56 (SR)
F7A2-EM14K-H8	960 / LA-71	F7P6-EM14K-H2	MIL800-H / LA-71 (SR)
F7A4-EH11K-H8	882 / L-56	F7P6-EM14K-H8	882 / LA-71 (SR)
F7A4-EM12K	P223 / L-61	F7P6-EM14K-H8	P223 / LA-71 (SR)
F7A4-EM12K-H8	860 / L-61	F7P8-EH11K	8500 / L-56 (SR)
F7A4-EM12K-H8	995N / L-61	F7P8-EH11K-H4	888™ / L-56 (SR)
F7A4-EM13K-H8	P223 / L-50	F7P8-EH12K-H2	MIL800-H / L-S3 (SR)
F7A4-EM14K-H8	P223 / LA-71	F7P8-EH12K-H8	882 / L-S3 (SR)
F7A6-EH11K-H8	880M / L-56	F7P8-EH12K-H8	P223 / L-S3 (SR)
F7A6-EH11K-H8	P223 / L-56	F7P8-EM14K-H4	888™ / LA-71 (SR)
F7A6-EH12K-H8	880M / L-S3	F7P8-EM14K-H8	880M / LA-71 (SR)
		F7P8-EM14K-H8	8500 / LA-71 (SR)

LINCOLNWELD® FLUX-ELECTRODE CERTIFICATIONS - LOW ALLOY CLASSIFICATION

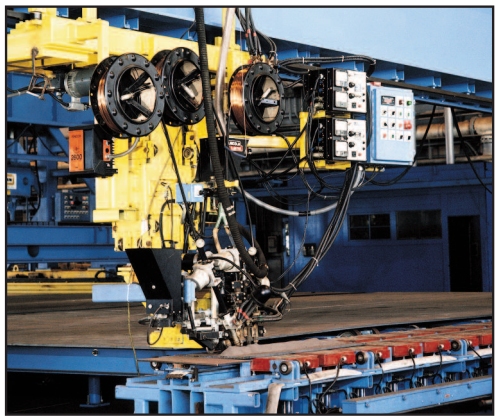
As Required Per AWS A5.23

AWS / ASME Classification	Flux / Electrode
F7A2-EA1-A2-H8	860 / L-70
F7A2-ENi1K-Ni1-H8	860 / LA-75
F7A2-ENi1K-Ni1-H8	980 / LA-75
F7A4-EA1-A2-H4	888™ / L-70
F7A4-EM12K-Ni1-H8	AXXX-10 / L-61
F7A4-ENi1K-Ni1-H8	882 / LA-75
F7A4-ENi5-Ni5-H8	882 / LA-85
F7A6-ECNi2-Ni2-H8	880 / LAC-Ni2
F7A6-ENi5-Ni5-H8	880M / LA-85
F7A8-ENi1K-Ni1-H2	MIL800-H / LA-75
F7A8-ENi1K-Ni1-H4	888™ / LA-75
F7A8-ENi1K-Ni1-H8	880 / LA-75
F7A8-ENi1K-Ni1-H8	880M / LA-75
F7A10-ECNi2-Ni2-H8	880M / LAC-Ni2
F7P0-EB3R-B3-H8	880M / LA-93 (SR)
F7P2-EA1-A2-H8	860 / L-70 (SR)
F7P2-EB2R-B2-H8	880M / LA-92 (SR)
F7P2-EB2R-B2-H8	882 / LA-92 (SR)
F7P2-ENi1K-Ni1-H8	860 / LA-75 (SR)
F7P4-EA1-A2-H8	882 / L-70 (SR)
F7P4-ECNi2-Ni2-H8	882 / LAC-Ni2 (SR)
F7P4-ENi5-Ni5-H8	882 / LA-85 (SR)
F7P5-ENi5-G-H8	960 / LA-85 (SR)
F7P4-EA1-A2-H4	888™ / L-70 (SR)
F7P6-EB2R-B2R-H4	888™ / LA-92 (SR)
F7P6-ENi1K-Ni1-H8	960 / LA-75 (SR)
F7P6-ENi5-Ni5-H8	8500 / LA-85 (SR)
F7P6-ENi5-Ni5-H4	888™ / LA-85 (SR)
F7P8-ENi5-Ni5-H8	880M / LA-85 (SR)
F7P10-ECNi2-Ni2-H8	880 / LAC-Ni2 (SR)
F7P10-ECNi2-Ni2-H8	880M / LAC-Ni2 (SR)
F7P10-ECNi2-Ni2-H8	888™ / LAC-Ni2 (SR)
F8A2-EA1-A2	P223 / L-70
F8A2-EA1-A4	995N / L-70
F8A2-ECNi2-Ni2-H8	980 / LAC-Ni2
F8A2-ENi1K-G-H8	865 / LA-75
F8A2-ENi1K-Ni1-H8	960 / LA-75
F8A2-ENi5-G-H8	960 / LA-85
F8A4-EA3K-A4-H8	880 / LA-90
E8A4-ENi5-Ni5-H8	860 / LA-85
F8A4-ECNi2-Ni2-H8	882 / LAC-Ni2
F8A6-ENi1K-G-H2	MIL800-HPNi / LA-75
F8A6-ENi5-Ni5-H4	888™ / LA-85
F8A8-ECNi2-Ni2-H8	888™ / LAC-Ni2

