McKAY

PRODUCT CATALOG

Setting The Standard
In Stainless & Hardsurfacing Welding
Since 1881 McKay® has built a strong reputation for quality, consistency and reliability in the manufacture of various filler metal products. Starting in 1935 we pioneered the development of modern welding consumable products, leading the U.S. in the development of low hydrogen and stainless electrodes. By the onset of World War II, we were firmly established in the welding industry, supplying millions of pounds of mild and stainless steel stick electrodes for use in the construction of warships, tanks and other defense-related hardware.

During the war, our extensive research led us into the business of producing wear-resistant welding products. Since then, nearly 60 years of research, development and service to thousands of customers have given us a wealth of practical hard surfacing knowledge.

Today, as a world leader in hard surfacing products, stainless steel products, low alloy electrodes, and mild steel electrodes, our commitment is to make our people and facilities available to help solve your application problems.
## Table of Contents

### Mild Steel Stick Electrodes & Solid Wires
- **Product Line Overview**: 2
- **AWS Classification Information**: 3
- **Mild and Low Hydrogen Welding Characteristics**: 4
- **Detailed Product Information**: 5-7
- **Comparative Index, Packaging**: 8

### Stainless Steel Stick Electrodes
- **Product Line Overview**: 9
- **AWS Classification Information**: 10
- **Type 15, 16 and 17 Coating Information**: 11
- **Detailed Product Information**: 12-14
- **Comparative Index**: 16
- **Technical Section**: 17-18

### Stainless Steel Wires
- **Product Line Overview**: 19
- **AWS Classification Information**: 20
- **Detailed Product Information**: 21-23
- **Technical Section**: 24-26
- **AWS Classification Information**: 27
- **Detailed Product Information**: 28-30
- **Comparative Index**: 31

### Hard Surfacing Stick Electrodes
- **Product Line Overview**: 33
- **AWS Classification Information**: 34
- **Product Line Summary**: 35
- **Detailed Product Information**: 36-39
- **Cast Iron Stick Electrodes**: 40
- **Maintenance Electrodes**: 41
- **Comparative Index**: 42
- **Technical Section**: 43-44

### Hard Surfacing Wires
- **Product Line Overview/Application Guide**: 45
- **Main Line Products**: 46
- **Detailed Product Information (Tube-Alloy® Metal-Cored Sub-Arc Wires)**: 47-59
- **Detailed Product Information (Special Alloy Wires)**: 60
- **Technical Section**: 61-66
- **Typical Composition and Preheat Temperatures**: 67
- **Oven Storage and Reconditioning**: 68

### Product Offices
- **Product Offices**: 69

(Rev. 01-09)
**Mild Steel Stick Electrode Product Line Overview**

McKay® premium mild steel electrodes are formulated to the same exacting standards as the industry-leading alloy products. The McKay name on the box of mild steel electrodes is an assurance of superior operation, tight deposit chemistries & properties, and consistent overall quality.
STICK ELECTRODES
AWS SECTION

AWS Classification of Mild Steel Stick Electrodes

E7018-1 H4R

Meets requirements of absorbed moisture test
Hydrogen (See Additional Requirements Chart)
Type of coating and current
Position
Tensile in ksi
Electrode

Additional Requirements

Suffix  Additional Requirement
-1  Increased toughness (impact strength) for E7018 electrodes. Also increased ductility in E7024 electrodes.
H4  Indicates the maximum diffusible hydrogen limit measured in millimeters per 100 grams (ml/100 g).
The 4 indicates what the limit is. Example: H4 = 4 mL per 100 grams
R  Meets the requirements of absorbed moisture test.

AWS Tension Test Requirements

<table>
<thead>
<tr>
<th>Class</th>
<th>Min. Tensile Strength</th>
<th>Min. Yield Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>E60xx</td>
<td>62,000 psi</td>
<td>50,000 psi</td>
</tr>
<tr>
<td>E70xx</td>
<td>70,000 psi</td>
<td>57,000 psi</td>
</tr>
<tr>
<td>E80xx</td>
<td>80,000 psi</td>
<td>67,000 psi</td>
</tr>
<tr>
<td>E90xx</td>
<td>90,000 psi</td>
<td>77,000 psi</td>
</tr>
<tr>
<td>E100xx</td>
<td>100,000 psi</td>
<td>87,000 psi</td>
</tr>
<tr>
<td>E110xx</td>
<td>110,000 psi</td>
<td>95,000 psi</td>
</tr>
<tr>
<td>E120xx</td>
<td>120,000 psi</td>
<td>107,000 psi</td>
</tr>
</tbody>
</table>

Types of Coating and Current

<table>
<thead>
<tr>
<th>Digit</th>
<th>Type of Coating</th>
<th>Welding Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>cellulose sodium</td>
<td>DCEP</td>
</tr>
<tr>
<td>1</td>
<td>cellulose potassium</td>
<td>AC or DCEP</td>
</tr>
<tr>
<td>2</td>
<td>titania sodium</td>
<td>AC or DCEN</td>
</tr>
<tr>
<td>3</td>
<td>titania potassium</td>
<td>AC or DCEP or DCEN</td>
</tr>
<tr>
<td>4</td>
<td>iron powder titania</td>
<td>AC or DCEP or DCEN</td>
</tr>
<tr>
<td>5</td>
<td>low hydrogen sodium</td>
<td>DCEN</td>
</tr>
<tr>
<td>6</td>
<td>low hydrogen potassium</td>
<td>AC or DCEP</td>
</tr>
<tr>
<td>7</td>
<td>iron powder iron oxide</td>
<td>AC or DCEP or DCEN</td>
</tr>
<tr>
<td>8</td>
<td>iron powder low hydrogen</td>
<td>AC or DCEN</td>
</tr>
</tbody>
</table>

DCEP—Direct Current Electrode Positive
DCEN—Direct Current Electrode Negative
AC—Alternating Current

Mild Steel Stick Electrode Pallet Information

<table>
<thead>
<tr>
<th>Length</th>
<th>McKay Type</th>
<th>Pallet Weight (lb)</th>
<th>Pallet Dimensions</th>
<th>Number of Units Per Pallet</th>
</tr>
</thead>
<tbody>
<tr>
<td>14&quot;</td>
<td>7018XLM</td>
<td>1320</td>
<td>1420</td>
<td>38&quot; 45&quot; 39&quot; 132 (10 lb cans)</td>
</tr>
<tr>
<td></td>
<td>6011, 6013, 7014, 7024</td>
<td>3000</td>
<td>3080</td>
<td>32&quot; 40&quot; 32&quot; 60 (50 lb cartons)</td>
</tr>
<tr>
<td>14&quot;</td>
<td>6010 PM, 7018 XLM, Soft-Arc 7018-1</td>
<td>3000</td>
<td>3080</td>
<td>32&quot; 40&quot; 38&quot; 60 (50 lb cans)</td>
</tr>
<tr>
<td>16&quot;</td>
<td>7024, 7018 XLM</td>
<td>3000</td>
<td>3115</td>
<td>38&quot; 40&quot; 32&quot; 60 (50 lb cartons)</td>
</tr>
<tr>
<td>18&quot;</td>
<td>7018 XLM</td>
<td>2450</td>
<td>2539</td>
<td>38&quot; 40&quot; 24&quot; 49 (50 lb cans)</td>
</tr>
</tbody>
</table>

Mild Steel Low Hydrogen Suggested Operating Ranges

<table>
<thead>
<tr>
<th>Electrode Diameter</th>
<th>Current Range (amperage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32&quot;</td>
<td>70–110</td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>90–160</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>120–210</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>150–300</td>
</tr>
<tr>
<td>7/32&quot;</td>
<td>240–340</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>270–380</td>
</tr>
</tbody>
</table>
# Mild Steel Stick Electrodes

## Mild Steel Stick Electrodes

<table>
<thead>
<tr>
<th>McKay Product</th>
<th>AWS Class</th>
<th>ABS</th>
<th>Type of Coating</th>
<th>Welding Characteristics</th>
<th>Deposition</th>
<th>Positions</th>
<th>Welding Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>6010 PM</td>
<td>E6010</td>
<td>E6010</td>
<td>High-cellulose sodium</td>
<td>Deep</td>
<td>Medium</td>
<td>All</td>
<td>DCEP</td>
</tr>
<tr>
<td>6011</td>
<td>E6011</td>
<td>E6011</td>
<td>High-cellulose potassium</td>
<td>Deep (DCEP gives reduced penetration)</td>
<td>Medium</td>
<td>All</td>
<td>AC DCEP</td>
</tr>
<tr>
<td>6013</td>
<td>E6013</td>
<td>E6013</td>
<td>High-titania potassium</td>
<td>Light</td>
<td>Medium</td>
<td>All</td>
<td>AC DCEP DCEP</td>
</tr>
<tr>
<td>7014</td>
<td>E7014</td>
<td>E7014</td>
<td>Iron powder titania</td>
<td>Light</td>
<td>High</td>
<td>All</td>
<td>AC DCEP DCEN</td>
</tr>
<tr>
<td>7024</td>
<td>E7024 &amp; E7024-1</td>
<td>E7024-1:3</td>
<td>Iron powder titania</td>
<td>Light</td>
<td>High</td>
<td>Flat Horizontal</td>
<td>AC DCEN</td>
</tr>
</tbody>
</table>
### 6010 PM

**AWS E6010**


Approvals and conformance: AWS Spec A5.1, ASME SFA5.1 (F-2, A-1), ABS E6010, Lloyd’s Grade 3M

#### Typical Weld Metal Properties

(Chem Pad):

<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>0.13</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.40</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.20</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.05</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.04</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.01</td>
</tr>
<tr>
<td>Vanadium</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

#### Typical Properties as Welded

- Tensile Strength, psi: 75,000
- Yield Strength, psi: 62,000
- Elongation in 2": 25% (Charpy V Notch), -20°F, 34 ft•lbs

#### Suggested Operating Ranges

<table>
<thead>
<tr>
<th>Dia. (mm)</th>
<th>DC+ Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32 (2.4 mm)</td>
<td>40-70</td>
</tr>
<tr>
<td>1/8 (3.2 mm)</td>
<td>65-130</td>
</tr>
<tr>
<td>5/32 (4.0 mm)</td>
<td>90-175</td>
</tr>
<tr>
<td>3/16 (4.8 mm)</td>
<td>140-225</td>
</tr>
</tbody>
</table>

#### Typical Applications

- Construction and shipbuilding
- General all-purpose electrode
- Maintenance welding
- Out-of-position X-ray welds
- Pipe welding
- Vertical and overhead plate welding

### 6011

**AWS E6011**

An iron powder E6011 electrode. Low spatter, smooth arc. Deep arc penetration. X-ray quality weld metal. Excellent welding characteristics. Vertical down operation is particularly outstanding. The AC counterpart of McKay 6010 PM.

Approvals and conformance: AWS Spec A5.1, ASME SFA5.1 (F-3, A-1), ABS E6011, Lloyd’s Grade 3M

#### Typical Weld Metal Properties

(Chem Pad):

<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>0.14</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.61</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.30</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.07</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.08</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.01</td>
</tr>
<tr>
<td>Vanadium</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

#### Typical Properties as Welded

- Tensile Strength, psi: 77,700
- Yield Strength, psi: 63,200
- Elongation in 2": 22-63% (Charpy V Notch), -20°F, 30 ft•lbs

#### Suggested Operating Ranges

<table>
<thead>
<tr>
<th>Dia. (mm)</th>
<th>AC, DC+ Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32 (2.4 mm)</td>
<td>60-90</td>
</tr>
<tr>
<td>1/8 (3.2 mm)</td>
<td>80-125</td>
</tr>
<tr>
<td>5/32 (4.0 mm)</td>
<td>130-160</td>
</tr>
<tr>
<td>3/16 (4.8 mm)</td>
<td>160-190</td>
</tr>
</tbody>
</table>

#### Typical Applications

- Construction and shipbuilding
- Galvanized steel
- General all-purpose electrode
- Light sheet metal fabrication
- Maintenance welding
- Welding through paint, mill scale or rust

### 6013

**AWS E6013**

Exceptionally smooth deposit and stable arc. Designed for general purpose use, especially with low-voltage AC welders. Good all-purpose electrode for welding with alternating or direct current. Originally developed for light gage metal, but with sufficient penetration for use on heavier assemblies.

Approvals and conformance: AWS Spec A6.1, ASME SFA5.1 (F-2, A-1), ABS E6013

#### Typical Weld Metal Properties

(Chem Pad):

<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>0.10</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.37</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.27</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.06</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.06</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.01</td>
</tr>
<tr>
<td>Vanadium</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

#### Typical Properties as Welded

- Tensile Strength, psi: 72,600
- Yield Strength, psi: 61,300
- Elongation in 2": 26.5% (Charpy V Notch), -25-55%

#### Suggested Operating Ranges

<table>
<thead>
<tr>
<th>Dia. (mm)</th>
<th>AC, DC+ Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32 (2.4 mm)</td>
<td>40-80</td>
</tr>
<tr>
<td>1/8 (3.2 mm)</td>
<td>70-120</td>
</tr>
<tr>
<td>5/32 (4.0 mm)</td>
<td>130-160</td>
</tr>
<tr>
<td>3/16 (4.8 mm)</td>
<td>160-220</td>
</tr>
</tbody>
</table>

#### Typical Applications

- Excellent for bridging joints with poor fit-up
- General all-purpose electrode
- Metal buildings and structures
- Shaft build-up
- Welding machine parts
**7024**

**AWS E7024 & E7024-1**
A high speed production electrode of the iron powder or contact type. Has optimum arc stability, smoothness of deposit and ease of slag removal. Used for high speed horizontal or flat fillet welds. Approvals and conformances: AWS Spec A5.1, ASME SFA5.1 (F-1, A-1), ABS 3

**Typical Weld Metal Properties**
(Chem Pad):
- Carbon: 0.06
- Manganese: 0.81
- Silicon: 0.43
- Phosphorus: 0.008
- Sulphur: 0.019
- Nickel: 0.07
- Chromium: 0.05
- Molybdenum: 0.02
- Vanadium: 0.02

**Typical Properties as Welded**
- Tensile Strength, psi: 82,000
- Yield Strength, psi: 72,000
- Elongation in 2": 27.5%
- Reduction in Area: 33-55%

**Suggested Operating Ranges**

<table>
<thead>
<tr>
<th>Dia.</th>
<th>AC, DC-</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8 (3.2 mm)</td>
<td>130-150</td>
</tr>
<tr>
<td>5/32 (4.0 mm)</td>
<td>180-225</td>
</tr>
<tr>
<td>3/16 (4.8 mm)</td>
<td>200-280</td>
</tr>
<tr>
<td>7/32 (5.6 mm)</td>
<td>250-320</td>
</tr>
<tr>
<td>1/4 (6.4 mm)</td>
<td>300-360</td>
</tr>
</tbody>
</table>

**Typical Applications**
- Earthmoving equipment and mining machinery
- General all-purpose electrode
- High speed/high deposition
- Plate fabrication
- Railroad cars and shipbuilding

---

**7014**

**AWS E7014**
A high speed general purpose iron powder electrode with greater range of usability than an E7024 electrode. Arc is extremely stable. Deposits are very flat and smooth. Slag removes freely and clearly. Approvals and conformances: AWS Spec A5.1, ASME SFA5.1 (F-2, A-1), ABS E7014

**Typical Weld Metal Properties**
(Chem Pad):
- Carbon: 0.06
- Manganese: 0.54
- Silicon: 0.35
- Phosphorus: 0.026
- Sulphur: 0.013
- Nickel: 0.09
- Chromium: 0.06
- Molybdenum: 0.01
- Vanadium: 0.01

**Typical Properties as Welded**
- Tensile Strength, psi: 79,000
- Yield Strength, psi: 68,100
- Elongation in 2": 27.5%
- Reduction in Area: 33-55%

**Suggested Operating Ranges**

<table>
<thead>
<tr>
<th>Dia.</th>
<th>AC, DC±</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32 (2.4 mm)</td>
<td>70-90</td>
</tr>
<tr>
<td>1/8 (3.2 mm)</td>
<td>120-145</td>
</tr>
<tr>
<td>5/32 (4.0 mm)</td>
<td>140-210</td>
</tr>
<tr>
<td>3/16 (4.8 mm)</td>
<td>180-280</td>
</tr>
</tbody>
</table>

**Typical Applications**
- Excellent for bridging joints with poor fit-up
- General all-purpose electrode
- Heavy sheet metal
- Iron powder increases deposition rate and efficiency
- Welding machine bases and frames
**7018 XLM**

AWS E7018-1 H4R

A high deposition rate iron powder electrode for use with either AC or DC reverse polarity. Ease of welding in vertical or overhead positions is outstanding. For mild steel and joining mild to low alloy steels. Approvals and conformances: AWS Spec A5.1, ASME SFA5.1 (F-4, A-1), ABS E7018-1

**Typical Weld Metal Properties**

(Chem Pad):

<table>
<thead>
<tr>
<th>Element</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>0.07</td>
</tr>
<tr>
<td>Manganese</td>
<td>1.10</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.30</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.01</td>
</tr>
<tr>
<td>Sulphur</td>
<td>0.01</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.08</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.08</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.01</td>
</tr>
<tr>
<td>Vanadium</td>
<td>0.01</td>
</tr>
<tr>
<td>Mn + Ni + Cr + Mo + V</td>
<td>1.28</td>
</tr>
</tbody>
</table>

**Typical Properties of Welded Deposit As Welded**

- Tensile Strength, psi: 78,000
- Yield Strength, psi: 68,000
- Elongation in 2": 31%
- Reduction in Area: 77%
- Impact Strength, ft•lbs: -20°F, 90 ft•lbs

**Suggested Operating Ranges**

<table>
<thead>
<tr>
<th>Dia.</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32&quot; (2.4 mm)</td>
<td>70-110</td>
</tr>
<tr>
<td>1/8&quot; (3.2 mm)</td>
<td>90-100</td>
</tr>
<tr>
<td>5/32&quot; (4.0 mm)</td>
<td>110-230</td>
</tr>
<tr>
<td>3/16&quot; (4.8 mm)</td>
<td>190-300</td>
</tr>
<tr>
<td>7/32&quot; (5.6 mm)</td>
<td>240-340</td>
</tr>
<tr>
<td>1/4&quot; (6.4 mm)</td>
<td>310-390</td>
</tr>
</tbody>
</table>

**Typical Applications**

- Excellent for out-of-position tacking
- Iron powder increases deposition rate
- Low allow structural
- Offshore rigs and power plants
- Steel structures and field erections

---

**Soft-Arc™ 7018-1**

AWS E7018-1 H4

An electrode designed to give outstanding operator appeal in all positions when welding steels that require low hydrogen X-ray quality welds. Very good low temperature impacts are also found along with a smooth, stable arc with low spatter and good slag removal. Approvals and conformances: AWS Spec A5.1, ASME SFA5.1 (F-4, A-1), ABS E7018-1

**Typical Weld Metal Properties**

(Chem Pad):

<table>
<thead>
<tr>
<th>Element</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>0.04</td>
</tr>
<tr>
<td>Manganese</td>
<td>1.00</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.40</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.012</td>
</tr>
<tr>
<td>Sulphur</td>
<td>0.009</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.06</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.05</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.02</td>
</tr>
<tr>
<td>Vanadium</td>
<td>0.01</td>
</tr>
<tr>
<td>Mn + Ni + Cr + Mo + V</td>
<td>1.14</td>
</tr>
</tbody>
</table>

**Typical Properties of Welded Deposit As Welded**

- Tensile Strength, psi: 81,000
- Yield Strength, psi: 69,000
- Elongation in 2": 29%
- Reduction in Area: 77%
- Impact Strength, ft•lbs: -20°F, 100 ft•lbs
- (Charpy V Notch): -50°F, 75 ft•lbs

**Suggested Operating Ranges**

<table>
<thead>
<tr>
<th>Dia.</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32&quot; (2.4 mm)</td>
<td>80-110</td>
</tr>
<tr>
<td>1/8&quot; (3.2 mm)</td>
<td>90-150</td>
</tr>
<tr>
<td>5/32&quot; (4.0 mm)</td>
<td>110-230</td>
</tr>
<tr>
<td>3/16&quot; (4.8 mm)</td>
<td>150-300</td>
</tr>
</tbody>
</table>

**Typical Applications**

- Welding of enameling steels; free machining steels; low allow structural;
- and low, medium or high carbon steels
- Weldments in low temperature environments where low temperature impacts are important
### Comparative Index of Mild Steel Electrodes

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>McKay</th>
<th>ESAB</th>
<th>Lincoln</th>
<th>Hobart</th>
</tr>
</thead>
<tbody>
<tr>
<td>E6010</td>
<td>6010 PM</td>
<td>SW-10P, SW-10P Plus</td>
<td>Fleetweld 5P, 5P+</td>
<td>Pipemaster 60</td>
</tr>
<tr>
<td>E6011</td>
<td>6011</td>
<td>SW-14</td>
<td>Fleetweld 35, 180</td>
<td>335A, 335C</td>
</tr>
<tr>
<td>E6013</td>
<td>6013</td>
<td>SW-15</td>
<td>Fleetweld 37</td>
<td>447A, 447C</td>
</tr>
<tr>
<td>E7014</td>
<td>7014</td>
<td>SW-15IP</td>
<td>Fleetweld 47</td>
<td>14A</td>
</tr>
<tr>
<td>E7024, E7024-1</td>
<td>7024</td>
<td>7024</td>
<td>Jetweld 1</td>
<td>24</td>
</tr>
<tr>
<td>E7018-1</td>
<td>7018 XLM</td>
<td>Atom Arc 7018</td>
<td>LH-70, Excalibur 7018-1</td>
<td>418</td>
</tr>
<tr>
<td></td>
<td>Soft-Arc 7018-1</td>
<td>Atom Arc 7018-1</td>
<td>LH-78 MR</td>
<td>718 MC</td>
</tr>
</tbody>
</table>

### Mild Steel Electrodes Per Pound

<table>
<thead>
<tr>
<th>McKay Type</th>
<th>Diameter:</th>
<th>3/32” (2.4 mm)</th>
<th>1/8” (3.2 mm)</th>
<th>5/32” (4.0 mm)</th>
<th>3/16” (4.8 mm)</th>
<th>1/4” (6.4 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6010 PM</td>
<td>30</td>
<td>17</td>
<td>12</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6011</td>
<td>29</td>
<td>16</td>
<td>11</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6013</td>
<td>30</td>
<td>15</td>
<td>10</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7014</td>
<td>23</td>
<td>13</td>
<td>9</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7024</td>
<td></td>
<td>10</td>
<td>7</td>
<td></td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>7018 XLM, Soft-Arc 7018-1</td>
<td>21</td>
<td>12</td>
<td>9</td>
<td>7</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

### Packaging Options

#### 14-Inch Electrodes

- 10 lb Hermetically Sealed Can
- 50 lb Hermetically Sealed Can
- 50 lb Corrugated Carton

#### 18-Inch Electrodes

- 50 lb Hermetically Sealed Can
- 50 lb Corrugated Carton

*All the McKay mild steel electrodes are stamped with tAWS class or product name.*
For over a half a century, McKay® has been the acknowledged leader in stainless steel welding technology. Exceptionally tight internal specifications and controls in all phases of the manufacturing operation assure the end user the utmost consistency in chemistry, ferrite, welder appeal, and overall quality.

McKay stainless electrode coatings are custom formulated for each electrode diameter, grade and coating type, and for each individual heat of selected core wire. Each electrode has complete traceability and is imprinted with both AWS grade and lot number. For most of the popular grades, McKay stainless electrodes are available in three coating types: AC-DC, DC Lime and Sterling® coating. In addition, actual chemistries are available upon request for McKay stainless steel covered electrodes at no additional charge.

From formulation through raw material selection and each stage of production, McKay stainless electrodes are made to be the industry standard.
**STICK ELECTRODES AWS SECTION**

**AWS Classification of Stainless Steel Coated Electrodes**

E308L-16

- Indicates how the metal is transferred and the coating type. (See Coating Characteristics Chart)
- Indicates any changes to the original alloy. (See Additional Requirements Chart)
- Indicates what a weld made by this electrode will have in it. (See Applications Chart)
- Indicates that this is an electrode.

### Positions

1 Flat, Horizontal, Vertical, Overhead

- **Flat**—Usually groove welds, fillet welds only if welded like a “V”.
- **Horizontal**—Fillet welds, welds on walls (travel is from side to side).
- **Vertical**—Welds on walls (travel is either up or down).
- **Overhead**—Weld that needs to be done upside down.

### Coating Characteristics

<table>
<thead>
<tr>
<th>Coating</th>
<th>Dash Number</th>
<th>Out of Position</th>
<th>Bead Ripple</th>
<th>Slag Removal</th>
<th>Spatter Level</th>
<th>Crack Resistance</th>
<th>Transfer Type</th>
<th>Operating Current</th>
<th>Bead Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Lime</td>
<td>-15</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>Globular</td>
<td>DCEP</td>
<td>Convex</td>
</tr>
<tr>
<td>AC-DC</td>
<td>-16</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>Globular</td>
<td>AC/DCEP</td>
<td>Flat</td>
</tr>
<tr>
<td>Sterling</td>
<td>-17</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>Spray</td>
<td>AC/DCEP</td>
<td>Concave</td>
</tr>
</tbody>
</table>

**Ratings:** 1 = the best, 3 = the least

### AWS Class and Applications

#### Class Brief Description

- A: E308 Used for welding many dissimilar 300 series stainless steels
- A: E309 Used for welding many dissimilar metals—mild steel to stainless steel
- A: E310 Used to join similar alloys—some dissimilar metals
- A: E312 Excellent for welding dissimilar metals
- A: E316 Mo added to help prevent pitting and increase creep resistance
- A: E317 Even more Mo than E316
- A: E330 For heat and scale resistance above 1800F on similar base metal
- M: E410 For welding martensitic stainless steels and used for surfacing carbon steels
- PH: E630 For welding ASTM A564 Type 630 (17-4 PH and 15-5 PH)
- D: E2209 For welding similar duplex stainless steels

### Additional Requirements

**Suffix** Additional Requirements

- L: Has a lower carbon content
- H: Limited to the upper range on the carbon content
- Mo: Molybdenum added—pitting resistance, creep strength, ferrite increased
- Ni: Nickel added—high temperature strength, corrosion resistance, added toughness

### AWS (A5.4) Stainless Steel Stick Electrode Chemical Composition of Weld Metal Deposit, %

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>Carbon</th>
<th>Chromium</th>
<th>Nickel</th>
<th>Molybdenum</th>
<th>Manganese</th>
<th>Silicon</th>
<th>Phosphorous</th>
<th>Copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>E308-XX</td>
<td>0.08 Max.</td>
<td>18.0–21.0</td>
<td>9.0–11.0</td>
<td>0.75 Max.</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E308H-XX</td>
<td>0.04–0.08</td>
<td>18.0–21.0</td>
<td>9.0–11.0</td>
<td>0.75 Max.</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E308L-XX</td>
<td>0.04 Max.</td>
<td>18.0–21.0</td>
<td>9.0–11.0</td>
<td>0.75 Max.</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E309-XX</td>
<td>0.15 Max.</td>
<td>22.0–25.0</td>
<td>12.0–14.0</td>
<td>0.75 Max.</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E309L-XX</td>
<td>0.04 Max.</td>
<td>22.0–25.0</td>
<td>12.0–14.0</td>
<td>0.75 Max.</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E309Mo</td>
<td>0.08 Max.</td>
<td>22.0–25.0</td>
<td>12.0–14.0</td>
<td>0.75 Max.</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E309MoL</td>
<td>0.08 Max.</td>
<td>22.0–25.0</td>
<td>12.0–14.0</td>
<td>0.75 Max.</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E310-XX</td>
<td>0.08 Max.</td>
<td>25.0–28.0</td>
<td>20.0–22.5</td>
<td>0.75 Max.</td>
<td>1.0–2.5</td>
<td>0.75 Max.</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E312-XX</td>
<td>0.15 Max.</td>
<td>28.0–32.0</td>
<td>8.0–10.5</td>
<td>0.75 Max.</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E316-XX</td>
<td>0.08 Max.</td>
<td>17.0–20.0</td>
<td>11.0–14.0</td>
<td>2.0–3.0</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E316H-XX</td>
<td>0.04–0.08</td>
<td>17.0–20.0</td>
<td>11.0–14.0</td>
<td>2.0–3.0</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E316L-XX</td>
<td>0.04 Max.</td>
<td>17.0–20.0</td>
<td>11.0–14.0</td>
<td>2.0–3.0</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E317L-XX</td>
<td>0.04 Max.</td>
<td>18.0–21.0</td>
<td>12.0–14.0</td>
<td>2.0–3.0</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E330-XX</td>
<td>0.18–0.25</td>
<td>14.0–17.0</td>
<td>33.0–37.0</td>
<td>0.75 Max.</td>
<td>1.0–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E347-XX</td>
<td>0.08 Max.</td>
<td>18.0–21.0</td>
<td>9.0–11.0</td>
<td>0.75 Max.</td>
<td>0.5–2.5</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E410-XX</td>
<td>0.12 Max.</td>
<td>11.0–13.5</td>
<td>0.7 Max.</td>
<td>0.75 Max.</td>
<td>1.0 Max.</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E410NMo-XX</td>
<td>0.06 Max.</td>
<td>11.0–12.5</td>
<td>4.0–5.0</td>
<td>0.40–0.70</td>
<td>1.0 Max.</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>E2209-XX**</td>
<td>0.04 Max.</td>
<td>21.5–23.5</td>
<td>8.5–10.5</td>
<td>2.5–3.5</td>
<td>0.5–2.0</td>
<td>0.90 Max.</td>
<td>0.04 Max.</td>
<td>0.75 Max.</td>
</tr>
</tbody>
</table>
### Stainless Steel Stick Electrodes

**DC Lime (-15)** Excellent for all-position operation, McKay DC Lime stick electrodes provide low spatter and good weld bead appearance. The best choice for maximum impact and crack resistance at high temperatures or for welding highly restrained joints, DC Lime electrodes are the preferred choice for pipe welding and cryogenic applications.

