



WELDING CONSUMABLES

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WELDING CONSUMABLES

NICKEL AND NICKEL ALLOY Welding Electrodes

ENiCrFe-2

Alloy a (ENiCrFe-2) Electrodes are used for welding of nickel-chromium-iron alloys to themselves as well as for dissimilar welding between various nickel alloys and carbon or stainless steels. There is a large range of applications from cryogenic temperatures up to 1500°F. These electrodes can also be used for overlay cladding where similar alloy is needed.

AWS Specification: A5.11
Welding Current: DCEP
Overhead

AWS Classification: ENiCrFe-2
Welding Positions: Flat, Horizontal, Vertical,

Typical Wire Chemistry:

C: 0.04	Mn: 1.75	Si: 0.32	Cr: 15.5	Mo: 1.5	Cb +Ta: 1.25	Fe: 8.5
Ni: 71.15						

Typical Mechanical Properties (As Welded):

Yield Strength, psi: 72,000	Tensile Strength, psi: 89,000	% Elongation: 36
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Available Diameters and Operating Range in Amps:

3/32": 70 – 90	1/8": 100 – 135	5/32": 130 – 180	3/16": 190 - 220
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ENiCrFe-3

Type 182 Electrodes (ENiCrFe-3) are used for welding of nickel-chromium-iron alloys to themselves and for dissimilar welding between nickel-chromium-iron alloys and steels. Its high manganese content lessens the possibility of micro fissures and also reduces creep strength which limits its usage up to 900°F. Applications for this alloy include surfacing as well as clad-side welding.

AWS Specification: A5.11
Welding Current: DCEP
Overhead

AWS Classification: ENiCrFe-3
Welding Positions: Flat, Horizontal, Vertical,

Typical Wire Chemistry:

C: 0.03	Mn: 6.5	Si: 0.42	Cr: 15.25	Cb + Ta: 1.75	Fe: 7.4	Ni: 68.6
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Typical Mechanical Properties (As Welded):

Yield Strength, psi: 53,500	Tensile Strength, psi: 84,500	% Elongation: 36
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Available Diameters and Operating Range in Amps:

3/32": 70 – 90	1/8": 100 – 135	5/32": 130 – 180	3/16": 190 - 220
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ENiCrMo-3

Type 112 (ENiCrMo-3) is an electrode which is used to weld nickel-chromium-molybdenum alloys. Its applications include dissimilar joints between nickel-chromium-molybdenum alloys to either stainless steels, carbon or low alloy steels. It is also used extensively in overlay cladding where similar chemical composition is required on the clad side. This alloy is suitable for applications where the temperature ranges from cryogenic up to 1800°F.

AWS Specification: A5.11
Welding Current: DCEP
Overhead

AWS Classification: ENiCrMo-3
Welding Positions: Flat, Horizontal, Vertical,

Typical Wire Chemistry:

C: 0.03	Mn: 0.35	Si: 0.34	Fe: 1.5	Cr: 21.5	Mo: 9.2	Cb +Ta: 3.55
Ni: BAL						

Typical Mechanical Properties (As Welded):

Yield Strength, psi: 89,500	Tensile Strength, psi: 114,500	% Elongation: 34
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Available Diameters and Operating Range in Amps:

3/32": 70 – 90	1/8": 100 – 135	5/32": 130 – 180	3/16": 190 - 220
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ENiCrMo-4

Type C276 (ENiCrMo-4) is used for welding materials of similar composition. This material may also be used for dissimilar welding between nickel base alloys and stainless steels as well as for surfacing and cladding. It offers excellent resistance to stress cracking, pitting and crevice corrosion.

AWS Specification: A5.11
Welding Current: DCEP

AWS Classification: ENiCrMo-4
Welding Positions: Flat, Horizontal, Vertical, Overhead

Typical Wire Chemistry:

C: 0.015	Mn: 0.4	Si: 0.14	Fe: 5.5	Mo: 16.1	W: 3.25	Cr: 15.5
Ni: 59.1						

Typical Mechanical Properties (As Welded):

Yield Strength, psi: 78,500	Tensile Strength, psi: 106,000	% Elongation: 39
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Available Diameters and Operating Range in Amps:

3/32": 70 – 90	1/8": 100 – 135	5/32": 130 – 180	3/16": 190 - 220
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ENiCrMo-10

Alloy C22 (ENiCrMo-10) Electrodes are used for welding of nickel-chromium-molybdenum alloys as well as for overlay cladding on carbon, low alloy, or stainless steels. They are also used for dissimilar joints between nickel chromium-molybdenum alloys and stainless, carbon, or low alloy steels. C22 offers excellent corrosion resistance in oxidizing as well as reducing media in a wide variety of chemical process environments. It also offers spectacular resistance to stress corrosion cracking, pitting, and crevice corrosion.