AWS / ASME Classification	Flux / Electrode
F8A8-ENi5-Ni5-H2	MIL800-H / LA-85
F8A8-ENi5-Ni5-H8	8500 / LA-85
F8P0-EB2-B2-H8	8500 / LA-92 (SR)
F8P2-ECB2-B2-H8	880 / LAC-B2 (SR)
F8P2-ECB2-B2-H8	880M / LAC-B2 (SR)
F8P2-ENi1K-G	865 / LA-75 (SR)
F8P4-ECB2-B2-H8	888™ / LAC-B2 (SR)
F8P6-EB3R-B3R-H4	888™ / LA-93 (SR)
F8P6-ENi5-Ni5-H2	MIL800-H / LA-85 (SR)
F8P8-EA3K-A3-H8	880M / LA-90 (SR)
F8P6-EF3-F3-H4	888™ / LA-84 (SR)
F9A0-EA1-G	761 / L-70
F9A0-EA1-G	781 / L-70
F9A0-EA3K-G	P223 / LA-90
F9A2-EA3K-A3-H8	8500 / LA-90
F9A2-EA3K-G-H8	995N / LA-90
F9A2-EG-G	995N / LA-81
F9A4-EF2-F2-H8	860 / LA-82
F9A4-EM2-M2-H8	880 / LA-100
F9A4-ENi5-G-H2	MIL800-HPNi / LA-85
F9A6-EA3K-A3-H2	MIL800-H / LA-90
F9A6-EA3K-A3-H4	888™ / LA-90
F9A6-EA3K-A3-H8	880M / LA-90
F9A6-EF2-F2-H8	8500 / LA-82
F9A6-EM2-M2-H8	880M / LA-100
F9A8-EF3-F3-H4	888™ / LA-84
F9P0-EB3R-B3-H8	882 / LA-93 (SR)
F9P0-EB3R-G-H8	960 / LA-93 (SR)
F9P2-EB3R-B3R-H2	MIL800-H / LA-93
F9P6-EA3K-A3-H2	MIL800-H / LA-90 (SR)
F9P6-EF2-F2-H8	8500 / LA-82 (SR)
F10A4-EM2-G-H8	960 / LA-100
F10A6-EF2-F2-H2	MIL800-H / LA-82
F10A6-EF2-F2-H8	882 / LA-82
F10A6-EM2-M2-H2	MIL800-H / LA-100
F10A4-EM2-M2-H4	888™ / LA-100
F10A8-EF2-F2-H4	888™ / LA-82
F10P2-EM2-M2-H4	888™ / LA-100 (SR)
F10P6-EF2-F2-H2	MIL800-H / LA-82 (SR)
F11A4-EM2-G-H2	MIL800-HPNi / LA-100
F11A6-ECM2-M2-H8	880 / LAC-M2
F11A6-ECM2-M2-H8	880M / LAC-M2
F12A6-ECG-G	MIL800-H / LAC-M2
F12A8-ECG-G-H8	888™ / LAC-M2

Agency Approvals

Flux / Electrode Combination	ABS (AWS Classification)	ABS Grade	Lloyd's Grade	DNV Grade	Germanischer Grade	Bureau Veritas
761 / L-60	F7A2-EL12	---	---	---	---	---
761 / L-61	F7A2-EM12K-H8	---	3M-3YM	III YM	3YM	A3YM
761 / L-70	---	3YM, 3YT	---	III YTM	---	---
780 / L-60	F7A0-EIL	---	2M-2YM	---	---	---
780 / L-61	F7A2-EL12-H8	---	2M-2YM	II YTM	2YTM	A2YTM
860 / L-60	F6A2-EL12-H8	---	---	---	---	---
860 / L-61	F7A2-EM12K-H8	---	3M-3YM	III YM, II YT	3YM, 2YT	A3YM, A3YT
880M / L-50	---	3YM	3M-3YM	V YM	---	---
882 / L-61	F7A6-EM12K-H8	---	---	---	---	---
880M / LAC-M2	F11A6-ECM2-M2-H8	---	---	---	---	---
880 / LAC-Ni2	F7P10-ECNi2-Ni2-H8	---	---	---	---	---
888™ / L-S3	---	4YQM420	---	IV YM42	---	---
888™ / LA-82	---	4YQM620	---	---	---	---
888™ / LAC-M2	---	4YQ690M	---	IV YM69	---	---
960 / L-50	F7A2-EM13K-H8	---	---	---	---	---
960 / L-61	F7A2-EM12K-H8	---	---	---	---	---
8500 / L-61	---	4YM	4YM	IV YM	4YM	---
8500 / L-S3	---	4YM	4YM	IV YM	4YM	---
8500 / LA-85	---	4YM	4YM	IV YM	4YM	---
888™ / LAC-690	---	---	---	V YM69	---	---
888™ / LA-84	---	4YQ550	4Y550	IV Y55	---	---