**AC-DC/Sterling AP/Smootharc Plus (-16)** Ideal multipurpose stainless electrodes provide smooth, uniform and finely rippled weld beads that require minimal finishing. AC-DC/Sterling AP electrodes perform well on AC or DCEP and possess outstanding out-of-position capabilities and good strike and restrike characteristics.

**Sterling® (-17)** A superb family of spray transfer electrodes that produces attractive, finely rippled concave weld beads. Sterling electrodes operate well in all positions, on AC or DCEP, with self-peeling slag and excellent restrike characteristics. The direct spray arc transfer is extremely stable and exhibits higher deposition rates with little spatter.

<table>
<thead>
<tr>
<th>McKay Product</th>
<th>AWS Class</th>
<th>Smootharc Plus/AC-DC/Sterling AP -16</th>
<th>DC Lime -15</th>
<th>Sterling -17</th>
</tr>
</thead>
<tbody>
<tr>
<td>308/308H</td>
<td>E308 &amp; E308H</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>308L</td>
<td>E308L</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>309</td>
<td>E309</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>309L</td>
<td>E309L</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>310</td>
<td>E310</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>312</td>
<td>E312</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>316/316H</td>
<td>E316 &amp; E316H</td>
<td>●</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>316L</td>
<td>E316L</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>317L</td>
<td>E317L</td>
<td>●</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>330</td>
<td>E330</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>347</td>
<td>E347</td>
<td>●</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>410</td>
<td>E410</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>410NiMo</td>
<td>E410NiMo</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2209</td>
<td>E2209</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

● Offered  ○ Not Offered

**NOTE:** Actual certs are included in every master carton of stainless stick electrodes at no charge.
### Stainless Steel Stick Electrodes

#### 308/308H Sterling AP
- **308/308H DC Lime**
- **308/308H Sterling®**

AWS E308-16 & E308H-16  
AWS E308-15 & E308H-15  
AWS E308-17 & E308H-17  

For applications where service conditions are not severe. Intermediate layer prior to deposition of hard-facing material. Use on Types 301, 302, 304, 305, and 308 base metals. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, A-8)

**Typical Deposit Analysis %**
- C – 0.06  
- Mn – 0.14  
- Si – 0.44  
- Cr – 19.88  
- Ni – 9.78  
- Fe – Bal.

**Typical Properties and Ferrite Number of Weld Deposit as Welded**
- Tensile Strength: 86,000 psi  
- Yield Strength: 65,000 psi  
- Elongation in 2": 45%  
- DeLong Ferrite Number: 7

#### 309 H Sterling AP
- **AWS E309-16**

The moisture resistant, all-position 309 (H) Sterling® AP electrode is primarily designed for welding Type 309 metal but can also be used for 18-8 clad steels or dissimilar materials if the alloy content is sufficiently high for a sound, ductile deposit. It yields a uniform weld bead that is flat to slightly convex:  
AWS Spec A5.4, ASME SF5.4 (F-5, A-8)

**Typical Deposit Analysis %**
- C – 0.08  
- Cr – 23.50  
- Ni – 13.00  
- Mo – 0.10  
- Mn – 1.05  
- P – 0.020  
- S – 0.16  
- Cu – 0.10

**Typical Properties and Ferrite Number of Weld Deposit as Welded**
- Tensile Strength: 88,000 psi  
- Yield Strength: 67,000 psi  
- Elongation in 2": 37%  
- DeLong Ferrite Number: .6-15

#### 310 AC-DC
- **AWS E310-16**

For welding base metal of similar composition, when the stainless base metal is of unknown composition, and for dissimilar metals. Used as a transition layer for high restrained joints of high carbon steels.  
Approvals and conformances: AWS Spec A5.4, ASME SF5.4 (F-5, A-9)

**Typical Deposit Analysis %**
- C – 0.14  
- Mn – 2.02  
- Si – 0.48  
- Cr – 26.12  
- Ni – 21.00  
- Fe – Bal.

**Typical Properties and Ferrite Number of Weld Deposit as Welded**
- Tensile Strength: 86,000 psi  
- Yield Strength: 70,000 psi  
- Elongation in 2": 35%  
- DeLong Ferrite Number: 13

#### 309Mo
- **309MoL AC-DC**

AWS E309Mo-16  
AWS E309MoL-16

Addition of Molybdenum to 309 for improved tensile strength and resistance. Used for 316 clad steels and joining Mo-containing steels to carbon steels:  
AWS Spec A5.4, ASME SF5.4 (F-5, A-8)

**Typical Deposit Analysis %**
- C – 0.03  
- Mn – 1.23  
- Si – 0.44  
- Cr – 22.70  
- Ni – 13.60  
- Mo – 2.40  
- Fe – Bal.

**Typical Properties and Ferrite Number of Weld Deposit as Welded**
- Tensile Strength: 90,000 psi  
- Yield Strength: 70,000 psi  
- Elongation in 2": 35%  
- DeLong Ferrite Number: 13
312 AC-DC
AWS E312-16
Welding Type 312 base metals. Excellent for dissimilar metal joining due to high ferrite potentials. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, 4-8)

Typical Deposit Analysis %
- C: 0.07
- Mn: 0.80
- Si: 0.40
- Cr: 28.50
- Ni: 9.10
- Fe: Bal.

Typical Properties and Ferrite Number of Weld Deposit as Welded
- Tensile Strength: .115,000 psi
- Yield Strength: .95,000 psi
- Elongation in 2": .25%
- DeLong Ferrite Number: .45

316/316L Sterling AP
316/316L DC Lime
316/316L Sterling®
316L Smootharc Plus
AWS 316/E316L-16
AWS 316/E316L-15
AWS 316/E316L-17
Welding Type 316L material. Properties similar to Type 316. Suited for urea environments. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, A-8)

Typical Deposit Analysis %
- C: 0.02
- Mn: 1.55
- Si: 0.48
- Cr: 18.20
- Ni: 13.00
- Mo: 2.27
- Fe: Bal.

Typical Properties and Ferrite Number of Weld Deposit as Welded
- Tensile Strength: .82,000 psi
- Yield Strength: .61,000 psi
- Elongation in 2": .42%
- DeLong Ferrite Number: .2

316/316H Sterling AP
316/316H Sterling®
AWS E316-16 & E316H-16
AWS E316-17 & E316H-17
For welding Type 316 steel. Applies where increased high temperature corrosion resistance of molybdenum-bearing steels are necessary. Low FN version. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, A-8)

Typical Deposit Analysis %
- C: 0.02
- Mn: 1.63
- Si: 0.40
- Cr: 18.50
- Ni: 12.40
- Mo: 2.21
- Fe: Bal.

Typical Properties and Ferrite Number of Weld Deposit as Welded
- Tensile Strength: .85,000 psi
- Yield Strength: .68,000 psi
- Elongation in 2": .45%
- DeLong Ferrite Number: .4

317L AC-DC
AWS E317L-16
AWS E317L-17
Increased molybdenum content results in higher tensile strength, better corrosion resistance, and improved high temperature creep strength when compared with 316L. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, A-8)

Typical Deposit Analysis %
- C: 0.03
- Mn: 1.21
- Si: 0.51
- Cr: 18.80
- Ni: 13.70
- Mo: 3.40
- Fe: Bal.

Typical Properties and Ferrite Number of Weld Deposit as Welded
- Tensile Strength: .92,000 psi
- Yield Strength: .69,000 psi
- Elongation in 2": .35%
- DeLong Ferrite Number: .4

347 AC-DC
AWS E347-16
AWS E347-17
Metal stabilized with columbium prevents carbide precipitation. Better corrosion resistance than Type 308. For welding Types 347 and 321 steels. Good corrosion resistance in steam or utility applications up to 1400°F. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, A-8)

Typical Deposit Analysis %
- C: 0.20
- Mn: 1.84
- Si: 0.34
- Cr: 15.30
- Ni: 34.19
- Fe: Bal.

Typical Properties and Ferrite Number of Weld Deposit as Welded
- Tensile Strength: .86,000 psi
- Yield Strength: .58,000 psi
- Elongation in 2": .40%
- DeLong Ferrite Number: .0

Stainless Steel Stick Electrodes
**Stainless Steel Stick Electrodes**

### 410NiMo AC-DC
**AWS E410NiMo-16**
Air-hardening stainless for welding 12 Cr material. Requires pre and post-weld heat treatments. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, A-8)

**Typical Deposit Analysis %**
- C – 0.09
- Mn – 0.55
- Si – 0.29
- Cr – 12.30
- Fe – Bal.

**Typical Properties and Ferrite Number of Weld Deposit as Welded**
Heat Treated for 1 hr. @ 1375°F
- Tensile Strength ............... 80,000 psi
- Yield Strength .................. 44,000 psi
- Elongation in 2" ................. .24%  

### 2209 AC-DC
**AWS E2209-16**
Specially formulated for welding the 22 Cr-5 Ni-3 Mo (Type 2205) duplex stainless steels. The deposited duplex weld metal offers combined high strength with improved pitting and SSC resistance. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, A-8)

**Typical Deposit Analysis %**
- C – 0.03
- Mn – 1.01
- Si – 0.38
- Cr – 22.90
- Ni – 10.10
- Mo – 03.00
- N – 0.093
- Fe – Bal.

**Typical Properties and Ferrite Number of Weld Deposit as Welded**
Tensile Strength ............... 115,000 psi
- Yield Strength .................. 90,000 psi
- Elongation in 2" ................. .27%
- DeLong Ferrite Number (Extended) ........ 34
- Impact Strength ... -50°F ........ .23 ft•lbf (Charpy v Notch)

### 410 AC-DC
**AWS E410-16**
Air-hardening stainless for welding 12 Cr material. Requires pre and post-weld heat treatments. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, A-8)

**Typical Deposit Analysis %**
- C – 0.09
- Mn – 0.55
- Si – 0.29
- Cr – 12.30
- Fe – Bal.

**Typical Properties and Ferrite Number of Weld Deposit as Welded**
Heat Treated for 1 hr. @ 1375°F
- Tensile Strength ............... 80,000 psi
- Yield Strength .................. 44,000 psi
- Elongation in 2" ................. .24%

### 410NiMo AC-DC
**AWS E410NiMo-16**
Used extensively for welding ASTM CA6NM castings as well as 410, 410S and 405 base metals. Better as-welded toughness than 410. Approvals and conformances: AWS Spec A5.4, ASME SFA5.4 (F-5, A-8)

**Typical Deposit Analysis %**
- C – 0.02
- Mn – 0.68
- Si – 0.35
- Cr – 12.48
- Ni – 04.30
- Mo – 0.55
- Fe – Bal.

**Typical Properties and Ferrite Number of Weld Deposit as Welded**
Stress Relieved for 1 hr. @ 1125°F
- Tensile Strength ............... 134,000 psi
- Yield Strength .................. 123,000 psi
- Elongation in 2" ................. .18%
### Comparative Index of Stainless Steel Electrodes

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>McKay</th>
<th>Techalloy</th>
<th>Sandvik</th>
<th>Lincoln</th>
</tr>
</thead>
<tbody>
<tr>
<td>E308L-16</td>
<td>308/308L Sterling AP</td>
<td>Tech Rod 308L-16</td>
<td>–</td>
<td>Red Baron 308L MR</td>
</tr>
<tr>
<td>E308L-17</td>
<td>308L-17 Sterling</td>
<td>Tech Rod 308L-17</td>
<td>19.9. LR</td>
<td>Blue Max 308/308L AC/DC</td>
</tr>
<tr>
<td>E308H-16</td>
<td>308/308H Sterling AP</td>
<td>Tech Rod 308-16</td>
<td>–</td>
<td>Red Baron 308/308H MR</td>
</tr>
<tr>
<td>E308H-17</td>
<td>308/308H Sterling</td>
<td>Tech Rod 308-17</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E309L-17</td>
<td>309L Sterling</td>
<td>Tech Rod 309L-17</td>
<td>24.3. LR</td>
<td>Blue Max 309/309L AC/DC</td>
</tr>
<tr>
<td>E309-17</td>
<td>309-17 Sterling</td>
<td>Tech Rod 309-17</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E309Mo-17</td>
<td>309 Mo/309MoL</td>
<td>–</td>
<td>23.12.2. LR</td>
<td>–</td>
</tr>
<tr>
<td>E310-16</td>
<td>310 AC-DC</td>
<td>Tech Rod 310-16</td>
<td>–</td>
<td>Red Baron 310 MR</td>
</tr>
<tr>
<td>E312-16</td>
<td>312 AC-DC</td>
<td>Tech Rod 312-16</td>
<td>29.9 R</td>
<td>–</td>
</tr>
<tr>
<td>E316L-16</td>
<td>316/316L Sterling AP</td>
<td>Tech Rod 316L-16</td>
<td>19.12.3. LRV</td>
<td>Red Baron 316/316L MR</td>
</tr>
<tr>
<td>E316L-17</td>
<td>316L-17 Sterling</td>
<td>Tech Rod 316L-17</td>
<td>19.12.3. LR</td>
<td>Blue Max 316/316L AC/DC</td>
</tr>
<tr>
<td>E316H-16</td>
<td>316/316H Sterling AP</td>
<td>Tech Rod 316-16</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E316H-17</td>
<td>316/316H-17 Sterling</td>
<td>Tech Rod 316-17</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E317L-16</td>
<td>317L AC-DC</td>
<td>Tech Rod 317-16</td>
<td>19.13.4. LR</td>
<td>–</td>
</tr>
<tr>
<td>E330-16</td>
<td>330 AC-DC</td>
<td>Tech Rod 330-16</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E347-16</td>
<td>347 AC-DC</td>
<td>Tech Rod 347-16</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E410-16</td>
<td>410 AC-DC</td>
<td>Tech Rod 410-16</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E410NiMo-16</td>
<td>410NiMo AC-DC</td>
<td>Tech Rod 410NiMo-16</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>E2209-16</td>
<td>2209 AC-DC</td>
<td>Tech Rod 2209</td>
<td>22.9.3. LR (B)</td>
<td>–</td>
</tr>
</tbody>
</table>
Calculate the nickel and chromium equivalents from the weld metal analysis. If nitrogen analysis of the weld metal is not available, assume 0.06% for GTAW and covered electrodes or 0.08% for GMAW weld metals.

If the chemistry is accurate, the diagram predicts the WRC Ferrite Number within ± 3 in approximately 90% of the tests for the 308, 309, 316, and 317 families.

Comparison with Schaeffler Diagram:
1. The Nickel Equivalent allows for a nitrogen pick-up of 30N.
2. Ferrite Numbers for 308, 308L, and 347 covered electrodes are similar. The higher alloy 309, 316, and 317 families have about 2 to 4 higher FN on this diagram.
3. Generally, this diagram correlates better with GTAW and GMAW weld metals because it allows for nitrogen pick-up.
4. The Schaeffler austenite-martensite boundary has been included here for reference.

Comparison with DeLong Diagram:
1. The Nickel Equivalent allows for a nitrogen pick-up of 30N.
2. Ferrite Numbers for 308, 308L, and 347 covered electrodes are similar. The higher alloy 309, 316, and 317 families have about 2 to 4 higher FN on this diagram.
3. Generally, this diagram correlates better with GTAW and GMAW weld metals because it allows for nitrogen pick-up.
4. The Schaeffler austenite-martensite boundary has been included here for reference.

Comparison with 1992 WRC Diagram:
1. Considered more accurate for predicting ferrite in higher-alloyed stainless steels.
2. Copper (Cu) has been added to help determine the FN of duplex stainless steel welds.
3. This diagram should be limited to welds that contain less than 3Mo, less than 1Si, less than 10Mn and less than 0.2N.
4. A = Entirely austenite
   AF = Austenite with some ferrite
   FA = Ferrite with islands of austenite
   F = Ferrite alone
Stainless Steel Stick Electrode Suggested Operating Ranges

<table>
<thead>
<tr>
<th>Electrode Diameter</th>
<th>AC-DC/Sterling AP and DC Lime</th>
<th>Sterling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flat and Vertical Up Welding</td>
<td>Flat and Vertical Up Welding</td>
</tr>
<tr>
<td></td>
<td>inches</td>
<td>mm</td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>3.2</td>
<td>90–110</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>4.0</td>
<td>125–150</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>4.8</td>
<td>140–190</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>6.4</td>
<td>210–300</td>
</tr>
</tbody>
</table>

NR = Not Recommended

Stainless Steel Electrodes Per Pound

<table>
<thead>
<tr>
<th>McKay Type</th>
<th>Diameter: Length:</th>
<th>3/32&quot; (2.4 mm) 10&quot;</th>
<th>1/8&quot; (3.2 mm) 14&quot;</th>
<th>5/32&quot; (4.0 mm) 14&quot;</th>
<th>3/16&quot; (4.8 mm) 14&quot;</th>
<th>1/4&quot; (6.4 mm) 14&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Lime (-15)</td>
<td></td>
<td>37</td>
<td>15</td>
<td>10</td>
<td>7</td>
<td>—</td>
</tr>
<tr>
<td>AC-DC/Sterling AP (-16)</td>
<td>Smootharc Plus</td>
<td>34</td>
<td>13</td>
<td>9</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Sterling (-17)</td>
<td></td>
<td>34</td>
<td>13</td>
<td>9</td>
<td>6</td>
<td>—</td>
</tr>
</tbody>
</table>

Stainless Steel Stick Electrode Pallet Information

<table>
<thead>
<tr>
<th>Length</th>
<th>McKay Type</th>
<th>Pallet Weight (lb)</th>
<th>Pallet Dimensions</th>
<th>Number of Units Per Pallet</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32&quot;–10&quot;</td>
<td>DC Lime</td>
<td>792</td>
<td>Net 38&quot;</td>
<td>45&quot;</td>
</tr>
<tr>
<td>1/8&quot;–14&quot;</td>
<td>1320</td>
<td>1420</td>
<td>Gross (est.) 38&quot;</td>
<td>45&quot;</td>
</tr>
<tr>
<td>5/32&quot;–14&quot;</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
<td>45&quot;</td>
</tr>
<tr>
<td>3/16&quot;–14&quot;</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
<td>45&quot;</td>
</tr>
<tr>
<td>3/32&quot;–10&quot;</td>
<td>AC-DC/Sterling AP</td>
<td>Smootharc Plus</td>
<td>792</td>
<td>892</td>
</tr>
<tr>
<td>1/8&quot;–14&quot;</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
<td>45&quot;</td>
</tr>
<tr>
<td>5/32&quot;–14&quot;</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
<td>45&quot;</td>
</tr>
<tr>
<td>3/16&quot;–14&quot;</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
<td>45&quot;</td>
</tr>
<tr>
<td>3/32&quot;–10&quot;</td>
<td>Sterling</td>
<td>792</td>
<td>892</td>
<td>38&quot;</td>
</tr>
<tr>
<td>1/8&quot;–14&quot;</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
<td>45&quot;</td>
</tr>
<tr>
<td>5/32&quot;–14&quot;</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
<td>45&quot;</td>
</tr>
<tr>
<td>3/16&quot;–14&quot;</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
<td>45&quot;</td>
</tr>
</tbody>
</table>

Packaging Options

10 & 14-Inch Electrodes

6 & 10 lb Hermetically Sealed Can

Note: The same can is used for the 10" and 14" electrodes. (A spacer is used for 10" electrodes.)

All McKay stainless steel electrodes are stamped with product name and lot number for complete traceability.
STAINLESS STEEL WIRE
PRODUCT LINE OVERVIEW

For over a half century, McKay® has been the acknowledged leader in stainless steel welding technology. Exceptionally tight internal specifications and controls in all phases of the manufacturing operation assure the end user the utmost consistency in chemistry, ferrite, welder appeal, and overall quality.

The McKay reputation for having the highest-quality stainless tubular and solid wires in the market is a reflection of our dedication to perfection. Industries including food processing, medical equipment, pulp & paper, petroleum refineries, chemical, nuclear, brewery & distillery, and water systems have all benefited from using McKay high-quality products.

60 lb Coil
(Stainless Steel Wire)

25 or 28 lb Plastic Spool
(Stainless Steel Wire)

30 lb Plastic Spool
(Stainless Steel Wire)

30 lb Tube
(Cut Lengths)
**STAINLESS STEEL TUBULAR WIRE**

**AWS SECTION**

**AWS Classification of Stainless Steel Tubular Wires**

**E308LT1-1**

- Indicates the shielding gas, if any. (See Shielding Chart)
- Indicates the welding position.
- Indicates that this is a flux-cored wire. Tubular
- Indicates any changes to the original alloy. (See Additional Requirements Chart)
- Indicates what the weld made by this electrode will have in it. (See Applications Chart)
- Indicates that this is an electrode.

**Positions**

1. Flat, Horizontal, Vertical, Overhead
2. Flat and Horizontal only

- Flat—Usually groove welds, fillet welds only if welded like a "V".
- Horizontal—Fillet welds, welds on walls (travel is from side to side).
- Vertical—Welds on walls (travel is either up or down).
- Overhead—Weld that needs to be done upside down.

**Chemical Symbols**

<table>
<thead>
<tr>
<th>C</th>
<th>Carbon</th>
<th>Increases strength and hardness—reduces corrosion resistance.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mn</td>
<td>Manganese</td>
<td>Improves crack resistance in fully austenitic welds.</td>
</tr>
<tr>
<td>Si</td>
<td>Silicon</td>
<td>Increased corrosion and scaling resistance.</td>
</tr>
<tr>
<td>P</td>
<td>Phosphorus</td>
<td>Causes cracking if too high.</td>
</tr>
<tr>
<td>S</td>
<td>Sulfur</td>
<td>Aids in machining, Cracking problems like P.</td>
</tr>
<tr>
<td>Cr</td>
<td>Chromium</td>
<td>Main corrosion and scaling resistance element.</td>
</tr>
<tr>
<td>Ni</td>
<td>Nickel</td>
<td>Better cold toughness—corrosion resistance.</td>
</tr>
<tr>
<td>Mo</td>
<td>Molybdenum</td>
<td>High temperature tensile/creep strength—pitting corrosion resistance.</td>
</tr>
<tr>
<td>Ti</td>
<td>Titanium</td>
<td>High temperature stabilizer—age hardening.</td>
</tr>
<tr>
<td>N</td>
<td>Nitrogen</td>
<td>Raises strength—minimize grain growth.</td>
</tr>
<tr>
<td>Cb</td>
<td>Columbium</td>
<td>High temperature stabilizer—hardening—strengthening.</td>
</tr>
</tbody>
</table>

**Additional Requirements**

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Additional Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Has a lower carbon content</td>
</tr>
<tr>
<td>H</td>
<td>Limited to the upper range on the carbon content</td>
</tr>
<tr>
<td>Mo</td>
<td>Molybdenum added—pitting resistance, creep strength, ferrite increased</td>
</tr>
<tr>
<td>Ni</td>
<td>Nickel added—high temperature strength, corrosion resistance, + ductility</td>
</tr>
</tbody>
</table>

**AWS Class and Applications**

**Class Brief Description**

- A E308 Used for welding many dissimilar 300 series stainless steels
- A E309 Used for welding many dissimilar metals—mild steel to stainless steel
- A E316 Mo added to help prevent pitting and increase creep resistance
- A E317 Even more Mo than E316
- A E347 Cb added to prevent corrosion just outside of the weld bead
- M E410 For welding martensitic stainless steels and used for surfacing carbon steels
- F E430 For welding similar alloys and corrosion-resistant surfacing
- D E2209 For welding similar duplex stainless steels
- E2553 For welding Ferralium 255 and other similar alloys

- Austenitic M—Martensitic F—Ferritic D—Duplex

<table>
<thead>
<tr>
<th>Shielding Gas and Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dash Number</td>
</tr>
<tr>
<td>-1</td>
</tr>
<tr>
<td>-3</td>
</tr>
<tr>
<td>-4</td>
</tr>
</tbody>
</table>

**AWS (A5.22) Stainless Steel Tubular Wire Chemical Composition of Weld Metal Deposit, %**

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>Carbon C</th>
<th>Chromium Cr</th>
<th>Nickel Ni</th>
<th>Molybdenum Mo</th>
<th>Manganese Mn</th>
<th>Silicon Si</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open-Arc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E308LT0-3</td>
<td>0.03 Max.</td>
<td>19.5–22.0</td>
<td>9.0–11.0</td>
<td>0.5 Max.</td>
<td>0.5–2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>E309LT0-3</td>
<td>0.03 Max.</td>
<td>23.0–25.5</td>
<td>12.0–14.0</td>
<td>0.5 Max.</td>
<td>0.5–2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>E316LT0-3</td>
<td>0.03 Max.</td>
<td>18.0–20.5</td>
<td>11.0–14.0</td>
<td>2.0–3.0</td>
<td>0.5–2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>E410NiMoT0-3</td>
<td>0.06 Max.</td>
<td>11.0–12.5</td>
<td>4.0–5.0</td>
<td>0.40–0.70</td>
<td>1.0 Max.</td>
<td>1.0</td>
</tr>
<tr>
<td>Gas-Shielded</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E308T1-4/-1*</td>
<td>0.04 Max.</td>
<td>18.0–21.0</td>
<td>9.0–11.0</td>
<td>0.5 Max.</td>
<td>0.5–2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>E308LT1-4/-1</td>
<td>0.04 Max.</td>
<td>18.0–21.0</td>
<td>9.0–11.0</td>
<td>0.5 Max.</td>
<td>0.5–2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>E309Ti-4/-1</td>
<td>0.04 Max.</td>
<td>22.0–25.0</td>
<td>12.0–14.0</td>
<td>0.5 Max.</td>
<td>0.5–2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>E316Ti-4/-1</td>
<td>0.04 Max.</td>
<td>17.0–20.0</td>
<td>11.0–14.0</td>
<td>2.0–3.0</td>
<td>0.5–2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>E317Ti-4/-1</td>
<td>0.04 Max.</td>
<td>18.0–21.0</td>
<td>12.0–14.0</td>
<td>3.0–4.0</td>
<td>0.5–2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>E347Ti-4/-1</td>
<td>0.08 Max.</td>
<td>18.0–21.0</td>
<td>9.0–11.0</td>
<td>0.5 Max.</td>
<td>0.5–2.5</td>
<td>1.0 Max.</td>
</tr>
<tr>
<td>E410NiMoTiT1-4/-1</td>
<td>0.06 Max.</td>
<td>11.0–12.5</td>
<td>4.0–5.0</td>
<td>0.40–0.70</td>
<td>1.0 Max.</td>
<td>1.0</td>
</tr>
<tr>
<td>E2209Ti-4/-1*</td>
<td>0.04 Max.</td>
<td>21.0–24.0</td>
<td>7.5–10.0</td>
<td>2.5–4.0</td>
<td>.05–2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>E2553Ti1-4/1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: All products listed above also require the following: 0.04 Max. Phosphorus, 0.5 Max. Copper, 0.03 Max. Sulfur

*Requires 0.08–0.2 of Nitrogen
### Stainless Steel Open-Arc Tubular Wires

McKay ‘In-Flux’ O Wires are designed for joining and cladding in the flat and horizontal positions. These products perform well in field fabrication or in drafty shop conditions, because they do not require external shielding gas.