AWS Specification: A5.11
Welding Current: DCEP
Overhead

AWS Classification: ENiCrMo-10
Welding Positions: Flat, Horizontal, Vertical,

Typical Wire Chemistry:

C: 0.014	Mn: 0.35	Si: 0.16	Cr: 21.2	Mo: 13.1	W: 3.3	Fe: 3.9
Ni: BAL						

Typical Mechanical Properties (As Welded):

Yield Strength, psi: 78,500	Tensile Strength, psi: 114,000	% Elongation: 36
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Available Diameters and Operating Range in Amps:

3/32": 70 – 90	1/8": 100 – 135	5/32": 130 – 180	3/16": 190 – 220
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ALUMINUM AND ALUMINUM ALLOY Wires & Electrodes

Alloy ER1100

Alloy ER1100 is highly resistant to chemical attack and weathering. It is a relatively soft alloy that is very formable and is used extensively in thin gauge and foil products. It has good welding characteristics and it is also used as a filler alloy for welding purposes. A desirable characteristic of the alloy is the bright finishes obtained by anodizing. Base metals that can be welded are 1060, 1070, 1080, and 3003. Electrode, wires & rods are available.

Applications: • Heat Exchangers • Food Handling Equipment • Rivets • Tie Wire • Metalizing

AWS Specification: AWS A5.10 AWS Classification: ER1100 Welding Current: DCEP Welding Positions: All positions

Typical Wire Chemistry

Al: 99.5 max	Mn: 0.05 max	Zn: 0.10 max	Cu: 0.05 - 0.20	Si + Fe: 0.95 max
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Typical Properties:

Melting range: 1190 - 1215°F	Conductivity: 59% IACS (- H12)	Density: 0.98 lbs./cu in	Anodized color: Gray
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Available Diameters GMAW & suggested Operating Range in Amps:

.030": 100 – 120	.035": 110 – 170	3/64": 150 – 190	1/16": 200 – 300	3/32": 320 - 330
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Available Diameters GTAW:

1/16" 3/32" & 1/8"

ER4043

ER4043 is a general-purpose type Aluminum welding wire. It is one of the oldest and most widely used welding and brazing alloys. This Aluminum alloys contains silicon additives, which result in improved fluidity (wetting action) of the weld pool and also produces a weld less sensitive to cracking. Its bright weld finish makes it a popular choice of welders. ER4043 can be used to weld various grades of aluminum. Electrode, wires & rods are available.

Applications: • Welding filler wire • Spray and flame metalizing wire

AWS Specification: AWS A5.10 AWS Classification: ER4043 Welding Current: DCEP Welding Positions: All positions

Typical Wire Chemistry:

Si: 4.5 - 6.0 Mn: 0.05 max Ti: 0.20 max Cu: 0.30 max Fe: 0.80 max Zn: 0.10 max Be: 0.0003 max
Mg: 0.05 max Al: BAL

Typical Properties:

Melting range: 1605 - 1170°F Conductivity: 42% IACS (- O) Density: 0.097 lbs/cu in
Anodized color: Gray

Available Diameters GMAW and suggested Operating Range in Amps:

.030": 100 - 120 .035": 110 - 170 3/64": 150 - 190 1/16": 200 - 300 3/32": 320 - 330

Available Diameters GTAW:

1/16" 3/32" 1/8" 5/32" & 3/16"

ER4047

ER4047 was originally developed as a brazing alloy (718) to take advantage of its low melting point and narrow freezing range. It has higher silicon content than its counterpart ER4043 which provides for increased fluidity and reduced shrinkage in the weld. ER4047 produces bright and almost smut-free welds. This alloy may be used in applications of sustained elevated temperatures. **Applications:** • Welding filler wire

AWS Specification: AWS A5.10 AWS Classification: ER4047 Welding Current: DCEP Welding Positions: All positions

Typical Wire Chemistry:

Si: 11.0 - 13.0 Fe: 0.8 max Cu: 0.3 max Mn: 0.15 max Mg: 0.1 max Zn: 0.2 max Be: 0.0003 max
Al: BAL

Typical Properties:

Melting range: 1070 - 1080°F Conductivity: 41% IACS (- O) Density: 0.096 lbs/cu in
Anodized color: Gray - Black

Available Diameters GMAW and suggested Operating Range in Amps:

.030": 100 - 120 .035": 110 - 170 3/64": 150 - 190 1/16": 200 - 300 3/32": 320 - 330

Available Diameters GTAW:

1/16" 3/32" 1/8" & 5/32"

ER5356

ER5356 is a general-purpose type aluminum alloy which is typically chosen for its relatively high shear strength. In addition, it also offers excellent corrosion resistance when exposed to salt water. ER5356 should be considered for welding 5000 series aluminum base metals. **Applications:** • Welding filler wire