Military Qualified Products

Product	MIL Specification	Classification
Lincolnweld® L-50*	MIL-E-23765/1D & 1E	Type MIL-70S-3
Lincolnweld® L-56*	MIL-E-23765/1D & 1E	Type MIL-70S-6
Lincolnweld® LA-100*	MIL-E-23765/2D and /2E NAVSEA Technical Publication T9074-BC-GIB-010/0200	Type MIL-100S-1 or MIL-100S-2 (with MIL800-H)
Lincolnweld® MIL800-H*	MIL-E-23765/2D and /2E NAVSEA Technical Publication T9074-BC-GIB-010/0200	Type MIL-100S-2F or MIL-100S-1F
Lincolnweld® 980	MIL-E-23765/1E	Type MIL-70S-3F

NOTE: Lot inspection is required with each order. The products listed with an (*) are listed on a products list (QPL).

MIL SPECIFICATIONS MIL-E-23765/4

Product	Classification Type
761 / L-61	MIL-F7A2-EM12K
780 / L-60	MIL-F7A0-EL12
780 / L-61	MIL-F7A2-EM12K
860 / L-60	MIL-F6A2-EL12
860 / L-61	MIL-F7A2-EM12K
860 / L-70	MIL-F7A2-EA1-A2
960 / L-61	MIL-F7A2-EM12K
L-60	MIL-EL12
L-61	MIL-EM12K
L-70	MIL-EA1
760 / L-61	MIL-F7A2-EM12

SAW Consumables Storage & Handling

Submerged Arc Welding Fluxes and Submerged Arc Welding Electrodes Manufactured by Lincoln Electric

Lincoln Electric Submerged Arc Welding Flux can be used directly from its original, undamaged package, if it has been stored according to the conditions listed in the chart below. Flux may be stored for up to two (2) years under these conditions.

When proper procedures are not followed, flux may show signs of moisture. These can include porosity, a rough bead surface or slag that is unusually difficult to remove. In many instances these fluxes can be re-dryed in general welding applications.

Re-Drying Flux

To re-dry fluxes other than MIL800-H & MIL800-HPNi

- Remove flux from its original packaging and place in a clean oven set between 260°C-480°C (500°F-900°F).
- Leave in oven long enough to raise the temperature of the entire bulk of flux to your set temperature for a minimum of one hour.
- For ovens in which heating rods are inserted into the flux, do not let the temperature of flux adjacent to the rods exceed 480°C (900°F).

For MIL800-H and MIL800-HPNi fluxes

Follow all previous procedures, with the following changes:

- Set temperature between 120°C-205°C (250°F-400°F).
- For ovens in which heating rods are inserted into the flux, do not let the temperature of flux adjacent to the rods exceed 205°C (400°F).

For all other fluxes requiring diffusible hydrogen control

Follow all previous procedures, with the following changes:

- Set temperature at approximately 425°C (800°F).

Recycling Flux

Non-consumed flux may be collected from the finished weld and recycled. To do so, please follow these procedures

- Remove slag, metal, mill scale, and any other contaminants from the flux.
- Prevent damage to the flux from heavy impingement in flux transport systems.
- Avoid the separation of different sized particles in cyclones or “dead” corners.
- Remove excess fines from recycled fluxes.
- For optimal welding characteristics, it is recommended to add at least 20% new flux by weight to recycled flux.

Flux Package Type[1]	Flux Storage Conditions for General Welding Applications	Flux Storage for Applications Requiring Diffusible Hydrogen Control
Plastic or Multi-Wall Plastic/Paper Bag	Store indoors at < 90% RH Protect from condensation	Store indoors at < 70% RH and 5°C - 50°C (40°F - 122°F). Protect from condensation
Bulk Bag with Liner	Store indoors at < 90% RH Protect from condensation	Store indoors at < 70% RH and 5°C - 50°C (40°F - 122°F). Protect from condensation
Steel Drum	Protect from rain or snow	Protect from rain or snow
Plastic Pail	Protect from rain or snow	Protect from rain or snow

[1] For other package types, consult your Technical Representative

Electrode Package Type[1]	Electrode Storage Conditions for All Welding Applications
Any Type	Protect from rain or snow. Protect from condensation. Do not use electrode with visible signs of rust.