<table>
<thead>
<tr>
<th>McKay Product</th>
<th>AWS Class</th>
<th>Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Flux 308L-O</td>
<td>E308LT0-3</td>
<td>Flat, Horizontal</td>
</tr>
<tr>
<td>In-Flux 309L-O</td>
<td>E309LT0-3</td>
<td>Flat, Horizontal</td>
</tr>
<tr>
<td>In-Flux 316L-O</td>
<td>E316LT0-3</td>
<td>Flat, Horizontal</td>
</tr>
<tr>
<td>In-Flux 410NiMo-O</td>
<td>E410NiMoT0-3</td>
<td>Flat, Horizontal</td>
</tr>
</tbody>
</table>

### Stainless Steel Gas-Shielded Flux-cored Tubular Wires

McKay ChromaWeld™ LT0 and LT1 Stainless wires are truly a premium stainless gas shielded flux-cored product. ChromaWeld™ features a bright, flat bead profile, clean easy slag release, minimal spatter, higher moisture resistance, and excellent overall weld bead appearance combined with excellent welder appeal.

<table>
<thead>
<tr>
<th>McKay Product</th>
<th>AWS Class</th>
<th>Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChromaWeld 308LT1</td>
<td>E308LT1-4/-1</td>
<td>All</td>
</tr>
<tr>
<td>ChromaWeld 309LT1</td>
<td>E309LT1-4/-1</td>
<td>All</td>
</tr>
<tr>
<td>ChromaWeld 316LT1</td>
<td>E316LT1-4/-1</td>
<td>All</td>
</tr>
<tr>
<td>In-Flux 410NiMoT1</td>
<td>E410NiMoT1-4/-1</td>
<td>All</td>
</tr>
</tbody>
</table>

### Stainless Steel Gas-Shielded Metal-Cored Tubular Wires

McKay Goldcor wires are designed to meet the needs of chemical/food service/automotive exhaust fabricators that have poor to fair fit up and desire a metal-cored wire that can produce a soft arc at superior welding speeds.

<table>
<thead>
<tr>
<th>McKay Product</th>
<th>AWS Class</th>
<th>Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goldcor 308LSi</td>
<td>EC308LSi</td>
<td>Flat, Horizontal</td>
</tr>
<tr>
<td>Goldcor 309LSi</td>
<td>EC309LSi</td>
<td>Flat, Horizontal</td>
</tr>
<tr>
<td>Goldcor 316LSi</td>
<td>EC316LSi</td>
<td>Flat, Horizontal</td>
</tr>
</tbody>
</table>
In-Flux® Stainless Steel Open-Arc Flux-Cored Wires

**In-Flux 308L-O**

**AWS E308LT0-3 flat & horizontal**

An austenitic stainless steel deposit that can be used for joining common austenitic stainless steels such as Types 304, 304L, 321, CF-8, and CF-3. It provides good resistance to intergranular corrosion. It can also be used as an intermediate layer for hard surfacing.

Approvals and conformances: AWS Spec A5.22, ASME SFA5.22 (F-6, A-8)

**Typical Deposit Analysis %**

C – 0.03  
Mn – 1.10  
Si – 0.44  
Cr – 20.20  
Ni – 9.80  
Fe – Bal.

**Typical Properties as Welded**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>94,000 psi</td>
</tr>
<tr>
<td>Yield Strength</td>
<td>70,000 psi</td>
</tr>
<tr>
<td>Elongation in 2&quot;</td>
<td>40%</td>
</tr>
<tr>
<td>DeLong Ferrite Number</td>
<td>.8</td>
</tr>
</tbody>
</table>

**Diameters**

1/16", 3/32"

---

**In-Flux 309L-O**

**AWS E309LT0-3 flat & horizontal**

An austenitic stainless steel deposit used for joining common austenitic stainless steels such as Types 309, 309L. It is also used for overlaying carbon steel and low alloy steel, as well as for joining stainless steel to carbon or low alloy steel. Approvals and conformances: AWS Spec A5.22, ASME SFA5.22 (F-6, A-8)

**Typical Deposit Analysis %**

C – 0.03  
Mn – 1.73  
Si – 0.58  
Cr – 23.10  
Ni – 12.90  
Fe – Bal.

**Typical Properties as Welded**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>91,000 psi</td>
</tr>
<tr>
<td>Yield Strength</td>
<td>70,000 psi</td>
</tr>
<tr>
<td>Elongation in 2&quot;</td>
<td>40%</td>
</tr>
<tr>
<td>DeLong Ferrite Number</td>
<td>11</td>
</tr>
</tbody>
</table>

**Diameters**

1/16", 3/32"

---

**In-Flux 316L-O**

**AWS E316LT0-3 flat & horizontal**

An austenitic stainless steel deposit used for joining Types 316, 316L, CF-8M, and CF-3M stainless steels. It provides high resistance to intergranular corrosion. Approvals and conformances: AWS Spec A5.22, ASME SFA5.22 (F-6, A-8)

**Typical Deposit Analysis %**

C – 0.02  
Mn – 2.12  
Si – 0.38  
Cr – 19.10  
Ni – 11.90  
Mo – 2.40  
Fe – Bal.

**Typical Properties as Welded**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>89,000 psi</td>
</tr>
<tr>
<td>Yield Strength</td>
<td>68,000 psi</td>
</tr>
<tr>
<td>Elongation in 2&quot;</td>
<td>40%</td>
</tr>
<tr>
<td>DeLong Ferrite Number</td>
<td>.5</td>
</tr>
</tbody>
</table>

**Diameters**

1/16", 3/32"

---

**In-Flux** Gas Shielded Stainless Steel

**In-Flux 410NiMoT1**

**AWS E410NiMoT1-4/-1 all-position**

A low carbon martensitic stainless steel deposit used for joining Type CA-6NM stainless steel castings as well as for joining Types 409, 410, 410S, and 405 stainless steels. The 410NiMoT1 has been tested to and has met hardness requirements set forth by NACE MR0175-95, with a PWHT procedure. Approvals and conformances: AWS Spec A5.22, ASME SFA5.22 (F-6)

**Typical Deposit Analysis %**

C – 0.03  
Ni – 4.30  
Mn – 0.30  
Mo – 0.59  
Si – 0.38  
Fe – Bal.  
Cr – 11.50

**Typical Properties as Welded**

Heat Treated for 1 hr. @ 1150°F:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>131,000 psi</td>
</tr>
<tr>
<td>Yield Strength</td>
<td>111,000 psi</td>
</tr>
<tr>
<td>Elongation in 2&quot;</td>
<td>21%</td>
</tr>
</tbody>
</table>

As Welded:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>161,900 psi</td>
</tr>
<tr>
<td>Yield Strength</td>
<td>144,900 psi</td>
</tr>
<tr>
<td>Elongation in 2&quot;</td>
<td>20%</td>
</tr>
</tbody>
</table>

Diameters: .045", 1/16", 3/32"
ChromaWeld Stainless Steel Gas-Shielded Flux-Cored Wires

**ChromaWeld 308LT1**
AWS E308LT1-4/-1
An austenitic stainless steel all-position gas shielded flux-cored wire with low carbon used for joining common austenitic stainless steels such as Types 301, 302, 304 and 304L, CF-8, and CF-3.

**Typical Deposit Analysis %**
- C - 0.025
- Mn - 1.40
- Si - 0.52
- Cr - 19.22
- Ni - 10.05
- Fe - Bal.

**Typical Weld Metal Properties**
- Tensile Strength . . . . . . . . . . .80,000 psi
- Yield Strength . . . . . . . . . .69,000 psi
- Elongation in 2" . . . . . . . . . . .42%
- DeLong Ferrite Number . . . . . .10

75% Ar-25% CO₂ or 100% CO₂

**Features**
- All position
- Self-detaching slag
- Spray-like arc transfer
- High moisture resistance

**Benefits**
- Welds well in vertical (up) position, as well as flat & horizontal
- Excellent welder appeal
- Low spatter and less clean-up
- Good weld soundness & extended shelf-life

**Diameters**
- .045", 1/16"

---

**ChromaWeld 309LT1**
AWS E309LT1-4/-1
An austenitic stainless steel all-position gas shielded flux-cored wire with low carbon used for joining common austenitic stainless steels such as Types 304, 304L, 309 and 309L. It is often used for joining stainless steel to carbon and low alloy steel, as well as for overlaying carbon steel and low alloy steel.

**Typical Deposit Analysis %**
- C - 0.027
- Mn - 1.23
- Si - 0.53
- Cr - 23.95
- Ni - 12.65
- Fe - Bal.

**Typical Weld Metal Properties**
- Tensile Strength . . . . . . . . . . .83,000 psi
- Yield Strength . . . . . . . . . .61,000 psi
- Elongation in 2" . . . . . . . . . . .38%
- DeLong Ferrite Number . . . . . .17

75% Ar/25% CO₂ or 100% CO₂

**Features**
- All-position
- Self-detaching slag
- Spray-like arc transfer
- High moisture resistance

**Benefits**
- Welds extremely well in vertical (up) position, as well as flat & horizontal
- Excellent welder appeal
- Low spatter and less clean-up
- Good weld soundness & extended shelf-life

**Diameters**
- .045", 1/16"

---

**ChromaWeld 316LT1**
AWS E316T1-4/-1
An austenitic stainless steel all-purpose gas shielded flux-cored wire with low carbon used for joining Types 316, 316L, CF-8M and CF-3M stainless steels.

**Typical Deposit Analysis %**
- C - 0.028
- Mn - 1.25
- Si - 0.55
- Cr - 18.80
- Ni - 12.60
- Mo - 2.65
- Fe - Bal.

**Typical Weld Metal Properties**
- Tensile Strength . . . . . . . . . . .82,000 psi
- Yield Strength . . . . . . . . . .60,000 psi
- Elongation in 2" . . . . . . . . . . .39%
- DeLong Ferrite Number . . . . . .9

75% Ar/25% CO₂ or 100% CO₂

**Features**
- All-position
- Self-detaching slag
- Spray-like arc transfer
- High moisture resistance

**Benefits**
- Welds extremely well in vertical (up) position, as well as flat & horizontal
- Excellent welder appeal
- Low spatter and less clean-up
- Good weld soundness & extended shelf-life

**Diameters**
- .045", 1/16"
**Comparative Index of Stainless Steel Open-Arc Tubular Wires**

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>McKay</th>
<th>ESAB</th>
<th>Stoody</th>
</tr>
</thead>
<tbody>
<tr>
<td>E308LT0-3</td>
<td>In-Flux 308L-0</td>
<td>Core-Bright 308L</td>
<td>SOS 308L</td>
</tr>
<tr>
<td>E309LT0-3</td>
<td>In-Flux 309L-0</td>
<td>Core-Bright 309L</td>
<td>SOS 309L</td>
</tr>
<tr>
<td>E316LT0-3</td>
<td>In-Flux 316L-0</td>
<td>Core-Bright 316L</td>
<td>SOS 316L</td>
</tr>
</tbody>
</table>

**Comparative Index of Stainless Steel Gas-Shielded Tubular Wires**

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>McKay</th>
<th>ESAB</th>
<th>Kobelco</th>
<th>Lincoln</th>
<th>Sandvik</th>
</tr>
</thead>
<tbody>
<tr>
<td>E308LT1-4/-1</td>
<td>ChromaWeld 308LT1</td>
<td>Shield-Bright 308L</td>
<td>DW-308LP</td>
<td>—</td>
<td>308LT-1AP</td>
</tr>
<tr>
<td>E309LT1-4/-1</td>
<td>ChromaWeld 309LT1</td>
<td>Shield-Bright 309L</td>
<td>DW-309LP</td>
<td>—</td>
<td>309LT-1AP</td>
</tr>
<tr>
<td>E316LT1-4/-1</td>
<td>ChromaWeld 316LT1</td>
<td>Shield-Bright 316L</td>
<td>DW-316LP</td>
<td>—</td>
<td>316LT-1AP</td>
</tr>
<tr>
<td>E410NiMoT1-4/-1</td>
<td>In-Flux 410NiMoT1</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**Stainless Steel Tubular Wire Pallet Information**

<table>
<thead>
<tr>
<th>McKay Type</th>
<th>Net Pallet Weight (lb)</th>
<th>Gross (est.)</th>
<th>Depth</th>
<th>Width</th>
<th>Height</th>
<th>Number of Items Per Pallet</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 lb Spool</td>
<td>500</td>
<td>605</td>
<td>24”</td>
<td>24”</td>
<td>27”</td>
<td>20 (25 lb Spools)</td>
</tr>
<tr>
<td>28 lb Spool</td>
<td>1568</td>
<td>1650</td>
<td>31”</td>
<td>47”</td>
<td>32”</td>
<td>56 (28 lb Spools)</td>
</tr>
<tr>
<td>60 lb Coil</td>
<td>1680</td>
<td>1743</td>
<td>36”</td>
<td>36”</td>
<td>35”</td>
<td>28 (60 lb Coils)</td>
</tr>
</tbody>
</table>

**Packaging Options**

- **25 lb Plastic Spool**
  - Diameter: 2”
  - Height: 11 3/4”

- **60 lb Coil**
  - Diameter: 2”
  - Height: 12”

- **28 lb Plastic Spool**
  - Diameter: 2”
  - Height: 11”
This chart is only a suggestion of which filler metals should be adequate for the joining of the stainless steels. This does not mean that other filler metal alloys are not recommended or of less quality. In all instances the chart should be used as a reference only. Actual application should dictate the proper alloy choice.

The gray sections of the chart indicate “free-matching” alloys, which are considered not weldable. This is due to the high percentage of sulfur or other low melting point elements that cause hot cracking. If high-quality joints are required welding is not generally recommended.

This chart does not indicate welding procedure. Some stainless steels require preheat while others should not have a preheat. Some welds require a butting layer or other more rigid procedure. Suppliers may be contacted regarding procedure recommendations.
## TECHNICAL SECTION

### Suggested Parameters and Typical Deposition Data for In-Flux-O Wires

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Electrical Stick-Out*</th>
<th>Voltage† Range</th>
<th>Current Range † amps</th>
<th>Deposition Rate lb/hr</th>
<th>Deposition Efficiency%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16&quot;</td>
<td>1/2&quot; – 1&quot;</td>
<td>26–32</td>
<td>150–275</td>
<td>9–15</td>
<td>85–88</td>
</tr>
<tr>
<td>5/64&quot;</td>
<td>3/4&quot; – 1-1/4&quot;</td>
<td>26–32</td>
<td>200–300</td>
<td>12–16</td>
<td>85–88</td>
</tr>
<tr>
<td>3/32&quot;</td>
<td>1&quot; – 1-1/2&quot;</td>
<td>26–32</td>
<td>225–350</td>
<td>13–17</td>
<td>85–88</td>
</tr>
</tbody>
</table>

*For 410-O and 410 NiMo-O, stick-out should be 1-1/2" for all diameters (these martensitic grades, being lower in Cr, have less tolerance for N).

†Note: Voltage and current should be in phase. If voltage is at the low end of the range, current also should be at the low end. Same way for high-side settings.

---

### Operating Ranges and Deposition Rates for ChromaWeld Wires

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Electric Stickout Pos.</th>
<th>Arc Voltage (Volts)</th>
<th>Current DCEP (+) (Amps)</th>
<th>Approx. Wire Feed Speed (In/Min)</th>
<th>Deposition Rates (lbs/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.045&quot; (1.2 mm)</td>
<td>Flat, Horizontal &amp; Vertical Up</td>
<td>24</td>
<td>140</td>
<td>210</td>
<td>5.0</td>
</tr>
<tr>
<td>1/16&quot; (1.6 mm)</td>
<td>29 – 33</td>
<td>240 – 280</td>
<td>230 – 290</td>
<td>420</td>
<td>8.5 – 11.0</td>
</tr>
</tbody>
</table>

*When using CO2 shielding gas, add 1–2 volts.

**BOLD**– Optimum parameters for welder appeal.
**Stainless Steel Wires**  
**AWS Section**

### METAL-CORE/SOLID WIRE  
**AWS SECTION**

**AWS Classification of Stainless Steel Solid Wires**

**ER308L**

Indicates any changes to the original alloy.  
(See Additional Requirements Chart)

Indicates what the weld made by this electrode will have in it.  
(See Applications Chart)

Electrode (wire) or Rod (cut length).  
Composite (metal-cored)

### Positions

- **Flat** – Usually groove welds, fillet welds only if welded like a “V”.
- **Horizontal** – Fillet welds, welds on walls (travel is from side to side).
- **Vertical** – Welds on walls (travel is either up or down).
- **Overhead** – Weld that needs to be done upside down.

### Chemical Symbols

- **C** Carbon  
  Increases strength and hardness – reduces corrosion resistance.
- **Mn** Manganese  
  Improves crack resistance in fully austenitic welds.
- **Si** Silicon  
  Increased corrosion and scaling resistance.
- **P** Phosphorus  
  Causes cracking if too high.
- **S** Sulfur  
  Aids in machining, Cracking problems like P.
- **Cr** Chromium  
  Main corrosion and scaling resistance element.
- **Ni** Nickel  
  Better cold toughness – corrosion resistance.
- **Mo** Molybdenum  
  High temperature tensile/creep strength – pitting resistance.
- **Ti** Titanium  
  High temperature stabilizer – age hardening.
- **N** Nitrogen  
  Raises strength – minimize grain growth.
- **Cb** Columbium  
  High temperature stabilizer – hardening – strengthening.

### Additional Requirements

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Additional Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Has a lower carbon content</td>
</tr>
<tr>
<td>H</td>
<td>Limited to the upper range on the carbon content</td>
</tr>
<tr>
<td>Mo</td>
<td>Molybdenum added – pitting resistance, creep strength, ferrite increased</td>
</tr>
<tr>
<td>Ni</td>
<td>Nickel added – high temperature strength, corrosion resistance, + ductility</td>
</tr>
</tbody>
</table>

### AWS Class and Applications

<table>
<thead>
<tr>
<th>Class</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>E308 Used for welding many dissimilar 300 series stainless steels</td>
</tr>
<tr>
<td>A</td>
<td>E309 Used for welding many dissimilar metals – mild steel to stainless steel</td>
</tr>
<tr>
<td>A</td>
<td>E310 Can be used for welding base metals of similar composition.</td>
</tr>
<tr>
<td>A</td>
<td>E316 Mo added to help prevent pitting and increase creep resistance</td>
</tr>
<tr>
<td>A</td>
<td>E317 Even more Mo than E316</td>
</tr>
<tr>
<td>A</td>
<td>E347 Cb added to prevent corrosion just outside of the weld bead</td>
</tr>
<tr>
<td>M</td>
<td>E410 For welding martensitic stainless steels and used for surfacing carbon steels</td>
</tr>
<tr>
<td>F</td>
<td>E430 For welding similar alloys and corrosion-resistant surfacing</td>
</tr>
<tr>
<td>D</td>
<td>E2209 For welding similar duplex stainless steels</td>
</tr>
</tbody>
</table>

- A – Austenitic  
- M – Martensitic  
- F – Ferritic  
- D – Duplex

### Chemical Symbols

- **C** Carbon  
  Increases strength and hardness – reduces corrosion resistance.
- **Mn** Manganese  
  Improves crack resistance in fully austenitic welds.
- **Si** Silicon  
  Increased corrosion and scaling resistance.
- **P** Phosphorus  
  Causes cracking if too high.
- **S** Sulfur  
  Aids in machining, Cracking problems like P.
- **Cr** Chromium  
  Main corrosion and scaling resistance element.
- **Ni** Nickel  
  Better cold toughness – corrosion resistance.
- **Mo** Molybdenum  
  High temperature tensile/creep strength – pitting resistance.
- **Ti** Titanium  
  High temperature stabilizer – age hardening.
- **N** Nitrogen  
  Raises strength – minimize grain growth.
- **Cb** Columbium  
  High temperature stabilizer – hardening – strengthening.

### AWS (A5.9) Stainless Steel Solid Wire Chemical Composition Requirements, %

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>Carbon C</th>
<th>Chromium Cr</th>
<th>Nickel Ni</th>
<th>Molybdenum Mo</th>
<th>Manganese Mn</th>
<th>Silicon Si</th>
<th>Phosphorus P</th>
<th>Copper Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER308</td>
<td>0.08 Max.</td>
<td>19.5–22.0</td>
<td>9.0–11.0</td>
<td>0.75 Max.</td>
<td>1.0–2.5</td>
<td>0.30–0.65</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER308H</td>
<td>0.04–0.08</td>
<td>19.5–22.0</td>
<td>9.0–11.0</td>
<td>0.50 Max.</td>
<td>1.0–2.5</td>
<td>0.20–0.65</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER308L</td>
<td>0.03 Max.</td>
<td>19.5–22.0</td>
<td>9.0–11.0</td>
<td>0.75 Max.</td>
<td>1.0–2.5</td>
<td>0.30–0.65</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER308LSi</td>
<td>0.03 Max.</td>
<td>19.5–22.0</td>
<td>9.0–11.0</td>
<td>0.75 Max.</td>
<td>1.0–2.5</td>
<td>0.65–1.00</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER309</td>
<td>0.12 Max.</td>
<td>23.0–25.0</td>
<td>12.0–14.0</td>
<td>0.75 Max.</td>
<td>1.0–2.5</td>
<td>0.30–0.65</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER309L</td>
<td>0.03 Max.</td>
<td>23.0–25.0</td>
<td>12.0–14.0</td>
<td>0.75 Max.</td>
<td>1.0–2.5</td>
<td>0.20–0.65</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER309LSi</td>
<td>0.03 Max.</td>
<td>23.0–25.0</td>
<td>12.0–14.0</td>
<td>0.75 Max.</td>
<td>1.0–2.5</td>
<td>0.65–1.00</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER310</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER316</td>
<td>0.08 Max.</td>
<td>18.0–20.0</td>
<td>11.0–14.0</td>
<td>2.0–3.0</td>
<td>1.0–2.5</td>
<td>0.30–0.65</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER316H</td>
<td>0.04–0.08</td>
<td>18.0–20.0</td>
<td>11.0–14.0</td>
<td>2.0–2.0</td>
<td>1.0–2.5</td>
<td>0.30–0.65</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER316L</td>
<td>0.03 Max.</td>
<td>18.0–20.0</td>
<td>11.0–14.0</td>
<td>2.0–2.0</td>
<td>1.0–2.5</td>
<td>0.30–0.65</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER316LSi</td>
<td>0.08 Max.</td>
<td>18.0–20.0</td>
<td>11.0–14.0</td>
<td>2.0–3.0</td>
<td>1.0–2.5</td>
<td>0.65–1.00</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER347*</td>
<td>0.08 Max.</td>
<td>19.0–21.5</td>
<td>9.0–11.0</td>
<td>0.75 Max.</td>
<td>1.0–2.5</td>
<td>0.30–0.65</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
<tr>
<td>ER410</td>
<td>0.12 Max.</td>
<td>11.5–13.5</td>
<td>0.6 Max.</td>
<td>0.75 Max.</td>
<td>0.6 Max.</td>
<td>0.5 Max.</td>
<td>0.03 Max.</td>
<td>0.75 Max.</td>
</tr>
</tbody>
</table>

* Also requires 10 x C min. / 1.0 max. of Cb  
** Also requires 0.08–0.20 of N
Stainless Steel Solid Wires — Spooled/Coiled/Cut Lengths

**308/308L**
AWS ER308 & ER308L
Lower range carbon 308 to help prevent intergranular corrosion. Used to weld Types 201, 302, 304, and 308 stainless steels. Also used for joining some dissimilar 300 series stainless steels. Approvals and conformance: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C – 0.02
- Cr – 20.50
- Ni – 10.50
- Mo – 0.30
- Mn – 1.70
- Si – 0.40
- Fe – Bal.

**Typical Properties as Welded**
- Tensile Strength, psi.........................................85,000 psi
- Yield Strength, psi...........................................58,000 psi
- Elongation in 2"................................................6%
- Impact Resistance ………..RT....96 ft•lbs (Charpy V Notch) ………..320°F…43 ft•lbs
- DeLong Ferrite Number………………………………11

**308L HiSil**
AWS ER308LSi
A 308L chemistry which has been modified with a higher silicon level to increase weld puddle fluidity, ensuring better tie-ins and potentially higher welding speeds. Approvals and conformance: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C – 0.02
- Cr – 20.50
- Ni – 10.50
- Mo – 0.30
- Mn – 1.60
- Si – 0.80
- Fe – Bal.

**Typical Properties as Welded**
- Tensile Strength, psi.........................................86,000 psi
- Yield Strength, psi...........................................57,000 psi
- Elongation in 2"................................................6%
- Impact Resistance ………..RT....92 ft•lbs (Charpy V Notch) ………..320°F…33 ft•lbs
- DeLong Ferrite Number………………………………12

Cut lengths available.

**309 (H)**
AWS ER309
This product is produced in the upper range of carbon content to give increased high temperature strength. For welding Type 309 stainless steels, 18-8 clad steel, or dissimilar metals. Approvals and conformance: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C – 0.06
- Cr – 24.00
- Ni – 12.50
- Mo – 0.20
- Mn – 1.70
- Si – 0.40
- Fe – Bal.

**Typical Properties as Welded**
- Tensile Strength, psi.........................................92,000 psi
- Yield Strength, psi...........................................60,000 psi
- Elongation in 2"................................................6%
- Impact Resistance ………..RT....85 ft•lbs (Charpy V Notch)
- DeLong Ferrite Number………………………………9

**309L HiSil**
AWS ER309LSi
A modified 309L deposit. The higher silicon levels help to overcome the typical sluggish nature of 300 series stainless steel welding puddles. Approvals and conformance: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C – 0.02
- Cr – 20.50
- Ni – 10.50
- Mo – 0.30
- Mn – 1.60
- Si – 0.80
- Fe – Bal.

**Typical Properties as Welded**
- Tensile Strength, psi.........................................87,000 psi
- Yield Strength, psi...........................................56,000 psi
- Elongation in 2"................................................6%
- Impact Resistance ………..RT....92 ft•lbs (Charpy V Notch)
- DeLong Ferrite Number………………………………10

Cut lengths available.

**308/308H**
AWS ER308 & ER308H
Use on Types 301, 302, 305, and 308 base metals. Carbon is restricted to the higher range (0.40-0.08%) to give increased strength for applications where high mechanical properties are required. Approvals and conformance: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C – 0.05
- Cr – 20.50
- Ni – 10.00
- Mo – 0.20
- Mn – 1.70
- Si – 0.40
- Fe – Bal.

**Typical Properties as Welded**
- Tensile Strength, psi.........................................88,000 psi
- Yield Strength, psi...........................................60,000 psi
- Elongation in 2"................................................40%
- Impact Resistance ………..RT....92 ft•lbs (Charpy V Notch)
- DeLong Ferrite Number………………………………10

Cut lengths available.

**309/309L**
AWS ER309/ER309L
Used to join similar 309L alloys or join 300 series stainless steels to carbon or low alloy steels. Approvals and conformance: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C – 0.02
- Cr – 20.00
- Ni – 13.50
- Mo – 0.20
- Mn – 2.10
- Si – 0.40
- Fe – Bal.

**Typical Properties as Welded**
- Tensile Strength, psi.........................................87,000 psi
- Yield Strength, psi...........................................59,000 psi
- Elongation in 2"................................................40%
- Impact Resistance ………..RT....100 ft•lbs (Charpy V Notch)
- DeLong Ferrite Number………………………………12

Cut lengths available.

**309L HiSil**
AWS ER309LSi
A modified 309L deposit. The higher silicon levels help to overcome the typical sluggish nature of 300 series stainless steel welding puddles. Approvals and conformance: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C – 0.02
- Cr – 24.00
- Ni – 13.00
- Mo – 0.20
- Mn – 1.70
- Si – 0.85
- Fe – Bal.