AWS Specification: AWS A5.10 AWS Classification: ER5356 Welding Current: DCEP Welding Positions: All positions

Typical Wire Chemistry:

Si: 0.25 max Fe: 0.4 max Cu: 0.1 max Mn: 0.05 - 0.20 Mg: 4.5 - 5.5 Cr: 0.05 - 0.20 Zn: 0.1max Ti: 0.06 - 0.20 Be: 0.0003 max Al: BAL

Typical Properties:

Melting range: 1060 - 1175°F Conductivity: 29% IACS (- O), 27% IACS (- H18) Density: 0.096 lbs/cu in

Available Diameters GMAW and suggested Operating Range in Amps:

.030": 100 – 120 .035": 110 – 170 3/64": 150 – 190 1/16": 200 – 300 3/32": 320 - 330

Available Diameters GTAW:

1/16" 3/32" 1/8" & 5/32

5/64": 20 – 60 3/32": 50 – 80 1/8": 70 – 120 5/32": 110 – 150

STAINLESS STEEL Covered Arc Welding Electrodes & Wires

E308/E308L-16

E308/E308L-16 is an extra low carbon electrode for the welding of type 304L, 321, and 347 stainless steels. The controlled ferrite in the weld deposit gives excellent notch toughness at cryogenic temperatures. This electrode deposits a maximum of .04% carbon in the weld metal to minimize the formation of chromium carbides and consequent susceptibility to inter-granular corrosion.

AWS Specification: AWS A5.4 AWS Classification: E308L/E308L-16 Welding Current: AC - DCEP (Positive) Positions: All positions

Typical Wire Chemistry:

C: 0.03 Mn: 1.65 Si: 0.43 Cr: 19.40 Ni: 9.30 Fe: BA WRC FN: 7

Typical Mechanical Properties (As Welded):

Yield Strength, psi: 64,000 Tensile Strength, psi: 83,300 %
Elongation: 46

Available Diameters & Operating Range in Amps:

1/16": 30 – 50 3/32": 50 – 70 1/8": 75 – 105 5/32": 95 – 130

E309/309L-16

E309/309L-16 Stainless steel electrode is ideal for joining stainless steels to themselves or to carbon and low-alloy steels. Carbon content in the weld metal is held to .04% max which gives it increased resistance to inter-granular corrosion.

AWS Specification: AWS A5. AWS Classification: E309/309L-16 Welding Current: AC - DCEP (Positive) All positions

Typical Wire Chemistry:

C: 0.035 Mn: 1.58 Si: 0.53 Cr: 23.45 Ni: 12.6 Fe: BAL

Typical Mechanical Properties (As Welded):

Yield Strength, psi: 64,000 Tensile Strength, psi: 79,000 %
Elongation: 38

Available Diameters & Operating Range in Amps:

3/32": 45 – 80 1/8": 75 – 135 5/32": 100 – 180

E316/316L-16

E316/316L-16 is used for welding type 316L or 318 stainless steels. It has a maximum of .04% carbon content in the weld metal, which reduces the possibility of carbide precipitation and consequent inter-granular corrosion. This electrode is widely used in the welding of chemical equipment.

AWS Specification: AWS A5.4 AWS Classification: E316L/E316L-16 Welding Current: AC - DCEP (Positive) All positions

Typical Wire Chemistry:

C: 0.035 Mn: 1.75 Si: 0.52 Cr: 18.7 Ni: 12.65 Mo: 2.30 Fe: BAL
WRC FN: 7

Typical Mechanical Properties (As Welded):

Yield Strength, psi: 58,000 Tensile Strength, psi: 85,800 % Elongation: 36

Available Diameters & Operating Range in Amps:

3/32": 45 – 80 1/8": 55 – 120 5/32": 65 – 170 3/16": 160 - 205

E347-16

E347-16 delivers outstanding performance, especially for projects that require you to do a lot of out-of-position welding. This electrode allows you to weld stabilized austenitic 18Cr- 8Ni steels, including those with grades of either the columbium (347) or titanium (321) type. E347-16 offer excellent resistance to sensitization during high temperature service.

AWS Specification: AWS A5.4 AWS Classification: E347-16 Welding Current: AC - DCEP (Electrode Positive) All positions

Typical Wire Chemistry:

C: 0.050 Mn: 1.65 Si: 0.52 Cr: 19.15 Ni: 10.15 Co: 0.6 Fe: BAL
WRC FN: 7

Typical Mechanical Properties (As Welded):

Yield Strength, psi: 57,000 Tensile Strength, psi: 86,000 %
Elongation: 35

Available Diameters & Operating Range in Amps:

3/32": 45 – 80 1/8": 55 – 120 5/32": 65 – 170 3/16": 160 - 205