NOTES

TEST RESULTS

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

DISTRICT SALES OFFICES

U.S.A.

ALABAMA
BIRMINGHAM 35124-1156
(205) 988-8232
DOTHAN 36303-5533
(334) 782-1074
MOBILE 3652-5323
(251) 377-8574

ALASKA
Contact VANCOUVER, WA
(360) 693-0155

ARIZONA
PHOENIX 85260-1745
(480) 348-2004

ARKANSAS
LITTLE ROCK 72032-4371
(501) 764-0480

CALIFORNIA
LOS ANGELES 90670-4062
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N. CALIFORNIA 95762-5706
(916) 939-8788

COLORADO
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TAMPA
(888) 935-3860

GEORGIA
ATLANTA 30122-3811
(888) 935-3860
SAVANNAH 31324-3866
(912) 656-1978

HAWAII
Contact LOS ANGELES, CA
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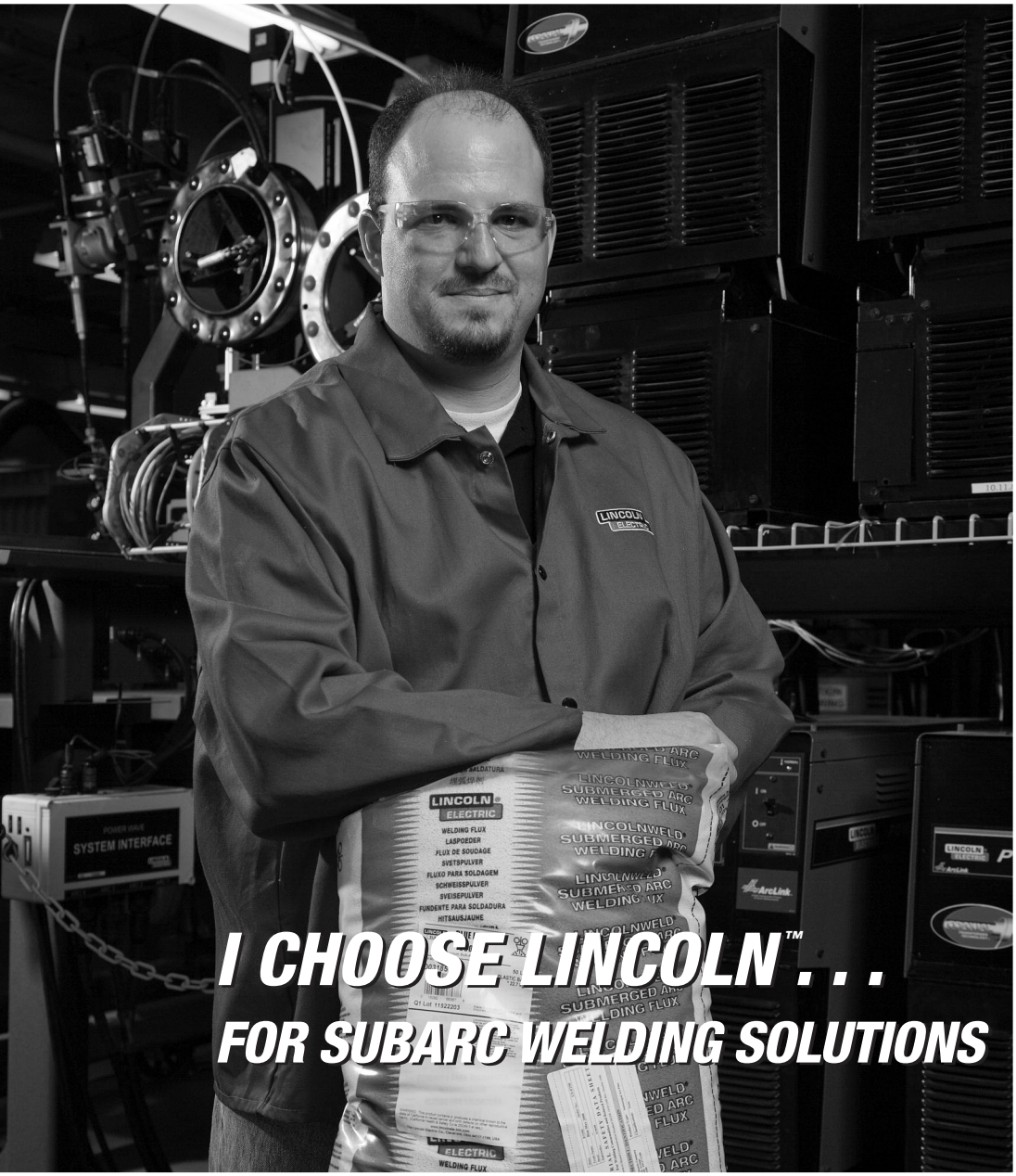

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