**Typical Properties as Welded**
- Tensile Strength, psi.........................................87,000 psi
- Yield Strength, psi...........................................56,000 psi
- Elongation in 2"................................................36%
- Impact Resistance ………..RT....92 ft•lbs (Charpy V Notch)
- DeLong Ferrite Number………………………………10

Cut lengths available.
### Stainless Steel Solid Wires — Spooled/Coiled/Cut Lengths

#### 316/316L
**AWS ER316 & ER316L**
A molybdenum bearing alloy for increased pitting corrosion resistance. The carbon is limited to the lower range for better intergranular corrosion resistance. Approvals and conformances: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C: 0.02
- Cr: 19.00
- Ni: 12.50
- Mo: 2.50
- Mn: 1.70
- Si: 0.40
- Fe: Bal.

**Typical Properties as Welded**
- Tensile Strength: 86,000 psi
- Yield Strength: 57,000 psi
- Elongation in 2": 36%
- Impact Resistance: RT: 82 ft-lbs
- (Charpy V Notch): -320°F: 34 ft-lbs
- DeLong Ferrite Number: 10

Cut lengths available

#### 316L HiSiL
**AWS ER316LSi**
A 316L formulation with an increased silicon level for better wetting action when using the GMAW process. Approvals and conformances: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C: 0.02
- Cr: 19.00
- Ni: 12.50
- Mo: 2.50
- Mn: 1.70
- Si: 0.85
- Fe: Bal.

**Typical Properties as Welded**
- Tensile Strength: 87,000 psi
- Yield Strength: 57,000 psi
- Elongation in 2": 36%
- Impact Resistance: RT: 95 ft-lbs
- (Charpy V Notch): -320°F: 36 ft-lbs
- DeLong Ferrite Number: 10

#### 347
**AWS ER347**
Stabilized with columbium to help prevent intergranular corrosion. Better corrosion resistance than Type 308. Used for Welding Types 347 and 321 steels. Good corrosion resistance in applications up to 1400°F. Approvals and conformances: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

**Typical Deposit Analysis %**
- C: 0.035
- Cr: 20.00
- Ni: 10.00
- Mo: 0.20
- Mn: 1.30
- Si: 0.40
- Fe: Bal.

**Typical Properties as Welded**
- Tensile Strength: 90,000 psi
- Yield Strength: 59,000 psi
- Elongation in 2": 42%
- Impact Resistance: RT: 112 ft-lbs
- (Charpy V Notch): -320°F: 34 ft-lbs
- DeLong Ferrite Number: 9

Cut lengths available.

#### 410
**AWS ER410**
Air-hardening stainless for welding 12Cr material. Heat treatable welding deposit. Pre- and post-weld heat treatments may be required. Approvals and conformances: AWS Spec A5.9, ASME SFA5.9 (F-6, A-6)

**Typical Deposit Analysis %**
- C: 0.08
- Cr: 13.00
- Mo: 0.10
- Mn: 0.50
- Si: 0.40
- Fe: Bal.

**Typical Properties as Welded**
- Tensile Strength: 79,000 psi
- Yield Strength: 44,000 psi
- Elongation in 2": 25%**
- (Charpy V Notch): -320°F: 34 ft-lbs
- DeLong Ferrite Number: —

**Heat Treated for 1 hr. @ 1375°F**

#### 430
**AWS ER312**
Welding Type 312 base metals. Excellent for dissimilar metal joining due to high ferrite potentials. Approvals and conformances: AWS Spec A5.9, ASME SFA5.9 (F-6, A-6)

**Typical Deposit Analysis %**
- C: 0.07
- Mn: 0.80
- Si: 0.40
- Cr: 28.50
- Ni: 9.10
- Fe: Bal.

**Typical Properties as Welded**
- Tensile Strength: 115,000 psi
- Yield Strength: 95,000 psi
- Elongation in 2": 25%
- DeLong Ferrite Number: 45

Cut lengths available

#### 310
**AWS ER310**
For welding base metal of similar composition, when the stainless base metal is of unknown composition, and for dissimilar metal Used as a transition layer for high restrained joints of high carbon steels. Approvals and conformances: AWS Spec A5.9, ASME SFA5.9 (F-6, A-6)

**Typical Deposit Analysis %**
- C: 0.14
- Mn: 2.02
- Si: 0.04
- Cr: 26.12
- Ni: 21.00
- Fe: Bal.

**Typical Properties as Welded**
- Tensile Strength: 86,000 psi
- Yield Strength: 63,000 psi
- Elongation in 2": 40%
- DeLong Ferrite Number: 0

Cut lengths available.
# Goldcor™ Stainless Steel Gas-Shielded Metal-Cored Wires

## Goldcor 308LSi
**AWS EC308LSi** flat & horizontal
An austenitic stainless steel wire used to join 301, 302, 304, 304L and 308 stainless steels. Approvals and conformances: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

### Typical Deposit Analysis %
- **C**: 0.023
- **Cr**: 20.50
- **Ni**: 10.10
- **Mo**: 0.25
- **Mn**: 1.50
- **Si**: 0.85
- **P**: 0.02
- **S**: 0.01
- **Cu**: 0.2

### Typical Weld Metal Properties* (As Welded):
- DeLong Ferrite: 10-18
- Schaeffler Number Range: 7-15
- WRC Number Range (1992): 8-19

### Diameter
- .045"
- 1/16"

## Goldcor 309LSi
**AWS EC309LSi** flat & horizontal
An austenitic stainless steel wire used to join similar 309L alloys or join 300 series stainless steel to carbon or low alloys steels. Approvals and conformances: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

### Typical Deposit Analysis %
- **C**: 0.025
- **Cr**: 23.90
- **Ni**: 13.10
- **Mo**: 0.25
- **Mn**: 1.50
- **Si**: 0.85
- **P**: 0.02
- **S**: 0.01
- **Cu**: 0.20

### Typical Weld Metal Properties* (As Welded):
- DeLong Ferrite: 13-20
- Schaeffler Number Range: 11-17
- WRC Number Range (1992): 11-19

### Diameter
- .045"
- 1/16"

## Goldcor 316LSi
**AWS EC316LSi** flat & horizontal
An austenitic stainless steel wire used to join 316 and 316L stainless steels. Approvals and conformances: AWS Spec A5.9, ASME SFA5.9 (F-6, A-8)

### Typical Deposit Analysis %
- **C**: 0.02
- **Cr**: 19.10
- **Ni**: 12.40
- **Mo**: 2.50
- **Mn**: 1.50
- **Si**: 0.85
- **P**: 0.02
- **S**: 0.01
- **Cu**: 0.20

### Typical Weld Metal Properties* (As Welded):
- DeLong Ferrite: 4-10
- Schaeffler Number Range: 4-10
- WRC Number Range (1992): 4-10

### Diameter
- .045"
- 1/16"
**Comparative Index of Stainless Steel Solid Wires**

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>McKay</th>
<th>ESAB</th>
<th>Harris</th>
<th>Welco</th>
<th>Lincoln</th>
<th>National Standard</th>
<th>Sandvik</th>
<th>Techalloy</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER308 &amp; ER308L</td>
<td>308/308L</td>
<td>Arcaloy ER308L</td>
<td>ER308L</td>
<td>Blue Max S308/308L</td>
<td>308L</td>
<td>Techalloy 308L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER308 &amp; ER308H</td>
<td>308/308H</td>
<td>Arcaloy ER308H</td>
<td>ER308H</td>
<td>—</td>
<td>308</td>
<td>Techalloy 308</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER308LSi</td>
<td>308LSi</td>
<td>Arcaloy ER308LSi</td>
<td>ER308LSi</td>
<td>Blue Max MIG 308LSi</td>
<td>308L LSi</td>
<td>Techalloy 308LSi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER309</td>
<td>309(H)</td>
<td>—</td>
<td>ER309</td>
<td>—</td>
<td>309</td>
<td>Techalloy 309</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER310</td>
<td>Arcaloy ER310</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER316 &amp; ER316L</td>
<td>316/316L</td>
<td>Arcaloy ER316L</td>
<td>ER316L</td>
<td>Blue Max S316/316L</td>
<td>316L</td>
<td>Techalloy 316L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER316LSi</td>
<td>316LSi</td>
<td>Arcaloy ER316LSi</td>
<td>ER316LSi</td>
<td>Blue Max MIG 316LSi</td>
<td>316L LSi</td>
<td>19.12.3.NDSi</td>
<td>Techalloy 316LSi</td>
<td></td>
</tr>
<tr>
<td>ER347</td>
<td>347</td>
<td>Arcaloy ER347</td>
<td>ER347</td>
<td>—</td>
<td>347</td>
<td>Techalloy 347</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER410</td>
<td>410</td>
<td>Arcaloy ER410</td>
<td>ER410</td>
<td>—</td>
<td>410</td>
<td>Techalloy 410</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typical Parameters for Short-Circuiting Welding With Bare Stainless Wires**

<table>
<thead>
<tr>
<th>Wire Diameter</th>
<th>Amperes DCEP</th>
<th>Voltage</th>
<th>Electrical Stick-out</th>
<th>90% He – 7-1/2% Ar – 2-1/2% CO₂ Flow Rate (CFH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.030”</td>
<td>50–150</td>
<td>14–20</td>
<td>3/8”–1/2”</td>
<td>25</td>
</tr>
<tr>
<td>.035”</td>
<td>60–200</td>
<td>14–22</td>
<td>3/8”–1/2”</td>
<td>25</td>
</tr>
<tr>
<td>.045”</td>
<td>75–225</td>
<td>15–23</td>
<td>3/8”–1/2”</td>
<td>25</td>
</tr>
<tr>
<td>1/16”</td>
<td>100–250</td>
<td>16–23</td>
<td>3/8”–1/2”</td>
<td>25</td>
</tr>
</tbody>
</table>

**Typical Parameters for Spray Transfer Welding With Bare Stainless Wires**

<table>
<thead>
<tr>
<th>Wire Diameter</th>
<th>Amperes DCEP</th>
<th>Voltage</th>
<th>Electrical Stick-out</th>
<th>Ar + 2% O₂ Flow Rate (CFH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.030”</td>
<td>130–200</td>
<td>23–27</td>
<td>3/8”–1/2”</td>
<td>35</td>
</tr>
<tr>
<td>.035”</td>
<td>150–225</td>
<td>23–26</td>
<td>1/2”–3/4”</td>
<td>35</td>
</tr>
<tr>
<td>.045”</td>
<td>200–325</td>
<td>24–28</td>
<td>1/2”–3/4”</td>
<td>35</td>
</tr>
<tr>
<td>1/16”</td>
<td>300–350</td>
<td>24–27</td>
<td>1/2”–3/4”</td>
<td>35</td>
</tr>
</tbody>
</table>

**Recommended Operating Parameters:**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Electric Stickout Pos.</th>
<th>Arc Voltage (Volts)</th>
<th>Current DCEP (+) (Amps)</th>
<th>Approx. Wire Feed Speed (In/Min)</th>
<th>Deposition Rates (lbs/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.045”</td>
<td>Flat and Horizontal</td>
<td>23</td>
<td>140</td>
<td>260</td>
<td>5.5</td>
</tr>
<tr>
<td>3/4” – 1”</td>
<td>Flat and Horizontal</td>
<td>26</td>
<td>180</td>
<td>152</td>
<td>6.0</td>
</tr>
<tr>
<td>(19 mm)</td>
<td>Flat and Horizontal</td>
<td>32</td>
<td>390</td>
<td>442</td>
<td>18.0</td>
</tr>
</tbody>
</table>

**Packaging Options**

- 30 lb Plastic Spool
- 60 lb Coil
- 10 lb Tube (Cut Lengths)
HARD SURFACING STICK ELECTRODE PRODUCT LINE OVERVIEW

McKay® has been a leading supplier of iron-based surfacing electrodes for over fifty years. The McKay full line of Hardalloy® electrodes and special alloy electrodes are formulated to cover a broad spectrum of wear-related applications.

Every McKay electrode product is formulated for maximum wear resistance and superior, consistent operation–then manufactured to exact standards. Every pound of product is backed by over fifty years of field hard surfacing experience.

MAIN LINE PRODUCTS

- Hardalloy 118
- Chrome-Mang
- Hardalloy 32
- Hardalloy 58
- Hardalloy 140
- Hardalloy 155

Within the wide scope of McKay hard surfacing stick electrodes, six alloys have been specially designed to cover the majority of impact and abrasive wear applications. These six main line electrodes listed to the left are explained in great detail on pages 36 and 37.
Hard Surfacing Stick Electrodes
AWS Section

AWS SECTION

AWS (A5.15) Cast Iron Electrode Chemical Composition of Weld Metal Deposit, %

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>Carbon (C)</th>
<th>Manganese (Mn)</th>
<th>Silicon (Si)</th>
<th>Sulfur (S)</th>
<th>Iron (Fe)</th>
<th>Nickel&lt;sup&gt;a&lt;/sup&gt; (Ni)</th>
<th>Copper&lt;sup&gt;b&lt;/sup&gt; (Cu)</th>
<th>Aluminum (Al)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENi-Ci</td>
<td>2.0 Max.</td>
<td>2.5 Max.</td>
<td>4.0 Max.</td>
<td>0.3 Max.</td>
<td>8.0 Max.</td>
<td>85 Min.</td>
<td>2.5 Max.</td>
<td>1.0 Max.</td>
</tr>
<tr>
<td>ENiFe-Ci</td>
<td>2.0 Max.</td>
<td>2.5 Max.</td>
<td>4.0 Max.</td>
<td>0.3 Max.</td>
<td>Balance</td>
<td>45-60</td>
<td>2.5 Max.</td>
<td>1.0 Max.</td>
</tr>
</tbody>
</table>

Note: 1.0 Max. of all other elements
<sup>a</sup>Nickel plus incidental cobalt
<sup>b</sup>Copper plus incidental silver

AWS (A5.13) Hard Surfacing Electrode Chemical Composition of Weld Metal Deposit, %

<table>
<thead>
<tr>
<th>AWS Class</th>
<th>Carbon (C)</th>
<th>Manganese (Mn)</th>
<th>Cobalt (Co)</th>
<th>Tungsten (W)</th>
<th>Nickel (Ni)</th>
<th>Chromium (Cr)</th>
<th>Molybdenum (Mo)</th>
<th>Iron (Fe)</th>
<th>Vanadium (V)</th>
<th>Silicon (Si)</th>
<th>Total Other Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFe5-B</td>
<td>0.5-0.9</td>
<td>0.60 Max.</td>
<td>—</td>
<td>1.0-2.5</td>
<td>—</td>
<td>3.0-5.0</td>
<td>5.0-9.5</td>
<td>Balance</td>
<td>3.0-5.0</td>
<td>5.0-9.5</td>
<td>1.0 Max.</td>
</tr>
</tbody>
</table>

Hard Surfacing Stick Electrode Alloy Classification

Austenitic Alloys
Austenitic alloys are extremely tough, ductile and work-hardenable. They offer excellent impact resistance and fair abrasion resistance (which improves as it work-hardens). These alloys will normally work-harden to a surface hardness up to 50 HRC and still retain their good impact resistance.

Martensitic Alloys
Martensite is formed in steels by rapid cooling rates. Most of the hard surfacing alloys are air hardenable and heat treatable. They provide a good balance of impact and abrasion resistance. Martensitic alloys also have relatively high compression strength and excellent metal-to-metal wear resistance.

Carbide Alloys
Carbide alloys are very much like asphalt. There are carbides (gravel) and matrix (tar). The carbides are what give the excellent abrasion resistance while the matrix (tar) holds the carbides in place and offers some impact resistance. Carbides are extremely hard and brittle. They cannot handle impact. The more carbides there are the higher the abrasion resistance but the lower the impact resistance.

Photomicrograph of austenite.

Photomicrograph of martensite.

Photomicrograph of large carbides in a carbide eutectic matrix.
# Hard Surfacing Stick Electrode Product Line

## Build-Up
Restoring worn parts to their original dimensions

<table>
<thead>
<tr>
<th>McKay Product</th>
<th>Description</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrome-Mang</td>
<td>Premium alloy for use on carbon and manganese steels.</td>
<td>Manganese: • Carbon: •</td>
</tr>
<tr>
<td>Hardalloy 118</td>
<td>For build-up &amp; joining of manganese steels only.</td>
<td>Manganese: • Carbon: O</td>
</tr>
<tr>
<td>Hardalloy 32</td>
<td>Excellent build-up and overlay alloy for carbon steels.</td>
<td>Manganese: O Carbon: •</td>
</tr>
<tr>
<td>Hardalloy 119</td>
<td>For build-up of manganese, carbon &amp; low alloy steels.</td>
<td>Manganese: • Carbon: O</td>
</tr>
<tr>
<td>Hardalloy M-932</td>
<td>Harder than Hardalloy 32 and still machinable.</td>
<td>Manganese: O Carbon: •</td>
</tr>
</tbody>
</table>

## Overlay
Providing additional resistance to wear

<table>
<thead>
<tr>
<th>Application</th>
<th>McKay Product</th>
<th>Description</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal to Metal</td>
<td>Hardalloy 32</td>
<td>Excellent build-up and overall alloy for carbon steels.</td>
<td>Hardness:</td>
</tr>
<tr>
<td>Hardalloy M-932</td>
<td>Harder than Hardalloy 32 and still machinable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardalloy 58</td>
<td>Very hard steel deposit for overlay only.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardalloy 61</td>
<td>Similar to an M2 type tool steel in composition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Chrome-Mang</td>
<td>Premium alloy for use on carbon and manganese steels.</td>
<td>Manganese: • Carbon: •</td>
</tr>
<tr>
<td>Hardalloy 118</td>
<td>For build-up &amp; joining of manganese steels only.</td>
<td>Manganese: • Carbon: O</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 119</td>
<td>For build-up of manganese, carbon &amp; low alloy steels.</td>
<td>Manganese: • Carbon: •</td>
<td></td>
</tr>
</tbody>
</table>

| Abrasion | Hardalloy 148 | For abrasion and impact resistance. | Abrasion Resistance: |
| Hardalloy 140 | For heavy abrasion and moderate impact. | |
| Hardalloy 40TiC | Better abrasion than Hardalloy 140 with titanium carbides. | |
| Hardalloy 155 | For extreme abrasion with minimal impact. | |
| Special Alloys | Cast Iron | Nickel electrode for low stress applications and maximum machinability. | |
| Cast-Alloy | Stronger and more ductile than Cast-Alloy with better hot cracking resistance. | |
| Cast-Alloy 60 | | |
| Heat & Corrosion | 121 | High carbon austenitic stainless steel alloy for high impact resistance & high temperature resistance. | |
| Maintenance | GP | Recommended for joining dissimilar metals and hard-to-weld steels. | |
| Hardalloy 120 | Similar to GP although a more economical product with excellent operator appeal. | |
Hardalloy® 118

Hardalloy 118 deposit is a work hardening austenitic manganese steel alloy. It is designed for the build-up and joining of austenitic manganese steels only. Provides a good wear resistance under heavy impact conditions. Weld deposits are extremely tough, and work hardens rapidly.

Optimum Current

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>120</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>180</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>230</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>280</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

Typical Deposit Analysis %

<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.80</td>
</tr>
<tr>
<td>Mn</td>
<td>16.50</td>
</tr>
<tr>
<td>Si</td>
<td>0.50</td>
</tr>
<tr>
<td>Cr</td>
<td>5.00</td>
</tr>
<tr>
<td>Ni</td>
<td>0.30</td>
</tr>
<tr>
<td>Fe</td>
<td>Bal.</td>
</tr>
</tbody>
</table>

Typical Properties

- Tensile Strength: .127,000 psi
- Yield Strength: .78,000 psi
- Elongation in 2": .50%
- Machinability: Difficult
- Hardness:
  - As Deposited: 18-22 Rc
  - Work Hardened: 50-55 Rc
- Flame cutting is difficult
- Nonmagnetic

Typical Applications

- Crusher Jaws & Cones
- Crusher Rolls
- Dredge Pump Casings, Impellers, & Side Plates
- Gyatory Crusher Mantles & Cones
- Hammer Mill Hammers
- Impactor Crusher Bars
- Manganese Bucket Teeth
- Manganese Steel Railroad Crossovers & Frogs
- Sizing Screens

Chrome-Mang™

Hardalloy® Chrome-Mang deposit is a premium work hardening chromium-manganese austenitic stainless steel alloy. It can be used for the build-up and joining of manganese, as well as carbon and low alloy steels. It has higher toughness than conventional manganese steel deposits. Crack resistance is excellent.

Optimum Current

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>150</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>200</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>250</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

Typical Deposit Analysis %

<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.40</td>
</tr>
<tr>
<td>Mn</td>
<td>14.50</td>
</tr>
<tr>
<td>Si</td>
<td>0.60</td>
</tr>
<tr>
<td>Cr</td>
<td>14.00</td>
</tr>
<tr>
<td>Ni</td>
<td>1.00</td>
</tr>
<tr>
<td>Mo</td>
<td>1.50</td>
</tr>
<tr>
<td>V</td>
<td>0.50</td>
</tr>
<tr>
<td>Fe</td>
<td>Bal.</td>
</tr>
</tbody>
</table>

Typical Properties

- Tensile Strength: .130,000 psi
- Yield Strength: .94,000 psi
- Elongation in 2": .40%
- Machinability: Difficult
- Hardness:
  - As Deposited: 18-22 Rc
  - Work Hardened: 50-55 Rc
- Cannot be flame cut
- Nonmagnetic

Typical Applications

- Crusher Jaws & Cones
- Hammer Mill Hammers
- Hydroelectric Turbines
- Impactor Crusher Bars
- Similar to those for Hardalloy 118, especially where the base metal is questionable or when contamination may be an issue
- Sizing Screens

Hardalloy® 32

Hardalloy® 32 deposit is a heat treatable alloy steel suited for the build-up of carbon and low alloy steels only. The weld metal is sound, and the good compressive strength makes it an excellent base for hard surfacing. It has excellent resistance to cracking and checking in heavy thicknesses.

Optimum Current

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>140</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>180</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>220</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>300</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

Typical Deposit Analysis %

<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.18</td>
</tr>
<tr>
<td>Mn</td>
<td>0.90</td>
</tr>
<tr>
<td>Si</td>
<td>0.60</td>
</tr>
<tr>
<td>Cr</td>
<td>0.70</td>
</tr>
<tr>
<td>Mo</td>
<td>0.30</td>
</tr>
<tr>
<td>Fe</td>
<td>Bal.</td>
</tr>
</tbody>
</table>

Typical Properties

- Machinability: Excellent
- Typical Hardness, Rc: 1020 Steel
  - No. of Layers: .127,000 psi
  - 1-2: 17-20
  - 3-8: 25-30
- Can be flame cut
- Deposit is strongly magnetic
- Deposit is heat treatable and forgeable

Typical Applications

- Bucket Teeth & Lips
- Coupling Boxes
- Crane Wheels
- Dragline Buckets & Chain
- Dredge Ladder Rolls
- Gear Teeth
- Grizzly Bars & Fingers
- Kiln Trunnions
- Mine Car Wheels
- Steel Shafts
- Tractor Idlers & Rollers
- Wobbler Ends
**Main Line Products for Overlay**

### Hardalloy® 58

Hardalloy 58 deposit is a martensitic alloy for hard, tough overlays on carbon and low alloy steel parts only. The deposit is sound with a good combination of impact and abrasion resistance. Proper preheat is required for crack-free deposits.

<table>
<thead>
<tr>
<th>Optimum Current</th>
<th>Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/8&quot;</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>5/32&quot;</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>3/16&quot;</td>
<td>210</td>
</tr>
<tr>
<td></td>
<td>1/4&quot;</td>
<td>270</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

Typical Deposit Analysis %

- C – 0.60
- Mn – 1.20
- Si – 0.70
- Cr – 5.50
- Mo – 0.50
- Fe – Bal.

Typical Properties

- Machinability: Grinding Only
- Typical Hardness, Rc: 45-55
- Flame cutting is difficult
- Deposit is magnetic
- Deposit is heat treatable and forgeable

Typical Applications

- Coupling Boxes
- Dragline Chain
- Dredge Ladder Rolls
- Kiln Trunnions
- Mill Guides
- Sliding Metal Parts
- Wobbler Ends

### Hardalloy® 140

Hardalloy 140 deposits a high chromium carbide alloy steel. It can be used to overlay surfaces subjected to high abrasion coupled with some impact. It maintains its wear resistance to a temperature of 1200°F and offers some corrosion resistance. Hardalloy 140 is designed for carbon, low alloy or austenitic manganese base metals or a weld metal base of Hardalloy 32, Hardalloy 118, or Chrome-Mang™.

<table>
<thead>
<tr>
<th>Optimum Current</th>
<th>Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/8&quot;</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>5/32&quot;</td>
<td>155</td>
</tr>
<tr>
<td></td>
<td>3/16&quot;</td>
<td>190</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

Typical Deposit Analysis %

- C – 3.00
- Mn – 0.40
- Si – 2.00
- Cr – 30.00
- Mo – 0.70
- Fe – Bal.

Typical Properties

- Machinability: Grinding Only
- Typical Hardness, Rc: 45-55
- Cannot be flame cut
- Deposit will relief-check crack readily
- Deposit maintains hot hardness to 1250°F

Typical Applications

- Ammonia Knives
- Augers
- Bucket Lips & Teeth
- Bulldozer Blades
- Cement Chutes
- Coal Feeder Screws
- Coke Chutes
- Coke Pusher Shoes
- Coal Pulverizer Hammers
- Conveyor Screws
- Crusher Jaws & Cones
- Crusher Rolls
- Cultivator Chisels & Sweeps
- Dredge Cutter Heads & Teeth
- Dredge Pump Inlet Nozzle & Side Plates
- Fan Blades
- Gizzizzly Bars & Fingers
- Manganese Pump Shells
- Muller Tires
- Ore/Coal Chutes
- Paving Agitator Screws
- Pipeline Ball Joints
- Pug Mill Paddles
- Ripper Shanks
- Road Rippers
- Sheepsfoot Tamperes, similar to those for Hardalloy 140 where additional abrasion resistance is required
- Sizing Screens
- Subsoiler Teeth

### Hardalloy® 155

Hardalloy 155 deposits an extra high chromium carbide alloy steel intended for overlay on surfaces subjected to extremely severe abrasion. It maintains its hot hardness to 1250°F and has an excellent edge building capability. Hardalloy 155 is designed for overlay on carbon, low allow, or manganese steel base metals or over a welded build-up base of Hardalloy 32, 118, or Chrome-Mang.

<table>
<thead>
<tr>
<th>Optimum Current</th>
<th>Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/8&quot;</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>5/32&quot;</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>3/16&quot;</td>
<td>190</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

Typical Deposit Analysis %

- C – 5.50
- Mn – 0.40
- Si – 1.00
- Cr – 32.00
- Mo – 4.50
- Fe – Bal.

Typical Properties

- Machinability: Grinding Only
- Thickness: 3 layers max
- Typical Hardness, Rc: 59-63
- Cannot be flame cut
- Deposit will relief-check crack readily
- Deposit maintains hot hardness to 1250°F

Typical Applications

- Ammonia Knives
- Augers
- Bucket Lips & Teeth
- Bulldozer Blades
- Cement Chutes
- Coal Feeder Screws
- Coke Chutes
- Coke Pusher Shoes
- Coal Pulverizer Hammers
- Conveyor Screws
- Crusher Jaws & Cones
- Crusher Rolls
- Cultivator Chisels & Sweeps
- Dredge Cutter Heads & Teeth
- Dredge Pump Inlet Nozzle & Side Plates
- Fan Blades
- Gizzizzly Bars & Fingers
- Manganese Pump Shells
- Muller Tires
- Ore/Coal Chutes
- Paving Agitator Screws
- Pipeline Ball Joints
- Pug Mill Paddles
- Ripper Shanks
- Road Rippers
- Sheepsfoot Tamperes, similar to those for Hardalloy 140 where additional abrasion resistance is required
- Sizing Screens
- Subsoiler Teeth
**Hardalloy® 119**

Hardalloy 119 is a work hardening austenitic manganese steel. It is designed for the build-up or joining of austenitic manganese steels. Slightly harder than 118 in the “as deposited” condition and also work hardens quicker.

**Optimum Current**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>1/8&quot;</th>
<th>5/32&quot;</th>
<th>3/16&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amps</td>
<td>150</td>
<td>200</td>
<td>240</td>
</tr>
</tbody>
</table>

Polarity:
- DCEP Preferred or AC

**Typical Deposit Analysis %**

<table>
<thead>
<tr>
<th></th>
<th>C – 0.01</th>
<th>Mn – 19.50</th>
<th>Si – 0.50</th>
<th>Cr – 5.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe</td>
<td>Bal.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typical Properties**

- Tensile Strength: 135,000 psi
- Yield Strength: 97,000 psi
- Elongation in 2": 31%
- Machinability: Difficult/Grinding only

**Hardness:**
- As Deposited: 21 Rc
- Work Hardened: 50-55 Rc

**Typical Applications**
- Manganese Steel Railroad Crossovers & Frogs
- Similar to Hardalloy 118

---

**Hardalloy® M-932**

Hardalloy M-932 deposit is a martensitic alloy with good toughness and abrasion resistance designed for all weldable steels other than austenitic stainless or manganese steels. Deposits are just within the machinable range.

**Optimum Current**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>5/32&quot;</th>
<th>3/16&quot;</th>
<th>1/4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amps</td>
<td>170</td>
<td>220</td>
<td>300</td>
</tr>
</tbody>
</table>

Polarity:
- DCEP Preferred or AC

**Typical Deposit Analysis %**

<table>
<thead>
<tr>
<th></th>
<th>C – 0.13</th>
<th>Mn – 0.80</th>
<th>Si – 0.40</th>
<th>Cr – 2.20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mo</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>Bal.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typical Properties**

- Tensile Strength: 145,000 psi
- Hardness, as deposited, Rc
  - No. of Layers:
    - #132 Rail: 1080 Steel: 1 38 33
    - 2 39 36
    - 3 38 38
- *700°F preheat and interpass temperature can be flame cut

**Typical Applications**
- Crane Wheels
- Frogs & Switch Points
- Low Alloy Steel Railroad Crossovers
- Steel Shafts
- Tractor Undercarriage Idlers & Rollers

---

**Hardalloy® 600**

Hardalloy 600 is designed for overlay of mild and low alloy steels, providing moderate abrasion and impact and excellent metal-to-metal wear resistance. Hardalloy has a smooth, steady arc that allows smooth operation for increased productivity. It has good resistance to abrasion and impact which makes it versatile for overlaying different alloys.

**Optimum Current**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>1/8&quot;</th>
<th>5/32&quot;</th>
<th>3/16&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amps</td>
<td>110</td>
<td>160</td>
<td>210</td>
</tr>
</tbody>
</table>

Polarity:
- DCEP Preferred or AC

**Typical Deposit Analysis %**

<table>
<thead>
<tr>
<th></th>
<th>C – 0.60</th>
<th>Mn – 1.00</th>
<th>Si – 0.40</th>
<th>Cr – 4.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mo</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>Bal.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typical Properties**

- Nonmachinable: Grinding only
- Typical Hardness, Rc
  - No. of Layers:
    - Steel: 1 45-55RC
    - 2 55-60RC
    - 3 55-60RC
    - 4 55-60RC
- Flame cutting can be difficult
- Deposit is magnetic

**Typical Applications**
- Coupling Boxes
- Dragline Chain
- Dredge Ladder Rolls
- Kiln Trunnions
- Mill Guides
- Sliding Metal Parts
- Wobbler Ends
**Hardalloy® 148**

Hardalloy 148 deposit is a high carbon-chromium austenitic plus carbide alloy steel suited to overlay surfaces subjected to light abrasion accompanied by impact. It has excellent metal-to-metal frictional wear resistance, and the deposit retains hardness at temperatures up to 1200°F.

**Optimum Current**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>120</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>160</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>175</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

**Typical Deposit Analysis %**

- C – 1.80
- Mn – 0.60
- Si – 1.80
- Cr – 30.00
- Ni – 3.00
- Mo – 1.50
- Fe – Bal.

**Typical Properties**

Low stress abrasion – excellent

Machinability . . . . . . . . . Grind only

Typical Hardness, Rc

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>1020 Steel</th>
<th>Mn Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>36RC</td>
<td>35RC</td>
</tr>
<tr>
<td>2</td>
<td>39RC</td>
<td>38RC</td>
</tr>
<tr>
<td>3</td>
<td>43RC</td>
<td>40RC</td>
</tr>
</tbody>
</table>

Cannot be flame cut

Little or no relief-check cracks

Maintains hot hardness to 1200°F

**Typical Applications**

- Gyatory Crusher Mantles & Cones
- Ingot Tongs
- Mill Guides
- Pulleys
- Slurry Mixer Paddles

---

**Hardalloy® 40 TIC**

Hardalloy 40 TIC deposit is a high alloy cast iron containing chromium and titanium as the important alloying ingredients added for increased wear life. It is suited for surfaces subjected to heavy abrasion and moderate impact. Hardalloy 40 TIC is an excellent overlay material on both carbon steels and austenitic manganese base metals.

**Optimum Current**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>120</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>160</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>200</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>260</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

**Typical Deposit Analysis %**

- C – 3.00
- Mn – 1.10
- Si – 0.80
- Cr – 8.20
- Ti – 1.50
- Fe – Bal.

**Typical Properties**

Nonmachinable nor forgeable

Thickness . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .2 layers min./3 layers max.

Typical Hardness, Rc

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>1020 Steel</th>
<th>Mn Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

Cannot be flame cut

Some relief-check cracks

Maintains hot hardness to 1200°F

**Typical Applications**

- Ammonia Knives
- Augers
- Bucket Teeth & Lips
- Bulldozer End Bits & Blades
- Cement Chutes
- Coke Pusher Shoes
- Conveyor Screws
- Crusher Rolls
- Cultivator Chisels & Sweeps
- Dredge Pump Inlet Nozzle
- Hammer Mill Hammers
- Impactor Crusher Bars
- Mill Hammers
- Plow Shares
- Scraper Blades
- Sheepfoot Tamers
- Subsoiler Teeth

---

**Hardalloy® 61**

Hardalloy 61 deposit is a martensitic surfacing alloy similar to a high speed tool steel deposit. It can be used for metal-to-metal wear and abrasive wear up to 1000°F.

**Optimum Current**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>140</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>180</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

**Typical Deposit Analysis %**

- C – 0.80
- Mn – 0.50
- Si – 0.70
- Cr – 4.00
- W – 1.10
- Mo – 8.00
- V – 1.10
- Fe – Bal.

**Typical Properties**

Machinability . . . . . . . . . . . Grind only

Typical Hardness, Rc

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>1020 Steel</th>
<th>Mn Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53-55</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>57-63</td>
<td></td>
</tr>
</tbody>
</table>

Cannot be flame cut

Maintains hot hardness to 1000°F

**Typical Applications**

- Shear Blades
- Sliding Metal Parts
- Trimming Dies & Punching Dies
**Hard Surfacing Stick Electrodes**

### Special Alloy Electrodes — CAST IRON

#### Cast-Alloy™
**AWS ENi-Cl**
The “straight” nickel electrode excels in low stress welding applications on light and medium weight castings and where maximum machinability is desired. Approvals and conformances: AWS Spec A5.15, ASME SFA5.15

<table>
<thead>
<tr>
<th>Optimum Current Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32”</td>
<td>70</td>
</tr>
<tr>
<td>1/8”</td>
<td>95</td>
</tr>
<tr>
<td>5/32”</td>
<td>130</td>
</tr>
<tr>
<td>3/16”</td>
<td>190</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

**Typical Deposit Analysis %**
- C – 1.10
- Mn – 0.40
- Si – 2.70
- Cu – 1.40
- Fe – 5.50
- Ni – 89.00

**Typical Properties as Welded**
- Tensile Strength, ..................... 40,000 psi
- Yield Strength, ...................... 38,000 psi
- Elongation in 2”, ...................... 4.5%

#### Cast-Alloy™ 60
**AWS ENiFe-Cl**
Because of its chemistry (approximately 50% iron and 50% nickel), the Cast-Alloy 60 can offer several advantages over conventional “straight” nickel electrodes. Among the benefits are stronger and more ductile deposits, better hot crack resistance, lower coefficient of thermal expansion, and lower cost. Approvals and conformances: AWS Spec A5.15, ASME SFA5.15

<table>
<thead>
<tr>
<th>Optimum Current Diameter</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32”</td>
<td>70</td>
</tr>
<tr>
<td>1/8”</td>
<td>95</td>
</tr>
<tr>
<td>5/32”</td>
<td>130</td>
</tr>
<tr>
<td>3/16”</td>
<td>190</td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

**Typical Deposit Analysis %**
- C – 1.30
- Mn – 0.50
- Si – 0.60
- Fe – 48.00
- Ni – 49.00

**Typical Properties as Welded**
- Tensile Strength, ..................... 70,000 psi
- Yield Strength, ...................... 52,000 psi
- Elongation in 2”, ...................... 9.5%
**Hard Surfacing Stick Electrodes**

**Special Alloy Electrodes — MAINTENANCE**

### Hardalloy® 121

(Formerly known as Frogalloy)

Hardalloy 121 deposit is a high carbon austenitic stainless steel alloy. It has high impact resistance and high temperature wear resistance.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Optimum Current</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

Polarity: DCEP

**Typical Deposit Analysis %**

- C: 0.40
- Mn: 4.10
- Si: 0.40
- Cr: 19.20
- Ni: 9.20
- Mo: 1.40
- Fe: Bal.

**Typical Properties as Welded**

- Tensile Strength: 116,000 psi
- Yield Strength: 89,000 psi
- Elongation in 2": 16%

**Hardness:**

- As Deposited: 21 Rc (220 BHN)
- Work Hardened: 50-55 Rc (460-550 BHN)

Cannot be flame cut

**Typical Applications**

- Furnace Skid Rails
- Ingot Tongs
- Manganese Steel Railroad Crossovers & Frogs
- Mill Guides
- Piercing Components
- Pulverizer Hammers

### GP

A special stainless alloy electrode balanced for maximum strength and crack resistance. McKay GP is recommended for joining dissimilar metals and hard-to-weld steels. Deposits have over 20% ferrite and crack resistance equal to the armor welding electrodes. McKay GP can be used for any high strength application, where wear, impact, heat and corrosion resistant properties are required. Excellent for highly alloyed steels and for repair of cracked dies. Excellent operation in all positions.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Optimum Current</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32&quot;</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>170</td>
<td></td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

**Typical Deposit Analysis %**

- C: 0.06
- Mn: 1.00
- Si: 0.50
- Cr: 26.50
- Ni: 9.00
- Fe: Bal.

**Typical Properties as Welded**

- Tensile Strength: 129,000 psi
- Yield Strength: 97,000 psi
- Elongation in 2": 37%

**Machinability:** Very Good

**Hardness, as deposited, Rc**

<table>
<thead>
<tr>
<th>Layers</th>
<th>Steel</th>
<th>Mn Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td>3-8</td>
<td>17</td>
<td>18</td>
</tr>
</tbody>
</table>

Work Hardened: 40-45 Rc

Cannot be flame cut

Good hot hardness to 1000°F

**Typical Applications**

- Welding Attachments to Manganese Castings
- Welding Grouser Bars to Grousers
- Welding T-1 Steel Lips to Manganese Buckets

### Hardalloy® 120

Hardalloy 120 deposit is a stainless steel alloy with a ferrite content of at least 20FN. It is designed to achieve good impact, abrasion resistance, high compressive strength, and superior joining properties in one product. It makes an excellent build-up material and is recommended for joining dissimilar metals.

Due to a heavy coating, Hardalloy 120 electrodes compare with standard electrodes having 1/32” larger core wire.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Optimum Current</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>175</td>
<td></td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>230</td>
<td></td>
</tr>
</tbody>
</table>

Polarity: DCEP Preferred or AC

**Typical Deposit Analysis %**

- C: 0.07
- Mn: 1.30
- Si: 0.40
- Cr: 23.50
- Ni: 9.70
- Fe: Bal.

**Typical Properties as Welded**

- Abrasion Resistance: Fair
- Impact Resistance: Excellent
- Tensile Strength: 129,000 psi
- Yield Strength: 97,000 psi
- Elongation in 2": 37%
- Machinability: Very Good

**Hardness, as deposited, Rc**

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>Steel</th>
<th>Mn Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1020</td>
<td>12-14%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>19</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

Work Hardened: 40-45 Rc

Cannot be flame cut

Good hot hardness to 1000°F

**Typical Applications**

- Surfacing Valve Seats
- Welding Alloy Steel Tips to Manganese Buckets
- Welding Attachments to Manganese Castings
### Comparative Index of Hard Surfacing Electrodes

<table>
<thead>
<tr>
<th>McKay</th>
<th>Certanium</th>
<th>Lincoln</th>
<th>Stoody</th>
<th>Build-Up LH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardalloy 32</td>
<td>283 FC</td>
<td>BU</td>
<td>Build-Up LH</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 40 TIC</td>
<td>222</td>
<td>ME, 44</td>
<td>21, 19, 35</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 148</td>
<td>246</td>
<td>ABR</td>
<td>31, 33, 77</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 58</td>
<td>281 FC, 246 FC</td>
<td>MM</td>
<td>Self-Harden</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 61</td>
<td>221</td>
<td>T&amp;D</td>
<td>1102</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 118</td>
<td>262 FC</td>
<td>Mangjet</td>
<td>Dynamo</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 119</td>
<td>282</td>
<td>Frogmang</td>
<td>Trackwear</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 140</td>
<td>247, 248 FC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardalloy 155</td>
<td>246 FC, 247 FC, 284 FC</td>
<td>—</td>
<td>Superchrome, 2134</td>
<td></td>
</tr>
<tr>
<td>Hardalloy M-932</td>
<td>222, NC, N70</td>
<td>—</td>
<td>Rail End 932</td>
<td></td>
</tr>
<tr>
<td>Chrome-Mang</td>
<td>106 FC, 282 FC</td>
<td>15CrMn</td>
<td>2110</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 600</td>
<td>222, NC, N70</td>
<td>Warshield ABR</td>
<td>77</td>
<td></td>
</tr>
</tbody>
</table>

### Comparative Index of Special Alloy Electrodes

<table>
<thead>
<tr>
<th>McKay</th>
<th>Certanium</th>
<th>Eutectic</th>
<th>Stoody</th>
<th>UTP</th>
<th>Weld Mold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast-Alloy</td>
<td>—</td>
<td>99</td>
<td>8</td>
<td>760, 702, 706, 704</td>
<td></td>
</tr>
<tr>
<td>Cast-Alloy 60</td>
<td>887</td>
<td>22*33N, 3055, 4055</td>
<td>55</td>
<td>83 FN, 85 FN, 86 FN, 750, 765</td>
<td></td>
</tr>
<tr>
<td>Hardalloy 121</td>
<td>233</td>
<td>6899 XHD</td>
<td>Thermalloy 400</td>
<td>—</td>
<td>762</td>
</tr>
<tr>
<td>GP</td>
<td>707 AC/DC</td>
<td>680</td>
<td>HD-20, Versalloy Plus, Versalloy GP</td>
<td>65, 653</td>
<td>881, 880, 8800</td>
</tr>
<tr>
<td>Hardalloy 120</td>
<td>706 AC/DC</td>
<td>680</td>
<td>HD-20, Versalloy Plus, Versalloy GP</td>
<td>65, 653</td>
<td>880-C</td>
</tr>
</tbody>
</table>

### Hard Surfacing Electrodes Per Pound

<table>
<thead>
<tr>
<th>McKay Type</th>
<th>Diameter: Length:</th>
<th>1/8” (3.2 mm)</th>
<th>5/32” (4.0 mm)</th>
<th>3/16” (4.8 mm)</th>
<th>7/32” (5.6 mm)</th>
<th>1/4” (6.4 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardalloy 32</td>
<td>13”</td>
<td>13</td>
<td>9</td>
<td>6</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Hardalloy 40 TIC</td>
<td>14”</td>
<td>14</td>
<td>9</td>
<td>6</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Hardalloy 148</td>
<td>9”</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 58</td>
<td>14”</td>
<td>14</td>
<td>9</td>
<td>6</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Hardalloy 61</td>
<td>12”</td>
<td>12</td>
<td>8</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 118</td>
<td>12”</td>
<td>12</td>
<td>8</td>
<td>5</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Hardalloy 119</td>
<td>9”</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 140</td>
<td>9”</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 155</td>
<td>8”</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Chrome-Mang</td>
<td>8”</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy M-932</td>
<td>—</td>
<td>9</td>
<td>6</td>
<td>7</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 600</td>
<td>14”</td>
<td>14</td>
<td>10</td>
<td>7</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

### Special Alloy Electrodes Per Pound

<table>
<thead>
<tr>
<th>McKay Type</th>
<th>Diameter: Length:</th>
<th>3/32” (2.4 mm)</th>
<th>5/32” (3.2 mm)</th>
<th>3/16” (4.8 mm)</th>
<th>7/32” (5.6 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast-Alloy</td>
<td>35”</td>
<td>13</td>
<td>9</td>
<td>6</td>
<td>—</td>
</tr>
<tr>
<td>Cast-Alloy 60</td>
<td>37”</td>
<td>14</td>
<td>9</td>
<td>6</td>
<td>—</td>
</tr>
<tr>
<td>GP</td>
<td>34”</td>
<td>13</td>
<td>9</td>
<td>6</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 121</td>
<td>—</td>
<td>13</td>
<td>8</td>
<td>6</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 120</td>
<td>—</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

For other product comparisons please go to our Hard Surfacing Product Cross-Reference Guide at www.hobartbrothers.com
## TECHNICAL SECTION

### Suggested McKay Stick Electrode per Industry Application

#### Agriculture

<table>
<thead>
<tr>
<th>Application</th>
<th>McKay Electrode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia Knives</td>
<td>140, 155, 40 TiC</td>
</tr>
<tr>
<td>Cultivator Chisels &amp; Sweeps</td>
<td>140, 155, 40 TiC</td>
</tr>
<tr>
<td>Mill Hammers</td>
<td>40 TiC</td>
</tr>
<tr>
<td>Plow Shares</td>
<td>140, 40 TiC</td>
</tr>
<tr>
<td>Ripper Shanks</td>
<td>155</td>
</tr>
<tr>
<td>Steel Shafts</td>
<td>M-932</td>
</tr>
<tr>
<td>Subsoiler Teeth</td>
<td>155, 40 TiC</td>
</tr>
</tbody>
</table>

#### Crushing/Quarry Industries

<table>
<thead>
<tr>
<th>Application</th>
<th>McKay Electrode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bucket Lips</td>
<td>32</td>
</tr>
<tr>
<td>Bucket Teeth</td>
<td>118, Chrome-Mang</td>
</tr>
<tr>
<td>Bulldozer End Bits</td>
<td>40 TiC</td>
</tr>
<tr>
<td>Cement Chutes</td>
<td>118, 155, 40 TiC</td>
</tr>
<tr>
<td>Conveyor Screws</td>
<td>118, 155, 40 TiC</td>
</tr>
<tr>
<td>Crusher Jaws/Cones</td>
<td>118, Chrome-Mang</td>
</tr>
<tr>
<td>Crusher Rolls</td>
<td>118, Chrome-Mang</td>
</tr>
<tr>
<td>Gear Teeth</td>
<td>32</td>
</tr>
<tr>
<td>Gratory Crusher Mantles/Cones</td>
<td>118, Chrome-Mang</td>
</tr>
<tr>
<td>Hammer Mill Hammers</td>
<td>118, Chrome-Mang</td>
</tr>
<tr>
<td>Impactor Crusher Bars</td>
<td>118, Chrome-Mang</td>
</tr>
<tr>
<td>Kiln Trunnions</td>
<td>32</td>
</tr>
<tr>
<td>Muller Tires</td>
<td>120</td>
</tr>
<tr>
<td>Pug Mill Paddles</td>
<td>155</td>
</tr>
<tr>
<td>Pulverizer Hammers</td>
<td>121</td>
</tr>
<tr>
<td>Sizing Screens</td>
<td>118, Chrome-Mang</td>
</tr>
<tr>
<td>Steel Shafts</td>
<td>32</td>
</tr>
</tbody>
</table>

#### Heavy Equipment/Mining Industries

<table>
<thead>
<tr>
<th>Application</th>
<th>McKay Electrode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augers</td>
<td>140, 155, 40 TiC</td>
</tr>
<tr>
<td>Bucket Teeth/Lips</td>
<td>32</td>
</tr>
<tr>
<td>Bulldozer Blades</td>
<td>140, 155, 40 TiC</td>
</tr>
<tr>
<td>Bulldozer End Bits</td>
<td>40 TiC</td>
</tr>
<tr>
<td>Crane Wheels</td>
<td>32, M-932</td>
</tr>
<tr>
<td>Dragline Buckets</td>
<td>32</td>
</tr>
<tr>
<td>Dragline Chain</td>
<td>32</td>
</tr>
<tr>
<td>Mine Car Wheels</td>
<td>32</td>
</tr>
<tr>
<td>Ore/Coal Chutes</td>
<td>32</td>
</tr>
<tr>
<td>Paving Agitator Screws</td>
<td>155</td>
</tr>
<tr>
<td>Power Shovel Bucket Teeth/Lips</td>
<td>32, 140, 155</td>
</tr>
<tr>
<td>Road Rippers</td>
<td>155</td>
</tr>
<tr>
<td>Scraper Blades</td>
<td>140, 40 TiC</td>
</tr>
<tr>
<td>Sheepsfoot Tamper</td>
<td>140, 155, 40 TiC</td>
</tr>
<tr>
<td>Steel Shafts</td>
<td>32, M-932</td>
</tr>
<tr>
<td>Tractor Idlers/Roilers</td>
<td>32, M-932</td>
</tr>
</tbody>
</table>

#### Iron & Steel Industry

<table>
<thead>
<tr>
<th>Application</th>
<th>McKay Electrode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coke Chutes</td>
<td>155</td>
</tr>
<tr>
<td>Coke Pusher Shoes</td>
<td>155, 40 TiC</td>
</tr>
<tr>
<td>Coupling Boxes</td>
<td>32</td>
</tr>
<tr>
<td>Crane Wheels</td>
<td>32, M-932</td>
</tr>
<tr>
<td>Furnace Sld Rails</td>
<td>121</td>
</tr>
<tr>
<td>Gear Teeth</td>
<td>32</td>
</tr>
<tr>
<td>Grizzly Bars &amp; Fingers</td>
<td>Chrome-Mang</td>
</tr>
<tr>
<td>Ingot Tongs</td>
<td>148, 121</td>
</tr>
<tr>
<td>Mill Guides</td>
<td>58, 140, 121</td>
</tr>
<tr>
<td>Piercing Components</td>
<td>121</td>
</tr>
<tr>
<td>Pulleys</td>
<td>148</td>
</tr>
<tr>
<td>Pug Mill Paddles</td>
<td>155</td>
</tr>
<tr>
<td>Screw Conveyors</td>
<td>140, 155</td>
</tr>
<tr>
<td>Shear Blades</td>
<td>61</td>
</tr>
<tr>
<td>Steel Shafts</td>
<td>32, M-932</td>
</tr>
<tr>
<td>Wobbler Ends</td>
<td>32</td>
</tr>
</tbody>
</table>

#### Railroad Industry

<table>
<thead>
<tr>
<th>Application</th>
<th>McKay Electrode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossovers (Low Alloy Steel)</td>
<td>M-932, Chrome-Mang</td>
</tr>
<tr>
<td>Crossovers (Manganese Steel)</td>
<td>118, 119, 121, Chrome-Mang</td>
</tr>
<tr>
<td>Treqs (Carbon Steel)</td>
<td>M-932, Chrome-Mang</td>
</tr>
<tr>
<td>Treqs (Manganese Steel)</td>
<td>118, 119, Chrome-Mang</td>
</tr>
<tr>
<td>Rail Ends (Low Alloy Steel)</td>
<td>M-932, Chrome-Mang</td>
</tr>
<tr>
<td>Switch Points (Low Alloy Steel)</td>
<td>M-932, Chrome-Mang</td>
</tr>
</tbody>
</table>

#### Power Generation Industry

<table>
<thead>
<tr>
<th>Application</th>
<th>McKay Electrode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Feeder Screws</td>
<td>155</td>
</tr>
<tr>
<td>Coal Pulverizer Hammers</td>
<td>155</td>
</tr>
<tr>
<td>Fan Blades</td>
<td>155</td>
</tr>
<tr>
<td>Hydroelectric Turbines</td>
<td>Chrome-Mang</td>
</tr>
</tbody>
</table>
### Hard Surfacing Stick Electrode/Wire Equivalent

<table>
<thead>
<tr>
<th>Stick Electrode</th>
<th>Open-Arc Wire</th>
<th>Gas-Shielded Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Flux-Cored</td>
</tr>
<tr>
<td>Hardalloy 118</td>
<td>Tube-Alloy 218-O</td>
<td>—</td>
</tr>
<tr>
<td>Chrome-Mang</td>
<td>Tube-Alloy AP-0</td>
<td>Vertexwear AP</td>
</tr>
<tr>
<td>Hardalloy 32</td>
<td>Tube-Alloy Build-Up-O</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>ArmorWear™</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 58</td>
<td>Tube-Alloy 258-O</td>
<td>Vertexwear 600</td>
</tr>
<tr>
<td>Hardalloy 140</td>
<td>Tube-Alloy 240-O</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 155</td>
<td>Tube-Alloy 255-O</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 119</td>
<td>Tube-Alloy 219-O</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy M-932</td>
<td>Tube-Alloy 242-O</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 148</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 40TiC</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hardalloy 61</td>
<td>Tube-Alloy 258-O</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy A43-O</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy A45-O</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 218 TiC-O</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 244 TiC-O</td>
<td>—</td>
</tr>
</tbody>
</table>

### Hard Surfacing Electrode Pallet Information

<table>
<thead>
<tr>
<th>Length</th>
<th>McKay Type</th>
<th>Pallet Weight (lb)</th>
<th>Pallet Dimensions</th>
<th>Number of Units Per Pallet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Net</td>
<td>Gross (est.)</td>
<td>Depth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>1/8&quot;–14&quot;</td>
<td>Hardalloy &amp; Chrome-Mang Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>5/32&quot;–14&quot;</td>
<td>Chrome-Mang Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>3/16&quot;–14&quot;</td>
<td>Chrome-Mang Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>7/32&quot;–18&quot;</td>
<td>Chrome-Mang Electrodes</td>
<td>2205</td>
<td>2294</td>
<td>38&quot;</td>
</tr>
<tr>
<td>1/4&quot;–18&quot;</td>
<td>Chrome-Mang Electrodes</td>
<td>2450</td>
<td>2539</td>
<td>38&quot;</td>
</tr>
<tr>
<td>3/32&quot;–12&quot;</td>
<td>Cast-Alloy Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>1/8&quot;–14&quot;</td>
<td>Cast-Alloy Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>5/32&quot;–14&quot;</td>
<td>Cast-Alloy Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>3/16&quot;–14&quot;</td>
<td>Cast-Alloy Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>3/32&quot;–10&quot;</td>
<td>GP &amp; Hardalloy 121 Electrodes</td>
<td>860</td>
<td>760</td>
<td>38&quot;</td>
</tr>
<tr>
<td>1/8&quot;–14&quot;</td>
<td>GP &amp; Hardalloy 121 Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>5/32&quot;–14&quot;</td>
<td>GP &amp; Hardalloy 121 Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
<tr>
<td>3/16&quot;–14&quot;</td>
<td>GP &amp; Hardalloy 121 Electrodes</td>
<td>1320</td>
<td>1420</td>
<td>38&quot;</td>
</tr>
</tbody>
</table>

### Packaging Options

#### 14-Inch Electrodes
- 9 and 10 lb Hermetically Sealed Can

#### 18-Inch Electrodes
- 45 and 50 lb Hermetically Sealed Can

All McKay hard surfacing electrodes are stamped with the product name.
HARD SURFACING WIRE
PRODUCT LINE OVERVIEW

McKay® has been a leading supplier of hard surfacing tubular wires for over fifty years. The McKay full line of Tube-Alloy® and VertiWear® wires are formulated to cover a broad spectrum of wear-related applications. Every McKay tubular wire product is formulated for maximum wear resistance and superior, consistent operation—then manufactured to exacting standards. Every pound of product is backed by over fifty years of field hard surfacing experience.

MAIN LINE PRODUCTS
Tube-Alloy 218-O
Tube-Alloy AP-O
VertiWear AP
ArmorWear
Tube-Alloy Build Up-O
Tube-Alloy Build Up-G
Tube-Alloy 258-O
Tube-Alloy 258-G
Tube-Alloy 240-O
Tube-Alloy 255-O
Tube-Alloy 255-G
Tube-Alloy 260-G

Within the wide scope of McKay hard surfacing tubular wires, six open-arc wires and four gas-shielded wires have been specially designed to cover the majority of impact and abrasive wear applications. These twelve main line wires listed to the left are explained in great detail on the following pages.
## Hard Surfacing Wire Product Line

### Build-Up
Restoring worn parts to their original dimensions

<table>
<thead>
<tr>
<th>Application</th>
<th>Open-Arc Tubular Wires</th>
<th>Gas-Shielded Tubular Wires</th>
<th>Metal-Cored Submerged-Arc Tubular Wires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube-Alloy Build Up-O*</td>
<td>Tube-Alloy Build Up-G*</td>
<td>Tube-Alloy Build Up-G*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy AP-O*</td>
<td>Tube-Alloy Build Up-G*</td>
<td>Tube-Alloy Build Up-G*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 218-O*</td>
<td>Tube-Alloy Build Up-G*</td>
<td>Tube-Alloy Build Up-G*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 219-O</td>
<td>Tube-Alloy Build Up-G*</td>
<td>Tube-Alloy Build Up-G*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 242-O</td>
<td>Tube-Alloy Build Up-G*</td>
<td>Tube-Alloy Build Up-G*</td>
<td></td>
</tr>
</tbody>
</table>

### Overlay
Providing additional resistance to wear

<table>
<thead>
<tr>
<th>Application</th>
<th>Open-Arc Tubular Wires</th>
<th>Gas-Shielded Tubular Wires</th>
<th>Metal-Cored Submerged-Arc Tubular Wires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal to Metal</td>
<td>Tube-Alloy Build Up-O*</td>
<td>Tube-Alloy Build Up-G*</td>
<td>Tube-Alloy BU-S</td>
</tr>
<tr>
<td>ArmorWear*</td>
<td>Tube-Alloy Build Up-G*</td>
<td>Tube-Alloy Build Up-G*</td>
<td>Tube-Alloy 258-S</td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 242-S Mod</td>
<td>Tube-Alloy 242-S Mod</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VertiWear 600</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 260-G</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 8620-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 861-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 868-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 877-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 852-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 954-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 252-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy A231-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 887-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy A250-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy A420M-S</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tube-Alloy 865-S Mod</td>
<td>Tube-Alloy 258-G*</td>
<td></td>
</tr>
</tbody>
</table>

### Impact

<table>
<thead>
<tr>
<th></th>
<th>Tube-Alloy AP-O*</th>
<th>VertiWear AP*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube-Alloy 218-O*</td>
<td>Tube-Alloy AP*</td>
<td>VertiWear AP*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 219-O</td>
<td>Tube-Alloy AP*</td>
<td>VertiWear AP*</td>
<td></td>
</tr>
</tbody>
</table>

### Abrasion

<table>
<thead>
<tr>
<th></th>
<th>Tube-Alloy 255-O*</th>
<th>Tube-Alloy 255-G*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube-Alloy 240-O*</td>
<td>Tube-Alloy 255-G*</td>
<td>Tube-Alloy 255-G*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 218TiC-0</td>
<td>Tube-Alloy 255-G*</td>
<td>Tube-Alloy 255-G*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 258TiC-0</td>
<td>Tube-Alloy 255-G*</td>
<td>Tube-Alloy 255-G*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 244-O</td>
<td>Tube-Alloy 255-G*</td>
<td>Tube-Alloy 255-G*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 443-0</td>
<td>Tube-Alloy 255-G*</td>
<td>Tube-Alloy 255-G*</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 445-0</td>
<td>Tube-Alloy 255-G*</td>
<td>Tube-Alloy 255-G*</td>
<td></td>
</tr>
</tbody>
</table>

### Special Alloys & Flux

<table>
<thead>
<tr>
<th>Application</th>
<th>Open-Arc Tubular Wires</th>
<th>Flux</th>
<th>Metal-Cored Submerged-Arc Tubular Wires</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GP-0</td>
<td>MK-N</td>
<td></td>
</tr>
</tbody>
</table>

* Bold items are main line products
Flux-Cored Open-Arc Hard Surfacing Wires — FOR BUILD-UP

**Tube-Alloy® Build Up-O**
Tube-Alloy Build Up-O deposit is a low alloy steel. It is designed for build-up on mild and low alloy steels only. The weld metals have good compressive strength and impact resistance, making it an excellent base for more abrasion-resistant alloys. The deposit has excellent resistance to cracking, even in multiple layers, and is within the machinable range.

**Diameter and Polarity**
- .045"
- 1/16"
- 7/64"
- DCEP

**Typical Deposit Analysis %**
- C – 0.12
- Mn – 2.80
- Si – 0.80
- Cr – 1.20
- Fe – Bal.

**Typical Properties**
- Abrasion Resistance: Fair
- Impact Resistance: Very Good
- Machinability: Excellent
- Hardness, as deposited, Rc
  - No. of Layers: 1020
    - Steel: 30
    - Steel: 36
  - 2
    - Steel: 28
    - Steel: 30
  - 3
    - Steel: 25
    - Steel: 26

Can be flame cut
- Magnetic
- Heat Treatable

**Typical Applications**
- Bucket Teeth & Lips
- Crane Wheels
- Dragline Buckets
- Dragline Chain
- Dredge Ladder Rolls
- Gear Teeth
- Kiln Trunnion
- Mine Car Wheels
- Spindles
- Steel Shafts
- Wobbler Ends

**Tube-Alloy® 218-O**
Tube-Alloy 218-O is a work hardening austenitic manganese steel alloy. It can be used for build-up or overlay on austenitic manganese steel only. It can also be used for joining austenitic manganese steel to manganese steel. Deposits are extremely tough and work harden rapidly under high impact.

**Diameter and Polarity**
- .045"
- 1/16"
- 7/64"
- DCEP

**Typical Deposit Analysis %**
- C – 1.00
- Mn – 15.00
- Si – 0.40
- Cr – 3.10
- Ni – 0.40
- Fe – Bal.

**Typical Properties**
- Abrasion Resistance: Fair
- Impact Resistance: Excellent
- Tensile Strength: 120,000 psi
- Yield Strength: 80,000 psi
- Elongation in 2": 32%
- Machinability: Difficult
- Hardness:
  - As Deposited: 15-22 Rc
  - Work Hardened: 50-55 Rc
- Flame Cutting: Difficult
- Nonmagnetic

**Typical Applications**
- Bucket Teeth
- Crusher Jaws & Cones
- Dredge Pump Casings
- Gyraotory Crusher Mantles & Cones
- Hammer Mill Hammers
- Impactor Crusher Bars
- Manganese Steel Railroad Crossovers & Frogs

**Tube-Alloy® AP-O**
Tube-Alloy AP-O deposit is a premium work hardening austenitic manganese steel alloy. It can be used for build-up or overlay on austenitic manganese steel, carbon steel and low alloy steel. It can also be used for joining austenitic manganese steel to manganese steel, carbon steel and low alloy steel. The weld metal has higher toughness than conventional manganese steel weld metal.

**Diameter and Polarity**
- 1/16"
- 7/64"
- DCEP

**Typical Deposit Analysis %**
- C – 0.42
- Mn – 16.50
- Si – 0.30
- Cr – 13.00
- Fe – Bal.

**Typical Properties**
- Abrasion Resistance: Fair
- Impact Resistance: Excellent
- Tensile Strength: 124,000 psi
- Yield Strength: 83,000 psi
- Elongation in 2": 40%
- Machinability: Difficult
- Hardness:
  - As Deposited: 18-24 Rc
  - Work Hardened: 50-55 Rc
- Cannot be flame cut
- Nonmagnetic

**Typical Applications**
- Bucket Teeth & Lips
- Crusher Jaws & Cones
- Dragline Buckets
- Dredge Cutter Heads & Teeth
- Grizzly Bars & Fingers
- Gyraotory Crusher Mantles & Cones
- Hammer Mill Hammers
- Hydroelectric Turbines
- Impactor Crusher Bars
- Muller Tires
- Pulverizer Hammers
- Similar to those for Tube-Alloy 218-O, especially where the base metal verification is questionable or where contamination may be an issue
- Sizing Screens
### Tube-Alloy® 258-O

Tube-Alloy 258-O deposit is a premium martensitic alloy steel of the hard, tough H-12 tool steel composition. It has excellent resistance to adhesive (metal-to-metal) wear. It is designed to surface mild and low alloy steel components subject to moderate abrasive wear and/or high temperature (up to 1000°F). Proper preheat is required for crack-free deposits.

**Diameter and Polarity**
- 0.045"
- 1/16"
- 7/64"
- DCEP

**Typical Deposit Analysis %**
- C – 0.45
- Mn – 1.40
- Si – 0.80
- Cr – 6.00
- Mo – 1.50
- W – 1.50
- Fe – Bal.

**Typical Properties**
- Abrasion Resistance: Good
- Impact Resistance: Good
- Machinability: Grind only

**Thickness**
- 3-5 Layers Maximum

**Hardness, as deposited, Rc**
- No. of 1020: 4130
- Layers: 1020
- Steel*: 4130
- Manganese: 35
- 1: 40
- 2: 48
- 3: 52

**Applications**
- Ammonia Knives
- Augers
- Bucket Teeth & Lips
- Bulldozer End Bits & Blades
- Conveyor Screws
- Crusher Jaws & Cones
- Crusher Rolls
- Cultivator Chisels & Sweeps
- Dragline Buckets
- Dredge Pump Impellers & Side Plates
- Hammer Mill Hammers
- Impactor Crusher Bars
- Manganese Pump Shells
- Mill Guides
- Muller Tires
- Pipeline Ball Joints
- Pulverizer Hammers
- Scraper Blades
- Screw Conveyors
- Sheepsfoot Tamper
- Sizing Screens

---

### Tube-Alloy® 240-O

Tube-Alloy 240-O deposit is a chromium carbide surfacing alloy. It can be used on components subject to severe abrasive wear and heavy impact. The weld metal has higher toughness than conventional chromium carbide due to fewer stress relief-check cracks.

**Diameter and Polarity**
- 0.045"
- 1/16"
- 7/64"
- DCEP

**Typical Deposit Analysis %**
- C – 3.20
- Mn – 0.80
- Si – 1.90
- Cr – 15.50
- Fe – Bal.

**Typical Properties**
- Abrasion Resistance: Very Good
- Impact Resistance: Fair
- Machinability: Grinding only
- Thickness: 3-5 Layers Maximum

**Hardness, as deposited, Rc**
- No. of 1020: 12-14%
- Layers: 1020
- Steel*: 12-14%
- Manganese: 48
- 1: 54
- 2: 56
- 3: 58

**Applications**
- Ammonia Knives
- Augers
- Bucket Teeth & Lips
- Bulldozer Blades
- Bulldozer End Bits & Blades
- Cement Chutes
- Coal Feeder Screws
- Coal Pulverizer Hammers, Rolls & Table
- Dredge Pump Impellers & Side Plates
- Coke Chutes
- Coke Pusher Shoes
- Conveyor Screws
- Crusher Jaws & Cones
- Cultivator Chisels & Sweeps
- Dredge Pump Inlet Nozzle & Side Plates
- Fan Blades
- Grizzly Bars & Fingers
- Gyatory Crusher Mantles & Cones
- Manganese Pump Shells
- Muller Tires
- Ore & Coal Chutes
- Pipeline Ball Joints
- Pug Mill Paddles
- Ripper Shanks
- Road Rippers
- Scraper Blades
- Screw Conveyors
- Sheepsfoot Tamper
- Similar to those for Tube-Alloy 240-0 where additional abrasion resistance is required
- Sizing Screens
- Subsoiler Teeth

---

### Tube-Alloy® 255-O

Tube-Alloy 255-O deposit is a premium high chromium carbide surfacing alloy. It can be used on components subject to extremely severe abrasive wear and moderate impact. It can also be used where high temperature (up to 1250°F) wear resistance is required. The weld metal will stress relief-check crack. Can be run as submerged arc by using MK-N neutral flux.

**Diameter and Polarity**
- 1/16"
- 7/64"
- DCEP

**Typical Deposit Analysis %**
- C – 4.50
- Mn – 0.90
- Si – 0.50
- Cr – 26.50
- Fe – Bal.

**Typical Properties**
- Abrasion Resistance: Excellent
- Impact Resistance: Poor
- Machinability: Grinding only
- Thickness: 3 Layers Maximum

**Hardness, as deposited, Rc**
- No. of 1020: 12-14%
- Layers: 1020
- Steel*: 12-14%
- Manganese: 53
- 1: 58
- 2: 56
- 3: 58

**Applications**
- Ammonia Knives
- Augers
- Bucket Teeth & Lips
- Bulldozer Blades
- Bulldozer End Bits & Blades
- Cement Chutes
- Coal Feeder Screws
- Coke Chutes
- Coke Pusher Shoes
- Conveyor Screws
- Dredge Pump Impellers & Side Plates
- Hammer Mill Hammers
- Impactor Crusher Bars
- Manganese Pump Shells
- Mill Guides
- Muller Tires
- Pipeline Ball Joints
- Pulverizer Hammers
- Scraper Blades
- Screw Conveyors
- Sheepsfoot Tamper
- Sizing Screens
- Subsoiler Teeth

---

### Flux-Cored Open-Arc Hard Surfacing Wires — OVERLAY

- Ammonia Knives
- Augers
- Bucket Teeth & Lips
- Bulldozer Blades
- Bulldozer End Bits & Blades
- Cement Chutes
- Coal Feeder Screws
- Coke Chutes
- Coke Pusher Shoes
- Conveyor Screws
- Dredge Pump Impellers & Side Plates
- Hammer Mill Hammers
- Impactor Crusher Bars
- Manganese Pump Shells
- Mill Guides
- Muller Tires
- Pipeline Ball Joints
- Pulverizer Hammers
- Scraper Blades
- Screw Conveyors
- Sheepsfoot Tamper
- Sizing Screens
- Subsoiler Teeth
Flux-Cored Open-Arc Hard Surfacing Wires — OVERLAY

**Tube-Alloy® 242-O**

Tube-Alloy® 242-O is a self-shielded, flux-cored wire that deposits a premium martensitic alloy steel. It has excellent resistance to adhesive (metal-to-metal) wear. The deposit has good resistance to abrasion and impact makes it a versatile overlay alloy. It is designed for use as an overlay on carbon and low alloy steels or as a base of Tube-Alloy Build Up-O. With proper preheating, crack-free deposits can be obtained. Tube-Alloy 242-O should never be used for joining.

**Diameter and Polarity**

- 0.045”
- 1/16”
- 7/64”
- DCEP

**Typical Deposit Analysis %**

- C – 0.25
- Mn – 1.30
- Si – 0.70
- Cr – 5.80
- Mo – 1.50
- W – 1.40

**Typical Properties**

- Abrasion Resistance: Good
- Impact Resistance: Good
- Machinability: Grind only

**Typical Applications**

- Carbon Steel Rolls
- Crane Wheels
- Dragline Chain
- Frogs & Switch Points
- Idlers
- Low Alloy Steel Railroad Crossovers and Rail Ends
- Steel Shafts
- Tractor Rollers

**ArmorWear™**

ArmorWear is a self-shielded, flux-cored wire that deposits a premium martensitic alloy steel of H-12 tool steel composition. It has excellent resistance to adhesive (metal-to-metal) wear. It also has good resistance to abrasion and impact, and maintains its hardness up to 1000°F. It is designed for use as an overlay on carbon and low alloy steels. Because of its high hardenability, proper preheat may be required for crack-free deposits, particularly on low alloy steels. ArmorWear is formulated to optimize performance with the small 110/220V type wire welding machines.

**Diameter and Polarity**

- 0.035”
- 0.045”
- DCEN

**Typical Deposit Analysis %**

- C – 0.40
- Mn – 1.00
- Si – 0.40
- Cr – 5.80
- Mo – 1.50
- W – 1.40

**Typical Properties**

- Abrasion Resistance: Good
- Impact Resistance: Good
- Machinability: Grind only

**Typical Applications**

- Bucket lips and teeth
- Cultivator chisels and sweeps
- Plow shares, scraper blades
- Shanks, knives, teeth
- Kiln trunnions
- Spindles
- Pump components

**Tube-Alloy® 219-O**

Tube-Alloy 219-O is a work hardening austenitic manganese steel alloy. The high carbon and manganese content allows for a fully austenitic first layer on carbon steel. Deposits are extremely tough and work harden rapidly under high impact. It can be used for most railroad track maintenance applications.

**Diameter and Polarity**

- 1/16”
- 7/64”
- DCEP

**Typical Deposit Analysis %**

- C – 1.00
- Mn – 20.00
- Si – 0.60
- Cr – 4.50
- Fe – Bal.

**Typical Properties**

- Abrasion Resistance: Good
- Impact Resistance: Excellent
- Tensile Strength: 137,000 psi
- Yield Strength: 91,000 psi
- Elongation in 2": 34%
- Machinability: Difficult

**Typical Applications**

- Manganese Steel Railroad Crossovers & Frogs
- Similar to 218-O, except that it is slightly harder in the “as deposited” condition, and work hardens quicker
**Hard Surfacing Wires**

*Flux-Cored Open-Arc Hard Surfacing Wires — OVERLAY*

**Tube-Alloy® 218 TiC-O**
Tube-Alloy 218 TiC-O deposits a work hardenable austenitic manganese steel alloy containing titanium carbides. It offers the unique properties of high impact and high abrasion resistance. It can be used as a combination build-up and surfacing alloy.

**Diameter and Polarity**
7/64”
DCEP

**Typical Deposit Analysis %**
- C: 2.00
- Mn: 13.00
- Si: 0.60
- Cr: 3.20
- Ti: 3.50
- Fe: Bal.

**Typical Properties**
- Abrasion Resistance: Good
- Impact Resistance: Very Good
- Machinability: Poor

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>1020 Steel</th>
<th>12-14% Mn Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>31</td>
<td>30</td>
</tr>
</tbody>
</table>

Work hardens to 50-55 Rc
Can be flame cut
Nonmagnetic

**Typical Applications**
- Gyratory Crusher Mantles & Cones
- Hammer Mill Hammers
- Impactor Crusher Bars


**Tube-Alloy® 258TiC-O**
Tube-Alloy 218 TiC-O deposit is a martensitic alloy steel containing a high volume fraction of titanium carbides. It is particularly good for resisting high stress abrasive wear. The alloy has good hot hardness. Deposits can be applied crack-free with proper procedures.

**Diameter and Polarity**
1/16”
7/64”
DCEP

**Typical Deposit Analysis %**
- C: 2.10
- Mn: 1.30
- Si: 1.80
- Cr: 7.00
- Mo: 1.60
- Ti: 6.00
- Fe: Bal.

**Typical Properties**
- Abrasion Resistance: Excellent
- Impact Resistance: Good
- Machinability: Grinding only

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>1020 Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
</tr>
<tr>
<td>3-8</td>
<td>48</td>
</tr>
</tbody>
</table>

Cannot be flame cut
Magnetic
Maintains hot hardness to 1000°F

**Typical Applications**
- Paving Agitator Screws


**Tube-Alloy® 244-O**
Tube-Alloy 244-O deposit is a medium alloy carbide steel. It is designed primarily for the automatic rebuilding of dredge pump shells. Deposits do stress relief-check crack.

**Diameter and Polarity**
7/64”
DCEP

**Typical Deposit Analysis %**
- C: 2.50
- Mn: 1.60
- Si: 2.00
- Cr: 9.00
- Cu: 0.50
- Fe: Bal.

**Typical Properties**
- Abrasion Resistance: Very Good
- Impact Resistance: Fair
- Machinability: Very Difficult

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>1020 Steel</th>
<th>12-14% Mn Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>34</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>38</td>
</tr>
</tbody>
</table>

Cannot be flame cut
Slightly Magnetic
Deposit will relief-check crack

**Typical Applications**
- Dredge Pump Impellers & Side Plates
- Pipeline Ball Joints
- Pump Shells
**Flux-Cored Open-Arc Hard Surfacing Wires — OVERLAY**

**Tube-Alloy® A43-O**

Tube-Alloy A43-O deposit is a premium high chromium-columbium carbide surfacing alloy. It can be used on components subject to extremely severe high and low stress abrasive wear and moderate impact. It can also be used where high temperature (up to 1250°F) wear resistance is required. The deposit will stress relief-check crack readily. Can be run as submerged arc by using MK-N neutral flux.

**Diameter and Polarity**

- 1/16" DCEP
- 7/64" DCEP

**Typical Deposit Analysis %**

<table>
<thead>
<tr>
<th>Element</th>
<th>Analysis %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>5.50</td>
</tr>
<tr>
<td>Mn</td>
<td>0.20</td>
</tr>
<tr>
<td>Si</td>
<td>1.00</td>
</tr>
<tr>
<td>Cr</td>
<td>22.00</td>
</tr>
<tr>
<td>Cb</td>
<td>6.50</td>
</tr>
<tr>
<td>Fe</td>
<td>Bal.</td>
</tr>
</tbody>
</table>

**Typical Properties**

- Abrasion Resistance: Excellent
- Impact Resistance: Poor
- Machinability: Grinding only
- Thickness: 3 Layers Maximum
- Hardness, as deposited, RC:
  - No. of Layers: 1020
    - 1 layer: Steel 58, Mn Steel 48
    - 2-3 layers: Steel 62, Mn Steel 56

**Typical Applications**

- Augers
- Bucket Lips & Teeth
- Coal Feeder Screws
- Coal Pulverizer Rolls & Table
- Coke Chutes
- Coke Pusher Shoes
- Conveyor Screws
- Dredge Cutter Heads & Teeth
- Dredge Pump Inlet Nozzle & Side Plates
- Fan Blades
- Grizzly Bars & Fingers
- Muller Tires
- Paving Agitator Screws
- Pipeline Ball Joints
- Pug Mill Paddles
- Scraper Blades
- Sheepsfoot Tamper
- Sizing Screws

**Tube-Alloy® A45-O**

Tube-Alloy A45-O deposit is a combination of large chromium carbides and small fine columbium and alloy carbides in an austenitic eutectic carbide matrix. It is designed to resist severe high and low stress abrasion with minimal impact at elevated temperatures. The deposit will check crack readily. Can be run as submerged arc by using MK-N neutral flux.

**Diameter and Polarity**

- 7/64" DCEP

**Typical Deposit Analysis %**

<table>
<thead>
<tr>
<th>Element</th>
<th>Analysis %</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>5.50</td>
</tr>
<tr>
<td>Mn</td>
<td>0.20</td>
</tr>
<tr>
<td>Si</td>
<td>1.00</td>
</tr>
<tr>
<td>V</td>
<td>1.00</td>
</tr>
<tr>
<td>Cr</td>
<td>21.00</td>
</tr>
<tr>
<td>Mo</td>
<td>6.50</td>
</tr>
<tr>
<td>Cb</td>
<td>6.50</td>
</tr>
<tr>
<td>W</td>
<td>1.50</td>
</tr>
<tr>
<td>Fe</td>
<td>Bal.</td>
</tr>
</tbody>
</table>

**Typical Properties**

- Abrasion Resistance: Excellent
- Impact Resistance: Poor
- Machinability: Grinding only
- Thickness: 2-3 Layers Maximum
- Hardness, as deposited, RC:
  - No. of Layers: 1020 Steel
    - 1 layer: 60
    - 2-3 layers: 64
  - Temp. Typical Hardness:
    - up to 1000°F: 60
    - at 1050°F: 54
    - at 1100°F: 50

**Typical Applications**

- Blast Furnace Bell’s Burden Area
- Fan Blades
- Sheets in Blast Furnace Bell
- Sinter Breaker Bars
- Sinter Plant Parts
VertiWear® 600
VertiWear 600 deposits a multipurpose martensitic steel alloy. It can be used to surface mild and low alloy components subject to moderate abrasive wear and medium to high impact. Excellent operator appeal in all position.

Diameter and Polarity
.045”
1/16”
DCEP
Gas-Shielded
75/25 (Ar/CO₂)
or 100% CO₂

Typical Deposit Analysis %
C – 0.40
Mn – 0.75
Si – 0.60
Cr – 6.50
Mo – 1.00
V – 0.05
Fe – Bal.

Typical Properties
Abrasion Resistance .........................Good
Impact Resistance .........................Very Good
Machinability .........................Good
Hardness, as deposited, Rc
No. of Layers 1020 Steel
1 52
2 56
3-8 57

Flame cutting is difficult
Magnetic

Typical Applications
• Coupling Boxes
• Dragline Chain
• Dredge Ladder Rolls
• Klin Trunnions
• Mill Guides
• Sliding Metal Parts
• Wobbler Ends

Tube-Alloy™ 255-G
Tube-Alloy 255-G is a small-diameter, gas-shielded premium hard surfacing wire that deposits an extremely wear-resistant chromium-carbide overlay. It is designed for overlay on carbon, low alloy, cast iron, and austenitic manganese base metals. It outlasts competitive wires which deposit martensitic deposits 9 to 1.

Diameter and Polarity
.045”
DCEP
Gas-Shielded
98/2 (Ar/O₂)
75/25 (Ar/CO₂)

Typical Deposit Analysis %
C – 5.30
Mn – 1.00
Si – 0.40
Cr – 18.00
Fe – Bal.

Typical Properties
Abrasion Resistance .........................Excellent
Impact Resistance .........................Poor
Machinability .........................Grinding is Difficult
Thickness .........................3 Layers Maximum
Hardness, as deposited, Rc
No. of Layers 1020 Manganese
layers of Steel
1 58 47
2 61 51
3 65 54

Cannot be flame cut
Deposit will relief-check crack readily
Maintains hot hardness to 1250°F

Typical Applications
• Ammonia Knives
• Augers
• Bucket Teeth & Lips
• Bulldozer End Bits and Blades
• Cement Chutes
• Coal Feeder Screws
• Coal Pulverizer Hammers, Rolls and Table
• Coke Chutes
• Coke Pusher Shoes
• Conveyor Screws
• Crusher Jaws and Cones
• Cultivator Chisels and Sweeps
• Dragline Buckets
• Dredge Cutter Heads and Teeth
• Dredge Pump Inlet Nozzle & Side Plates
• Fan Blades
• Grizzly Bars and Fingers
• Gyrotrary Crusher Mantles and Cones
• Manganese Pump Shells
• Muller Tires
• Ore and Coal Chutes
• Pipeline Ball Joints
• Pug Mill Paddles
• Ripper Shanks
• Road Rippers
• Scraper Blades
• Screw Conveyors
• Sheepsfoot Tamers
• Sizing Screens
• Subsoiler Teeth

VertiWear® AP
VertiWear AP is a premium, work-hardening austenitic manganese steel alloy. This flux-cored, all-position wire can be used for build-up or overlay on austenitic manganese steel. It can also be used for joining austenitic manganese steel to manganese steel, carbon steel and low alloy steel. The deposit has an excellent impact resistance.

Diameter and Polarity
.045”
DCEP
Gas-Shielded
75/25 (Ar/CO₂)
or 100% CO₂

Typical Deposit Analysis %
C – 0.45
Mn – 14.00
Si – 0.50
Cr – 13.50
Ni – 0.50
Fe – Bal.

Typical Properties
Abrasion Resistance .........................Good
Impact Resistance .........................Excellent
Machinability .........................Fair
Hardness:
No. of Layers 1020 Steel
1 24 Rc
2 20 Rc
3-8 18 Rc

Cannot be flame cut

Typical Applications
• Coupling Boxes
• Dragline Chain
• Dredge Ladder Rolls
• Kiln Trunnions
• Mill Guides
• Sliding Metal Parts
• Wobbler Ends

Tube-Alloy™ 255-G
Tube-Alloy 255-G is a small-diameter, gas-shielded premium hard surfacing wire that deposits an extremely wear-resistant chromium-carbide overlay. It is designed for overlay on carbon, low alloy, cast iron, and austenitic manganese base metals. It outlasts competitive wires which deposit martensitic deposits 9 to 1.

Diameter and Polarity
.045”
DCEP
Gas-Shielded
98/2 (Ar/O₂)
75/25 (Ar/CO₂)

Typical Deposit Analysis %
C – 5.30
Mn – 1.00
Si – 0.40
Cr – 18.00
Fe – Bal.

Typical Properties
Abrasion Resistance .........................Excellent
Impact Resistance .........................Poor
Machinability .........................Grinding is Difficult
Thickness .........................3 Layers Maximum
Hardness, as deposited, Rc
No. of Layers 1020 Manganese
layers of Steel
1 58 47
2 61 51
3 65 54

Cannot be flame cut
Deposit will relief-check crack readily
Maintains hot hardness to 1250°F

Typical Applications
• Ammonia Knives
• Augers
• Bucket Teeth & Lips
• Bulldozer End Bits and Blades
• Cement Chutes
• Coal Feeder Screws
• Coal Pulverizer Hammers, Rolls and Table
• Coke Chutes
• Coke Pusher Shoes
• Conveyor Screws
• Crusher Jaws and Cones
• Cultivator Chisels and Sweeps
• Dragline Buckets
• Dredge Cutter Heads and Teeth
• Dredge Pump Inlet Nozzle & Side Plates
• Fan Blades
• Grizzly Bars and Fingers
• Gyrotrary Crusher Mantles and Cones
• Manganese Pump Shells
• Muller Tires
• Ore and Coal Chutes
• Pipeline Ball Joints
• Pug Mill Paddles
• Ripper Shanks
• Road Rippers
• Scraper Blades
• Screw Conveyors
• Sheepsfoot Tamers
• Sizing Screens
• Subsoiler Teeth

Flux-Cored Gas-Shielded Hard Surfacing Wires
Main Line Products
Hard Surfacing Wires

Metal-Cored Gas-Shielded Hard Surfacing Wires

**Tube-Alloy® Build Up-G**

Tube-Alloy Build Up-G is a gas-shielded, metal-cored wire designed for build-up on carbon and low alloy steels. The weld metals have good compressive strength and impact resistance, making them excellent bases for more abrasion-resistant alloys.

**Diameter and Polarity**
- .045"
- 1/16"
- DCEP
- Gas-Shielded
- 75/25 (Ar/CO₂)
- or 100% CO₂

**Typical Deposit Analysis %**
- C – 0.26
- Mn – 1.73
- Si – 0.32
- Cr – 1.85
- Fe – Bal.

**Typical Properties**
- Abrasion Resistance .......................Fair
- Impact Resistance .........................Very Good
- Machinability ................................Good
- Hardness .....................................25 Rc
- Can be flame cut
- Magnetic

**Typical Applications**
- Bucket Teeth & Lips
- Crane Wheels
- Dragline Buckets
- Dragline Chain
- Dredge Ladder Rolls
- Gear Teeth
- Kiln Trunnions
- Mine Car Wheels
- Spindles
- Steel Shafts
- Wobbler Ends

**Tube-Alloy® 258-G**

(Formerly known as HW-T)

Tube-Alloy 258-G is a metal-cored, gas-shielded wire which deposits a sound hot work tool steel alloy of the AISI H-12 type. It is extremely resistant to thermal shock and erosion at working temperatures. The alloy has good dimensional stability and uniform heat-treatment response, making it ideally suited for fabrication, modification, and repair of dies and other tool steel parts.

**Diameter and Polarity**
- .045"
- 1/16"
- DCEP
- Gas-Shielded
- 75/25 (Ar/CO₂)
- or 100% CO₂

**Typical Deposit Analysis %**
- C – 0.40
- Mn – 1.00
- Si – 0.55
- Cr – 5.00
- Mo – 1.45
- W – 1.25
- V – 0.40
- Fe – Bal.

**Typical Properties**
- Abrasion Resistance .........................Good
- Impact Resistance ............................ Good
- Machinability ................................Grinding only
- Hardness, as deposited, RC
- Nonmachinable in As-Welded
- Condition.................................Grinding only
- Good Dimensional Stability

**Typical Applications**
- Clean Out Rings
- Die Holders
- Dummy Blocks
- Extrusion Dies
- Forming Dies
- Forging Dies
- Gripper Dies
- Guide Rolls
- Header Dies
- Hot Forming Dies
- Mandrels
- Swaging Dies

**Tube-Alloy® 260-G**

Tube-Alloy 260-G is a gas-shielded, metal-cored wire that deposits a martensitic alloy steel. It is designed for use as an overlay on carbon and low alloy steels. It has very good resistance to adhesive (metal-to-metal) wear and good resistance to abrasion and impact.

**Diameter and Polarity**
- .045"
- 1/16"
- DCEP
- Gas-Shielded
- 75/25 (Ar/CO₂)
- or 100% CO₂

**Typical Deposit Analysis %**
- C – 0.70
- Mn – 2.00
- Si – 1.00
- Cr – 8.00
- Fe – Bal.

**Typical Properties**
- Abrasion Resistance .........................Good
- Impact Resistance ............................ Good
- Machinability ................................Grinding only
- Hardness: No. of Layers A36 Plate
- As Deposited ..........................55-60 RC
- Flame Cutting ..........................Difficult
- Good Resistance to softening at elevated temperatures
- Heat treatable
- Good Dimensional Stability

**Typical Applications**
- Coupling Boxes
- Dragline Chain
- Kiln Trunnions
- Mill Guides
- Spindles
- Wobbler Ends
Metal-Cored Submerged-Arc Hard Surfacing Wires

**Tube-Alloy® BU-S**

Tube-Alloy BU-S deposit is a low alloy steel composition. It can be used for build-up on mild and low alloy steel components. The weld metal has good compressive strength, making it an excellent base for surfacing.

**Diameter and Polarity**
- 3/32" 1/8" 5/32" DCEP

**Typical Deposit Analysis %**
- C – 0.12
- Mn – 1.80
- Si – 0.80
- Cr – 0.70
- Fe – Bal.

**MK-N Flux**

**Typical Properties**
- Abrasion Resistance: Fair
- Impact Resistance: Very Good
- Machinability: Excellent
- Thickness: As required

**Hardness, as deposited, Rc**
- No. of Layers 1020 1045
- 1 20 35
- 2 26 34
- 3 30 31

- Can be flame cut
- Strongly Magnetic

**Typical Applications**
- Crane Wheels
- Dredge Ladder Rolls
- Mine Car Wheels
- Spindles
- Table Rolls
- Tractor Idlers & Rollers

**Tube-Alloy® 8620-S**

Tube-Alloy 8620-S deposit is a low alloy steel composition. Its sound, tough deposit makes it an excellent choice for steel mill roll build-up.

**Diameter and Polarity**
- 3/32" 1/8" 5/32" DCEP

**Typical Deposit Analysis %**
- C – 0.17
- Mn – 0.80
- Si – 0.40
- Cr – 0.50
- Mo – 0.20
- Ni – 0.40
- Fe – Bal.

**MK-N Flux**

**Typical Properties**
- Abrasion Resistance: Fair
- Impact Resistance: Very Good
- Machinability: Excellent
- Thickness: As required

**Hardness, as deposited, Rc**
- No. of Layers 1020 Steel
- 1 12
- 2 19
- 3-8 21

- Can be flame cut
- Strongly Magnetic

**Typical Applications**
- Continuous Caster Rolls
- Table Rolls

**Tube-Alloy® 861-S**

Tube-Alloy 861-S deposit is a premium chrome-molybdenum steel composition. It can be used as build-up or overlay for steel mill roll applications. It offers superior resistance to softening in service versus mild steel deposits.

**Diameter and Polarity**
- 1/8" DCEP

**Typical Deposit Analysis %**
- C – 0.15
- Mn – 0.90
- Si – 0.50
- Cr – 1.70
- Mo – 0.60
- Fe – Bal.

**MK-N Flux**

**Typical Properties**
- Abrasion Resistance: Fair
- Impact Resistance: Fair
- Machinability: Very Good
- Thickness: As required

**Hardness, as deposited, Rc**
- No. of Layers 1020 Steel
- 1 21
- 2 28
- 3 30

- Cannot be flame cut
- Magnetic

**Typical Applications**
- Continuous Caster Rolls
- Straightener Rolls
- Table Rolls
**Metal-Cored Submerged-Arc Hard Surfacing Wires**

**Tube-Alloy® 877-S**
Tube-Alloy® 877-S deposit is a low alloy steel composition. It is a sound, tough, build-up alloy designed for use on steel mill con-cast rolls. Mechanical properties are outstanding.

**Diameter and Polarity**
- 1/8"
- 5/32"
- DCEP

**Typical Deposit Analysis %**
- C – 0.10
- Mn – 1.00
- Si – 0.60
- Cr – 1.00
- Mo – 0.40
- Ni – 1.30
- Fe – Bal.
- MK-N Flux

**Typical Properties**
- Abrasion Resistance .................Fair
- Impact Resistance ..................Very Good
- Machinability........................Excellent
- Thickness.............................As required

**Hardness, as deposited, Rc**
- No. of Layers
  - 1020 Steel
  - 1 22
  - 2 23
  - 3-8 24

**Can be flame cut**
- Strongly Magnetic

**Typical Applications**
- Continuous Caster Rolls

**Tube-Alloy® 242-S**
Tube-Alloy® 242-S deposit is a low alloy medium hardness martensitic steel. It can be used as a hard surfacing overlay where good abrasion resistance and machinability are required.

**Diameter and Polarity**
- 1/8"
- DCEP

**Typical Deposit Analysis %**
- C – 0.16
- Mn – 1.90
- Si – 0.80
- Cr – 1.60
- Mo – 0.60
- V – 0.20
- Fe – Bal.
- ESAB 50 Flux

**Typical Properties**
- Abrasion Resistance .........................Good
- Impact Resistance ...........................Good
- Machinability................................Good

**Hardness, as deposited, Rc**
- No. of Layers
  - 1020 Steel
  - 1 29
  - 2 38
  - 3 39

**Can be flame cut**
- Strongly Magnetic

**Typical Applications**
- Crane Wheels
- Tractor Idlers & Rollers

**Tube-Alloy® 242-S Mod**
Tube-Alloy® 242-S Mod deposit is a low alloy medium hardness martensitic steel. It can be used as a hard surfacing overlay where good abrasion resistance and machinability are required.

**Diameter and Polarity**
- 1/8"
- DCEP

**Typical Deposit Analysis %**
- C – 0.14
- Mn – 1.90
- Si – 0.80
- Cr – 3.00
- Mo – 0.80
- Fe – Bal.
- MK-N Flux

**Typical Properties**
- Abrasion Resistance ..........................Good
- Impact Resistance ...........................Good
- Machinability................................Good

**Hardness, as deposited, Rc**
- No. of Layers
  - 1020 Steel
  - 1 29
  - 2 38
  - 3 39

**Can be flame cut**
- Strongly Magnetic

**Typical Applications**
- Crane Wheels
- Tractor Idlers & Rollers
**Tube-Alloy® 252-S**

Tube-Alloy 252-S deposit is a low alloy medium hardness martensitic steel. It can be used as a hard surfacing overlay where maximum abrasion resistance and machinable deposits are required.

**Diameter and Polarity**

1/8”
DCEP

**Typical Deposit Analysis %**

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>Cr</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.18</td>
<td>2.10</td>
<td>0.90</td>
<td>3.50</td>
<td>Bal.</td>
</tr>
</tbody>
</table>

ESAB 50 Flux

**Typical Properties**

Abrasion Resistance .........................Good
Impact Resistance ......................... Good
Machinability..................................Fair

**Hardness, as deposited, Rc**

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>1020</th>
<th>1045</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>41</td>
<td>48</td>
</tr>
<tr>
<td>3</td>
<td>49</td>
<td>49</td>
</tr>
</tbody>
</table>

Can be flame cut
Strongly Magnetic

**Typical Applications**

- Mine Car Wheels
- Tractor idlers & Rollers

---

**Tube-Alloy® 258-S**

Tube-Alloy 258-S deposit is a premium martensitic steel alloy. It is a hard, tough H-12 tool steel composition. It can be used as an overlay on steel mill rolls where high hardness and abrasion resistance are more important than fire cracking.

**Diameter and Polarity**

3/32”
1/8”
5/32”
DCEP

**Typical Deposit Analysis %**

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>Cr</th>
<th>Mo</th>
<th>W</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.34</td>
<td>1.50</td>
<td>0.50</td>
<td>6.00</td>
<td>1.50</td>
<td>1.40</td>
<td>Bal.</td>
</tr>
</tbody>
</table>

ESAB 50 Flux

**Typical Properties**

Microstructure .........................Martensitic
Abrasion Resistance .........................Good
Impact Resistance ......................... Good
Machinability..................................Difficult with carbide tools

**Thickness..................................As required**

**Hardness, as deposited, Rc**

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>1020</th>
<th>1045</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>53</td>
</tr>
<tr>
<td>3</td>
<td>53</td>
<td>54</td>
</tr>
</tbody>
</table>

Flame cutting is difficult
Magnetic

**Typical Applications**

- Spindles
- Table Rolls

---

**Tube-Alloy® 810-S**

Tube-Alloy 810-S is a premium martensitic alloy. It is a hard, tough, H-10 type tool steel composition. It should be used on high impact applications that still require high hardness and abrasion resistance. It is a high deposition rate wire that produces sound, porosity-free, crack-free weld deposits.

**Diameter and Polarity**

3/32”
1/8”
DCEP

**Typical Deposit Analysis %**

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>Cr</th>
<th>Mo</th>
<th>W</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.28</td>
<td>1.00</td>
<td>0.70</td>
<td>5.50</td>
<td>3.50</td>
<td>Bal.</td>
<td></td>
</tr>
</tbody>
</table>

MK-N Flux

**Typical Properties**

Abrasion Resistance .........................Good
Impact Resistance ......................... Good
Machinability..................................Good with carbide tools

**Thickness..................................As required**

**Hardness, as deposited, Rc**

<table>
<thead>
<tr>
<th>No. of Layers</th>
<th>1020</th>
<th>1045</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>51</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
<td>52</td>
</tr>
<tr>
<td>3</td>
<td>52</td>
<td>53</td>
</tr>
</tbody>
</table>

Flame cutting is difficult
Magnetic

**Typical Applications**

- Table Rolls
- Cold Mill Leveler Rolls
- Plate Leveler Rolls
- Work Rolls
- Back-up Rolls
- Straightener Rolls
- Down Coiler Pinch Rolls
- Aluminum Mill Edger Rolls
- Primary Roughing Mill Rolls

---

**Metal-Cored Submerged-Arc Hard Surfacing Wires**

---
**Metal-Cored Submerged-Arc Hard Surfacing Wires**

**Tube-Alloy® A2JL-S**
Tube-Alloy A2JL-S deposit is a modified stainless steel composition. It offers good resistance to metal-to-metal wear corrosion and thermal fatigue fire cracking.

**Diameter and Polarity**
1/8”
DCEP

**Typical Deposit Analysis %**
- C – 0.04
- Mn – 0.80
- Si – 0.60
- Cr – 13.50
- Mo – 1.00
- Ni – 2.00
- Fe – Bal.

**MK-N Flux**

**Typical Properties**
- Microstructure ............... Martensitic w/controlled ferrite
- Abrasion Resistance ................. Good
- Impact Resistance .................. Good
- Machinability ................. Good with carbide tools
- Thickness .......................... As required
- Hardness, as deposited, Rc
  - No. of Layers 1020 Steel
    - 1-3 40
    - 4-8 33
- Cannot be flame cut
- Slightly Magnetic

**Typical Applications**
- Continuous Caster Rolls

---

**Tube-Alloy® 868-S**
Tube-Alloy 868-S deposit is a modified stainless steel composition. It offers moderate resistance to wear, corrosion, and the ultimate resistance to thermal fatigue fire cracking. It is a high-deposition rate wire that produces sound, porosity-free, crack-free weld deposits.

**Diameter and Polarity**
3/32”
1/8”
5/32”
DCEP

**Typical Deposit Analysis %**
- C – 0.04
- Mn – 0.80
- Si – 0.60
- Cr – 13.50
- Mo – 1.00
- Ni – 4.50
- Fe – Bal.

**MK-N Flux**

**Typical Properties**
- Abrasion Resistance ................. Good
- Impact Resistance .................. Very Good
- Machinability ................. Good with carbide tools
- Thickness .......................... As required
- Cannot be flame cut
- Slightly magnetic
- Maintains hot hardness to 1400°F

**No. of Layers 1020 Steel**
- 1-3 38 Rc
- 4-8 34 Rc

**Typical Applications**
- Continuous Caster Rolls

---

**Tube-Alloy® 887-S**
Tube-Alloy 887-S is a premium martensitic stainless steel alloy. It is a hard, tough composition that offers good resistance to metal-to-metal wear, corrosion and thermal fatigue.

**Diameter and Polarity**
3/32”
1/8”
DCEP

**Typical Deposit Analysis %**
- C – 0.14
- Mn – 0.88
- Si – 0.55
- Cr – 12.50
- V – 0.23
- Ni – 3.13
- Mo – 1.50
- Nb – 0.18

**MK-N Flux**

**Typical Properties**
- Microstructure ............... Martensitic
- Abrasion Resistance ................. Good
- Impact Resistance .................. Good
- Machinability ...................... Fair
- Thickness .......................... As required
- Cannot be flame cut
- Magnetic

**No. of Layers 1020 Steel**
- 1 32
- 2 38
- 3 40

**Typical Applications**
- Continuous Caster Rolls
**Metal-Cored Submerged-Arc Hard Surfacing Wires**

**Tube-Alloy® A250-S**
Tube-Alloy A250-S deposit is a modified 420 stainless steel composition. It offers good resistance to fire cracking and corrosion frequently encountered by steel mill rolls.

**Diameter and Polarity**
- 3/32”
- 1/8”
- 5/32”
- DCEP

**Typical Deposit Analysis %**
- C – 0.19
- Mn – 1.00
- Si – 0.50
- Cr – 12.30
- Fe – Bal.
- MK-N Flux

**Typical Properties**
- Microstructure: Martensitic
- Abrasion Resistance: Good
- Impact Resistance: Good
- Machinability: Good with carbide tools
- Thickness: As required
- Hardness, as deposited, Rc

<table>
<thead>
<tr>
<th>Layers</th>
<th>Steel</th>
<th>1020</th>
<th>1045</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>44</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>46</td>
<td>46</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>46</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

Cannot be flame cut
Slightly Magnetic

**Typical Applications**
- Continuous Caster Rolls
- Table Rolls

**Tube-Alloy® A420M-S**
Tube-Alloy A420M-S deposit is a modified high carbon 420 stainless steel composition. It offers higher hardness than standard 420 stainless steel deposits, resulting in longer roll life where thermal fatigue is not the prime consideration.

**Diameter and Polarity**
- 3/32”
- 1/8”
- 5/32”
- DCEP

**Typical Deposit Analysis %**
- C – 0.24
- Mn – 1.60
- Si – 0.70
- Cr – 14.70
- Fe – Bal.
- MK-N Flux

**Typical Properties**
- Microstructure: Martensitic
- Abrasion Resistance: Very Good
- Impact Resistance: Fair
- Machinability: Fair with carbide tools
- Thickness: As required
- Hardness, as deposited, Rc

<table>
<thead>
<tr>
<th>Layers</th>
<th>Steel</th>
<th>1020</th>
<th>1045</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46</td>
<td>46</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>49</td>
<td>53</td>
<td>52</td>
</tr>
<tr>
<td>3-8</td>
<td>53</td>
<td>56</td>
<td></td>
</tr>
</tbody>
</table>

Cannot be flame cut
Slightly Magnetic

**Typical Applications**
- Back-Up Rolls
- Continuous Caster Rolls
- Plate Leveler Rolls
- Straightener Rolls

**Tube-Alloy® 865-S Mod**
Tube-Alloy 865-S Mod deposit is a modified stainless steel composition. It offers good resistance to metal-to-metal wear, corrosion and the ultimate resistance to thermal fatigue fire cracking frequently encountered by steel mill rolls.

**Diameter and Polarity**
- 3/32”
- 1/8”
- DCEP

**Typical Deposit Analysis %**
- C – 0.18
- Mn – 1.10
- Si – 0.40
- Cr – 13.50
- Mo – 1.00
- Ni – 2.70
- V – 0.20
- Nb – 0.20
- Fe – Bal.
- MK-N Flux

**Typical Properties**
- Microstructure: Martensitic
- Abrasion Resistance: Very Good
- Impact Resistance: Good
- Machinability: Fair with carbide tools
- Thickness: As required
- Hardness, as deposited, Rc

<table>
<thead>
<tr>
<th>Layers</th>
<th>Steel</th>
<th>1020</th>
<th>1045</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>45</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>46</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>3-8</td>
<td>45</td>
<td>53</td>
<td>48</td>
</tr>
</tbody>
</table>

Cannot be flame cut
Magnetic

**Typical Applications**
- Continuous Caster Rolls

**Tube-Alloy® 865-S Mod**
Tube-Alloy 865-S Mod deposit is a modified stainless steel composition. It offers good resistance to metal-to-metal wear, corrosion and the ultimate resistance to thermal fatigue fire cracking frequently encountered by steel mill rolls.

**Diameter and Polarity**
- 3/32”
- 1/8”
- DCEP

**Typical Deposit Analysis %**
- C – 0.18
- Mn – 1.10
- Si – 0.40
- Cr – 13.50
- Mo – 1.00
- Ni – 2.70
- V – 0.20
- Nb – 0.20
- Fe – Bal.
- MK-N Flux

**Typical Properties**
- Microstructure: Martensitic
- Abrasion Resistance: Very Good
- Impact Resistance: Good
- Machinability: Fair with carbide tools
- Thickness: As required
- Hardness, as deposited, Rc

<table>
<thead>
<tr>
<th>Layers</th>
<th>Steel</th>
<th>1020</th>
<th>1045</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>45</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>46</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>3-8</td>
<td>45</td>
<td>53</td>
<td>48</td>
</tr>
</tbody>
</table>

Cannot be flame cut
Magnetic

**Typical Applications**
- Continuous Caster Rolls
**Metal-Cored Submerged-Arc Hard Surfacing Wires**

**Tube-Alloy® 952-S**
Tube-Alloy 952-S is a premium modified high carbon martensitic stainless steel that produces higher hardnesses than standard 420 types. It offers excellent toughness for higher impact applications along with good resistance to abrasive wear. This alloy can be used in higher temperature applications (up to 1050°F). It should not be used where thermal fatigue fire cracking is the prime consideration. It is a high-deposition rate wire that produces sound, porosity-free, crack-free weld deposits.

**Diameter and Polarity**
- 3/32"
- 1/8"
- DCEP

**Typical Deposit Analysis %**
- C – 0.27
- Mn – 1.20
- Si – 0.60
- Cr – 12.80
- W – 1.40
- Mo – 1.80
- Ni – 0.60
- V – 0.19
- Nb – 0.18
- Fe – Bal.

**Typical Properties**
- Microstructure: Martensitic
- Abrasion Resistance: Good
- Impact Resistance: Good
- Machinability: Good with carbide tools
- Thickness: As required

**Hardness, as deposited, Rc**
- No. of Layers: 1020 1045
- Steel: 40 44
- 45 49
- 49 49

**Magnetic:** Flame cutting is difficult

**Typical Applications**
- Straightener Rolls
- Plate Leveler Rolls
- Edger Rolls
- Descale Rolls
- Back-up Rolls
- Aluminum Caster Rolls Cores

**Tube-Alloy® 954-S**
Tube-Alloy 954-S is a premium high carbon martensitic tool steel that contains primary and secondary niobium carbides. It is designed to surface low, medium and high carbon steel components subject to moderate impact, abrasive wear and high temperatures (up to 950°F). It is a high-deposition rate wire that produces sound, porosity-free, crack-free weld deposits.

**Diameter and Polarity**
- 1/8"
- DCEP

**Typical Deposit Analysis %**
- C – 0.65
- Mn – 1.25
- Si – 1.10
- Cr – 5.50
- Mo – 1.00
- Nb – 3.45
- Fe – Bal.

**Typical Properties**
- Abrasion resistance: Very Good
- Impact resistance: Good
- Machinability: Good with carbide tools
- Thickness: As required
- Corrosion Resistance: Good
- Cannot be flame cut

**Hardness, as deposited, Rc**
- No. of Layers: 1020 1045
- Steel: 45 RC 48 RC
- 48 RC 48 RC
- 52 RC 52 RC

**Magnetic:**

**Typical Applications**
- Pinch Rolls
- Scale Breaker Rolls
- Damming Rolls
- Wrapper Rolls
- Looper Rolls
- Cold Mill Pulling Rolls
- Leveler Rolls
- Straightener Rolls
**Hard Surfacing Wires and Flux**

**Special Alloy Wires and Flux**

**GP-O**
McKay GP-O is a multipurpose wire recommended for joining dissimilar metals and hard to weld steels. It can be used for any high-strength application where wear, impact, heat and corrosion resistant properties are required.

**Diameter and Polarity**
1/16”
DCEP

**Typical Deposit Analysis %**
- C – 0.06
- Mn – 1.00
- Si – 0.50
- Cr – 26.50
- Ni – 9.00
- Fe – Bal.

**Typical Properties**
- Tensile Strength ............. 120,000 psi
- Yield Strength ............... 90,000 psi
- Elongation in 2” .............. 27%
- Machinability ................. Good
- Thickness .................. As required
- Cannot be flame cut
- Nonmagnetic

**Typical Applications**
- Welding Attachments to Manganese Castings
- Welding Grouser Bars to Grousers
- Welding T-1 Steel Lips to Manganese Buckets

**HF-N**
HF-N is a submerged arc flux designed for use with solid and tubular wires of the 400 series. It can also be used with low alloy wires. It has excellent recovery of alloying elements of the tubular wires, such as Cr, Ni, Mo, Nb, and V. HF-N has excellent hot slag removal and can be used when welding with twin-arc and oscillating technique. The weld beads are smooth and uniform and the weld metal has good wetting action.
**TECHNICAL SECTION**

**Hard Surfacing Wire Alloy Classification**

**Austenitic Alloys**

Austenitic alloys are extremely tough, ductile and work-hardenable. They offer excellent impact resistance and fair abrasion resistance (which improves as it work-hardens). These alloys will normally work-harden to a surface hardness up to 50 HRC and still retain their good impact resistance.

**Martensitic Alloys**

Martensite is formed in steels by rapid cooling rates. Most of the hard surfacing alloys are air hardenable and heat treatable. They provide a good balance of impact and abrasion resistance. Martensitic alloys also have relatively high compression strength and excellent metal-to-metal wear resistance.

**Carbide Alloys**

Carbide alloys are very much like asphalt. There are carbides (gravel) and matrix (tar). The carbides are what give the excellent abrasion resistance while the matrix (tar) holds the carbides in place and offers some impact resistance. Carbides are extremely hard and brittle. They cannot handle impact. The more carbides there are the higher the abrasion resistance but the lower the impact resistance.

---

**Hard Surfacing Wire/Stick Electrode Equivalent**

<table>
<thead>
<tr>
<th>Open-Arc Wire</th>
<th>Flux-Cored</th>
<th>Gas-Shielded Wire</th>
<th>Metal-Cored</th>
<th>Stick Electrode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube-Alloy 218-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Hardalloy 118</td>
</tr>
<tr>
<td>Tube-Alloy AP-O</td>
<td>—</td>
<td>VertiWear AP</td>
<td>—</td>
<td>Chrome-Mang</td>
</tr>
<tr>
<td>Tube-Alloy Build Up-O</td>
<td>—</td>
<td>—</td>
<td>Tube-Alloy Build Up-G</td>
<td>Hardalloy 32</td>
</tr>
<tr>
<td>Tube-Alloy 258-O/ArmorWear</td>
<td>—</td>
<td>VertiWear 600</td>
<td>—</td>
<td>Hardalloy 58</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>Tube-Alloy 260-G</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tube-Alloy 240-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Hardalloy 540</td>
</tr>
<tr>
<td>Tube-Alloy 255-O</td>
<td>—</td>
<td>—</td>
<td>Tube-Alloy 255-G</td>
<td>Hardalloy 555</td>
</tr>
<tr>
<td>Tube-Alloy 219-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Hardalloy 119</td>
</tr>
<tr>
<td>Tube-Alloy 242-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Hardalloy M-932</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>Hardalloy 48</td>
<td>Hardalloy 60 Tic</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>Hardalloy 61</td>
<td>—</td>
</tr>
<tr>
<td>Tube-Alloy 258 TiC-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Hardalloy 65</td>
</tr>
<tr>
<td>Tube-Alloy A43-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tube-Alloy A45-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tube-Alloy 218 TiC-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tube-Alloy 244-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

---

**Photomicrograph of austenite.**

**Photomicrograph of martensite.**

**Photomicrograph of large carbides in a carbide eutectic matrix.**
### General Operating Parameters of Tube-Alloy G Flux-Cored Gas-Shielded Surfacing Wires

<table>
<thead>
<tr>
<th>Diameter</th>
<th>.045&quot;</th>
<th>1/16&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use 1/2&quot; to 1&quot; wire stickout DC (electrode positive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amps</td>
<td>Volts</td>
<td>Amps</td>
</tr>
<tr>
<td>120-160</td>
<td>19-23</td>
<td>225-275</td>
</tr>
<tr>
<td>160-190</td>
<td>24-25</td>
<td>275-350</td>
</tr>
<tr>
<td>190-230</td>
<td>26-27</td>
<td>350-400</td>
</tr>
</tbody>
</table>

### Typical Deposition Rates of Tube-Alloy G Flux-Cored Gas-Shielded Surfacing Wires

<table>
<thead>
<tr>
<th>Diameter</th>
<th>.045&quot;</th>
<th>1/16&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use 1/2&quot; to 1&quot; wire stickout DC (electrode positive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amps</td>
<td>Lb/Hr</td>
<td>Amps</td>
</tr>
<tr>
<td>130</td>
<td>4</td>
<td>220</td>
</tr>
<tr>
<td>180</td>
<td>7</td>
<td>250</td>
</tr>
<tr>
<td>220</td>
<td>10</td>
<td>300</td>
</tr>
</tbody>
</table>

### General Operating Parameters of Tube-Alloy O Flux-Cored Open-Arc Surfacing Wires

<table>
<thead>
<tr>
<th>Diameter</th>
<th>.045&quot;</th>
<th>1/16&quot;</th>
<th>7/64&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use 1/2&quot; to 1&quot; wire stickout DC (electrode positive)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amps</td>
<td>Volts</td>
<td>Amps</td>
<td>Volts</td>
</tr>
<tr>
<td>120-160</td>
<td>19-23</td>
<td>225-275</td>
<td>23-25</td>
</tr>
<tr>
<td>160-190</td>
<td>24-25</td>
<td>275-350</td>
<td>24-27</td>
</tr>
<tr>
<td>190-230</td>
<td>26-27</td>
<td>350-400</td>
<td>26-29</td>
</tr>
</tbody>
</table>

With slight weave and 7 ipm travel speed average bead height will be 1/8" and width 3/8".

### Typical Deposition Rates of Tube-Alloy O Flux-Cored Open-Arc Surfacing Wires

<table>
<thead>
<tr>
<th>Diameter</th>
<th>.045&quot;</th>
<th>1/16&quot;</th>
<th>7/64&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amps</td>
<td>Lb/Hr</td>
<td>Amps</td>
<td>Lb/Hr</td>
</tr>
<tr>
<td>130</td>
<td>4</td>
<td>220</td>
<td>6</td>
</tr>
<tr>
<td>180</td>
<td>7</td>
<td>250</td>
<td>10</td>
</tr>
<tr>
<td>220</td>
<td>10</td>
<td>300</td>
<td>14</td>
</tr>
</tbody>
</table>

### General Operating Parameters of Tube-Alloy S Metal-Cored Submerged-Arc Surfacing Wires

<table>
<thead>
<tr>
<th>Diameter</th>
<th>3/32&quot; (2.4 mm)</th>
<th>1/8&quot; (3.2 mm)</th>
<th>5/32&quot; (4.0 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use 1&quot; to 1-1/4&quot; wire stickout. Travel speed of 12&quot; - 16&quot; (305 - 406 mm) per minute.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amps</td>
<td>Volts</td>
<td>Lb/Hr</td>
<td>Amps</td>
</tr>
</tbody>
</table>
### Comparative Index of Flux-Cored Open-Arc Hard Surfacing Wires

<table>
<thead>
<tr>
<th>McKay</th>
<th>Certanium</th>
<th>Eutectic</th>
<th>Lincoln</th>
<th>Stoody</th>
<th>Welding Alloys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube-Alloy AP-O</td>
<td>282 FC</td>
<td>3005-A, 3302</td>
<td>15CrMn</td>
<td>110</td>
<td>19/9/6-O, AP-O</td>
</tr>
<tr>
<td>Tube-Alloy Build Up-O</td>
<td>283 FC</td>
<td>3110, 3010-A</td>
<td>BU, 33</td>
<td>Build-Up</td>
<td>T-O</td>
</tr>
<tr>
<td>Tube-Alloy 218 TIC-O</td>
<td>285 FC</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tube-Alloy 219-O</td>
<td>282 FC</td>
<td>—</td>
<td>—</td>
<td>120, Trakwear, Nicro-Mang Plus</td>
<td>—</td>
</tr>
<tr>
<td>Tube-Alloy 240-O</td>
<td>284 FC</td>
<td>4025-A</td>
<td>50</td>
<td>12, 5A/53, 131, 133, 134</td>
<td>MC-O, HC333-O/G</td>
</tr>
<tr>
<td>Tube-Alloy 242-O</td>
<td>—</td>
<td>—</td>
<td>40-O</td>
<td>Super Build-Up, Rail End 932</td>
<td>P-O, R-O</td>
</tr>
<tr>
<td>Tube-Alloy 244-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>117</td>
<td>—</td>
</tr>
<tr>
<td>Tube-Alloy 255-O</td>
<td>247 FC</td>
<td>4601-A</td>
<td>60-O</td>
<td>100HC, 101HC, 101HD, 100XHP</td>
<td>HC2-O, HC3-O, HC333-O/G</td>
</tr>
<tr>
<td>Tube-Alloy 258-O/</td>
<td>281 FC</td>
<td>4415</td>
<td>55, T&amp;D</td>
<td>102, 965-O</td>
<td>R-O, W-O, L-O</td>
</tr>
<tr>
<td>ArmorWear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 258 TIC-O</td>
<td>246 FC</td>
<td>—</td>
<td>—</td>
<td>600</td>
<td>TiC-O</td>
</tr>
<tr>
<td>Tube-Alloy A43-O</td>
<td>—</td>
<td>—</td>
<td>5A/Super-20</td>
<td>CN-O, CN2-O</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy A45-O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>145, 143</td>
<td>CNV-O, CNV2-O</td>
</tr>
<tr>
<td>GP-O</td>
<td>706 FC</td>
<td>690</td>
<td>—</td>
<td>Versalloy, GP-O</td>
<td></td>
</tr>
</tbody>
</table>

### Comparative Index of Flux-Cored Gas-Shielded Hard Surfacing Wires

<table>
<thead>
<tr>
<th>McKay</th>
<th>Certanium</th>
<th>Lincoln</th>
<th>Hobart</th>
<th>Stoody</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube-Alloy Build Up-G</td>
<td>283 FC</td>
<td>—</td>
<td>FabTuf 250</td>
<td>Build-Up AP-G</td>
</tr>
<tr>
<td>Tube-Alloy 255-G</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tube-Alloy 258-G</td>
<td>—</td>
<td>—</td>
<td>T&amp;D</td>
<td>—</td>
</tr>
<tr>
<td>VertiWear 600</td>
<td>—</td>
<td>—</td>
<td>55</td>
<td>FabTuf 960</td>
</tr>
<tr>
<td>Tube-Alloy 260-G</td>
<td>—</td>
<td>—</td>
<td>55</td>
<td>FabTuf 960</td>
</tr>
<tr>
<td>VertiWear AP</td>
<td>—</td>
<td>15CrMn</td>
<td>—</td>
<td>110</td>
</tr>
</tbody>
</table>

For other product comparisons please go to our Hard Surfacing Product Cross-Reference Guide at www.hobartbrothers.com
**TECHNICAL SECTION**

**Suggested McKay Tubular Wire Per Industry Application**

### Dredging Industry

<table>
<thead>
<tr>
<th>Application Build-Up</th>
<th>Overlay</th>
<th>McKay Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredge Bucket Lips</td>
<td></td>
<td>240-O, 255-O, 255-G</td>
</tr>
<tr>
<td>Dredge Cutter Heads &amp; Teeth</td>
<td>AP-O, AP</td>
<td>255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Dredge Pump Casings</td>
<td>218-O</td>
<td>—</td>
</tr>
<tr>
<td>Dredge Inlet Nozzle</td>
<td></td>
<td>255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Dredge Ladder Rolls</td>
<td>BU-O, BU-G, BU-S</td>
<td>—</td>
</tr>
<tr>
<td>Dredge Pump Impellers</td>
<td></td>
<td>244-O, 240-O</td>
</tr>
<tr>
<td>Pipeline Ball Joints</td>
<td>244-O, 240-O, 255-O, 255-G, A43-O</td>
<td></td>
</tr>
<tr>
<td>Pump Shells (Carbon Steel)</td>
<td></td>
<td>244-O</td>
</tr>
<tr>
<td>Pump Shells (Manganese)</td>
<td>244-O, 240-O, 255-O, 255-G</td>
<td></td>
</tr>
</tbody>
</table>

### Heavy Equipment/Mining Industries

<table>
<thead>
<tr>
<th>Application Build-Up</th>
<th>Overlay</th>
<th>McKay Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augers</td>
<td></td>
<td>240-O, 255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Bulldozer Blades</td>
<td></td>
<td>240-O, 255-O, 255-G</td>
</tr>
<tr>
<td>Bulldozer End Bits</td>
<td></td>
<td>240-O, 255-O, 255-G</td>
</tr>
<tr>
<td>Crane Wheels BU-O, BU-G, BU-S</td>
<td>242-O, 242-S</td>
<td></td>
</tr>
<tr>
<td>Mine Car Wheels BU-O, BU-G, BU-S</td>
<td>242-S, 252-S</td>
<td></td>
</tr>
<tr>
<td>Ore/Coal Chutes</td>
<td></td>
<td>255-O, 255-G</td>
</tr>
<tr>
<td>Paving Agitator Screws</td>
<td></td>
<td>258-TIC-O, A43-O</td>
</tr>
<tr>
<td>Road Rippers</td>
<td></td>
<td>255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Scraper Blades</td>
<td></td>
<td>240-O, 255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Sheepfoot Tamper</td>
<td></td>
<td>240-O, 255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Steel Shafts BU-O, BU-G</td>
<td>242-O</td>
<td></td>
</tr>
<tr>
<td>Tractor Idlers/Rollers</td>
<td>BU-S, 242-S, 252-S</td>
<td></td>
</tr>
</tbody>
</table>

### Crushing/Quarry Industries

<table>
<thead>
<tr>
<th>Application Build-Up</th>
<th>Overlay</th>
<th>McKay Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bucket Teeth (Manganese Steel) 218-O, AP-O, AP</td>
<td>240-O, 255-O, 255-G, A43-O</td>
<td></td>
</tr>
<tr>
<td>Bulldozer End Bits</td>
<td></td>
<td>240-O, 255-O, 255-G</td>
</tr>
<tr>
<td>Cement Chutes</td>
<td></td>
<td>255-O, 255-G</td>
</tr>
<tr>
<td>Conveyor Screws</td>
<td></td>
<td>240-O, 255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Crusher Rolls</td>
<td></td>
<td>240-O</td>
</tr>
<tr>
<td>Gear Teeth BU-O, BU-G</td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>Gantry Cranes/Tubular Masts</td>
<td>218-O, AP-O, AP</td>
<td>218-TIC-O, 255-O, 255-G</td>
</tr>
<tr>
<td>Hammer Mill Hammers</td>
<td>218-O, AP-O, AP</td>
<td>218-TIC-O, 240-O</td>
</tr>
<tr>
<td>Impactor Crusher Bars</td>
<td>218-O, AP-O, AP</td>
<td>218-TIC-O, 240-O</td>
</tr>
<tr>
<td>Klin Trunnions BU-O, BU-G</td>
<td>258-O, 258-G, 258-S</td>
<td></td>
</tr>
<tr>
<td>Muller Rolls AP-O, AP</td>
<td>240-O, 255-O, 255-G, A43-O</td>
<td></td>
</tr>
<tr>
<td>Pulverizer Hammers</td>
<td>AP-O, AP</td>
<td>240-O</td>
</tr>
<tr>
<td>Sizing Screens</td>
<td>AP-O, AP</td>
<td>240-O, 255-Q255-G, A43-O</td>
</tr>
<tr>
<td>Steel Shafts BU-O, BU-G</td>
<td>242-O</td>
<td></td>
</tr>
</tbody>
</table>

### Iron & Steel Industry

<table>
<thead>
<tr>
<th>Application Build-Up</th>
<th>Overlay</th>
<th>McKay Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast Furnace Bell's Burden Area</td>
<td>—</td>
<td>A45-0</td>
</tr>
<tr>
<td>Coke Chutes</td>
<td></td>
<td>255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Coke Pusher Shoes</td>
<td></td>
<td>255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Con Eater Rolls 8620-S, 861-S</td>
<td>A250-S, 865-S Mod</td>
<td></td>
</tr>
<tr>
<td>Coupling Boxes BU-O, BU-G</td>
<td>258-O, 258-G, VertiWear 600</td>
<td></td>
</tr>
<tr>
<td>Crane Wheels BU-O, BU-G, BU-S</td>
<td>242-S</td>
<td></td>
</tr>
<tr>
<td>Gear Teeth BU-O, BU-G</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Grizzly Bars &amp; Fingers AP-O, AP</td>
<td>255-O, 255-G, A43-O</td>
<td></td>
</tr>
<tr>
<td>Mill Guides</td>
<td></td>
<td>258-O, 258-G, 240-O</td>
</tr>
<tr>
<td>Screw Conveyors</td>
<td></td>
<td>240-O, 255-O, 255-G</td>
</tr>
<tr>
<td>Sheets in Blast Furance Bell</td>
<td>A45-O</td>
<td></td>
</tr>
<tr>
<td>Sinter Broker Bars</td>
<td></td>
<td>A45-O</td>
</tr>
<tr>
<td>Sinter Plant Parts</td>
<td></td>
<td>A45-O</td>
</tr>
<tr>
<td>Spindles BU-O, BU-G, BU-S</td>
<td>258-O, 258-G, 258-S</td>
<td></td>
</tr>
<tr>
<td>Steel Shafts BU-O, BU-G</td>
<td>242-O</td>
<td></td>
</tr>
<tr>
<td>Straightener Rolls 861-S</td>
<td>A420M-S</td>
<td></td>
</tr>
<tr>
<td>Table Rolls BU-S, 8620-S, 861-S</td>
<td>A250-S, 258-S</td>
<td></td>
</tr>
<tr>
<td>Wobbler Ends BU-O, BU-G</td>
<td>258-O, 258-G</td>
<td></td>
</tr>
</tbody>
</table>

### Agriculture

<table>
<thead>
<tr>
<th>Application Build-Up</th>
<th>Overlay</th>
<th>McKay Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia Knives</td>
<td></td>
<td>240-O, 255-O, 255-G</td>
</tr>
<tr>
<td>Cultivator Chisels &amp; Sweeps</td>
<td>240-O, 255-O, 255-G</td>
<td></td>
</tr>
<tr>
<td>Mill Hammers</td>
<td></td>
<td>258-TIC-O</td>
</tr>
<tr>
<td>Ripper Shanks</td>
<td></td>
<td>255-O, 255-G</td>
</tr>
<tr>
<td>Steel Shafts</td>
<td></td>
<td>242-O</td>
</tr>
<tr>
<td>Subsoiler Teeth</td>
<td></td>
<td>255-O, 255-G</td>
</tr>
</tbody>
</table>

### Railroad Industry

<table>
<thead>
<tr>
<th>Application Build-Up</th>
<th>Overlay</th>
<th>McKay Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossovers (Low Alloy Steel)</td>
<td>242-O</td>
<td></td>
</tr>
<tr>
<td>Crossovers (Manganese Steel) 218-O, 219-O, AP-O, AP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frogs (Carbon Steel)</td>
<td>242-O</td>
<td></td>
</tr>
<tr>
<td>Frogs (Manganese Steel) 218-O, 219-O, AP-O, AP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail Ends (Low Alloy Steel)</td>
<td>242-O</td>
<td></td>
</tr>
<tr>
<td>Switch Points (Low Alloy Steel)</td>
<td>242-O</td>
<td></td>
</tr>
</tbody>
</table>

### Power Generation Industry

<table>
<thead>
<tr>
<th>Application Build-Up</th>
<th>Overlay</th>
<th>McKay Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Feeder Screws</td>
<td></td>
<td>255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Coal Pulverizer Hammers</td>
<td>255-O, 255-G</td>
<td></td>
</tr>
<tr>
<td>Coal Pulverizer Rolls</td>
<td></td>
<td>255-O, 255-G, A43-O</td>
</tr>
<tr>
<td>Coal Pulverizer Table</td>
<td>255-O, 255-G, A43-O</td>
<td></td>
</tr>
<tr>
<td>Fan Blades 255-O, 255-G, A43-O, A45-0</td>
<td>A45-0</td>
<td></td>
</tr>
<tr>
<td>Hydroelectric Turbines AP-O, AP</td>
<td>242-O</td>
<td></td>
</tr>
</tbody>
</table>

**BU = Build-Up**
TECHNICAL SECTION

Metal-to-Metal Wear Resistance

<table>
<thead>
<tr>
<th>McKay Type</th>
<th>Hardness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube-Alloy Build Up-O</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy Build Up-G</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 242-O</td>
<td></td>
</tr>
<tr>
<td>VertiWear 600</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 258-O/ArmorWear</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 260-G</td>
<td></td>
</tr>
<tr>
<td>ArmorWear</td>
<td></td>
</tr>
<tr>
<td>Tube-Alloy 258-G</td>
<td></td>
</tr>
</tbody>
</table>

Packaging Options

Hard Surfacing Wires

25 lb Plastic Spool

25 lb Spool

60 lb Coil

100 lb Auto-Pak

250 lb Auto-Pak

500 lb Auto-Pak
### Tensile Strength to Hardness Conversion Chart

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>898</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>440</td>
</tr>
<tr>
<td>857</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>420</td>
</tr>
<tr>
<td>817</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>401</td>
</tr>
<tr>
<td>780</td>
<td>1150</td>
<td>70</td>
<td>-</td>
<td>384</td>
</tr>
<tr>
<td>745</td>
<td>1050</td>
<td>68</td>
<td>-</td>
<td>368</td>
</tr>
<tr>
<td>712</td>
<td>960</td>
<td>66</td>
<td>-</td>
<td>352</td>
</tr>
<tr>
<td>682</td>
<td>885</td>
<td>64</td>
<td>-</td>
<td>337</td>
</tr>
<tr>
<td>653</td>
<td>820</td>
<td>62</td>
<td>-</td>
<td>324</td>
</tr>
<tr>
<td>627</td>
<td>765</td>
<td>60</td>
<td>-</td>
<td>311</td>
</tr>
<tr>
<td>601</td>
<td>717</td>
<td>58</td>
<td>-</td>
<td>298</td>
</tr>
<tr>
<td>578</td>
<td>675</td>
<td>57</td>
<td>-</td>
<td>287</td>
</tr>
<tr>
<td>555</td>
<td>633</td>
<td>55</td>
<td>120</td>
<td>276</td>
</tr>
<tr>
<td>534</td>
<td>598</td>
<td>53</td>
<td>119</td>
<td>266</td>
</tr>
<tr>
<td>514</td>
<td>567</td>
<td>52</td>
<td>119</td>
<td>256</td>
</tr>
<tr>
<td>495</td>
<td>540</td>
<td>50</td>
<td>117</td>
<td>247</td>
</tr>
<tr>
<td>477</td>
<td>515</td>
<td>49</td>
<td>117</td>
<td>238</td>
</tr>
<tr>
<td>461</td>
<td>494</td>
<td>47</td>
<td>116</td>
<td>229</td>
</tr>
<tr>
<td>444</td>
<td>472</td>
<td>46</td>
<td>115</td>
<td>220</td>
</tr>
<tr>
<td>429</td>
<td>454</td>
<td>45</td>
<td>115</td>
<td>212</td>
</tr>
<tr>
<td>415</td>
<td>437</td>
<td>44</td>
<td>114</td>
<td>204</td>
</tr>
<tr>
<td>401</td>
<td>420</td>
<td>42</td>
<td>113</td>
<td>196</td>
</tr>
<tr>
<td>388</td>
<td>404</td>
<td>41</td>
<td>112</td>
<td>189</td>
</tr>
<tr>
<td>375</td>
<td>389</td>
<td>40</td>
<td>112</td>
<td>182</td>
</tr>
<tr>
<td>363</td>
<td>375</td>
<td>38</td>
<td>110</td>
<td>176</td>
</tr>
<tr>
<td>352</td>
<td>363</td>
<td>37</td>
<td>110</td>
<td>170</td>
</tr>
<tr>
<td>341</td>
<td>350</td>
<td>36</td>
<td>109</td>
<td>165</td>
</tr>
<tr>
<td>331</td>
<td>339</td>
<td>35</td>
<td>109</td>
<td>160</td>
</tr>
<tr>
<td>321</td>
<td>327</td>
<td>34</td>
<td>108</td>
<td>155</td>
</tr>
<tr>
<td>311</td>
<td>316</td>
<td>33</td>
<td>108</td>
<td>150</td>
</tr>
<tr>
<td>302</td>
<td>305</td>
<td>32</td>
<td>107</td>
<td>145</td>
</tr>
<tr>
<td>293</td>
<td>296</td>
<td>31</td>
<td>106</td>
<td>142</td>
</tr>
<tr>
<td>285</td>
<td>287</td>
<td>30</td>
<td>105</td>
<td>138</td>
</tr>
<tr>
<td>277</td>
<td>279</td>
<td>29</td>
<td>104</td>
<td>134</td>
</tr>
<tr>
<td>269</td>
<td>270</td>
<td>28</td>
<td>104</td>
<td>131</td>
</tr>
<tr>
<td>262</td>
<td>263</td>
<td>26</td>
<td>103</td>
<td>128</td>
</tr>
<tr>
<td>255</td>
<td>256</td>
<td>25</td>
<td>102</td>
<td>125</td>
</tr>
<tr>
<td>248</td>
<td>248</td>
<td>24</td>
<td>102</td>
<td>122</td>
</tr>
<tr>
<td>241</td>
<td>241</td>
<td>23</td>
<td>100</td>
<td>119</td>
</tr>
<tr>
<td>235</td>
<td>235</td>
<td>22</td>
<td>99</td>
<td>116</td>
</tr>
<tr>
<td>229</td>
<td>229</td>
<td>21</td>
<td>98</td>
<td>113</td>
</tr>
<tr>
<td>223</td>
<td>223</td>
<td>20</td>
<td>97</td>
<td>110</td>
</tr>
<tr>
<td>217</td>
<td>217</td>
<td>18</td>
<td>96</td>
<td>107</td>
</tr>
<tr>
<td>212</td>
<td>212</td>
<td>17</td>
<td>96</td>
<td>104</td>
</tr>
<tr>
<td>207</td>
<td>207</td>
<td>16</td>
<td>95</td>
<td>101</td>
</tr>
<tr>
<td>202</td>
<td>202</td>
<td>15</td>
<td>94</td>
<td>99</td>
</tr>
<tr>
<td>197</td>
<td>197</td>
<td>13</td>
<td>93</td>
<td>97</td>
</tr>
<tr>
<td>192</td>
<td>192</td>
<td>12</td>
<td>92</td>
<td>95</td>
</tr>
<tr>
<td>187</td>
<td>187</td>
<td>10</td>
<td>91</td>
<td>93</td>
</tr>
<tr>
<td>183</td>
<td>183</td>
<td>9</td>
<td>90</td>
<td>91</td>
</tr>
<tr>
<td>179</td>
<td>179</td>
<td>8</td>
<td>89</td>
<td>89</td>
</tr>
<tr>
<td>174</td>
<td>174</td>
<td>7</td>
<td>88</td>
<td>87</td>
</tr>
<tr>
<td>170</td>
<td>170</td>
<td>6</td>
<td>87</td>
<td>85</td>
</tr>
<tr>
<td>166</td>
<td>166</td>
<td>4</td>
<td>86</td>
<td>83</td>
</tr>
<tr>
<td>163</td>
<td>163</td>
<td>3</td>
<td>85</td>
<td>82</td>
</tr>
<tr>
<td>159</td>
<td>159</td>
<td>2</td>
<td>84</td>
<td>80</td>
</tr>
<tr>
<td>156</td>
<td>156</td>
<td>1</td>
<td>83</td>
<td>78</td>
</tr>
<tr>
<td>153</td>
<td>153</td>
<td>-</td>
<td>82</td>
<td>76</td>
</tr>
<tr>
<td>149</td>
<td>149</td>
<td>-</td>
<td>81</td>
<td>75</td>
</tr>
<tr>
<td>146</td>
<td>146</td>
<td>-</td>
<td>80</td>
<td>74</td>
</tr>
<tr>
<td>143</td>
<td>143</td>
<td>-</td>
<td>79</td>
<td>72</td>
</tr>
<tr>
<td>140</td>
<td>140</td>
<td>-</td>
<td>78</td>
<td>71</td>
</tr>
<tr>
<td>137</td>
<td>137</td>
<td>-</td>
<td>77</td>
<td>70</td>
</tr>
<tr>
<td>134</td>
<td>134</td>
<td>-</td>
<td>76</td>
<td>68</td>
</tr>
<tr>
<td>131</td>
<td>131</td>
<td>-</td>
<td>74</td>
<td>66</td>
</tr>
<tr>
<td>128</td>
<td>128</td>
<td>-</td>
<td>73</td>
<td>65</td>
</tr>
<tr>
<td>126</td>
<td>126</td>
<td>-</td>
<td>72</td>
<td>64</td>
</tr>
<tr>
<td>124</td>
<td>124</td>
<td>-</td>
<td>71</td>
<td>63</td>
</tr>
<tr>
<td>121</td>
<td>121</td>
<td>-</td>
<td>70</td>
<td>62</td>
</tr>
<tr>
<td>118</td>
<td>118</td>
<td>-</td>
<td>69</td>
<td>61</td>
</tr>
<tr>
<td>116</td>
<td>116</td>
<td>-</td>
<td>68</td>
<td>60</td>
</tr>
<tr>
<td>114</td>
<td>114</td>
<td>-</td>
<td>67</td>
<td>59</td>
</tr>
<tr>
<td>112</td>
<td>112</td>
<td>-</td>
<td>66</td>
<td>58</td>
</tr>
<tr>
<td>109</td>
<td>109</td>
<td>-</td>
<td>65</td>
<td>56</td>
</tr>
<tr>
<td>107</td>
<td>107</td>
<td>-</td>
<td>64</td>
<td>56</td>
</tr>
<tr>
<td>105</td>
<td>105</td>
<td>-</td>
<td>62</td>
<td>54</td>
</tr>
<tr>
<td>103</td>
<td>103</td>
<td>-</td>
<td>61</td>
<td>53</td>
</tr>
<tr>
<td>101</td>
<td>101</td>
<td>-</td>
<td>60</td>
<td>52</td>
</tr>
<tr>
<td>99</td>
<td>99</td>
<td>-</td>
<td>59</td>
<td>51</td>
</tr>
<tr>
<td>97</td>
<td>97</td>
<td>-</td>
<td>57</td>
<td>50</td>
</tr>
<tr>
<td>95</td>
<td>95</td>
<td>-</td>
<td>56</td>
<td>49</td>
</tr>
</tbody>
</table>
## Typical Composition and Suggested Preheat Temperatures for Several Steel Mill Roll Alloys.

<table>
<thead>
<tr>
<th>Alloy</th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>V</th>
<th>W</th>
<th>Suggested Preheat (° F)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>AISI 1020</td>
<td>.20</td>
<td>.45</td>
<td>.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>300-500</td>
</tr>
<tr>
<td>AISI 1030</td>
<td>.30</td>
<td>.75</td>
<td>.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>400-550</td>
</tr>
<tr>
<td>AISI 1040</td>
<td>.40</td>
<td>.75</td>
<td>.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>450-600</td>
</tr>
<tr>
<td>AISI 8620</td>
<td>.20</td>
<td>.80</td>
<td>.28</td>
<td>.50</td>
<td>.55</td>
<td>.20</td>
<td></td>
<td></td>
<td>450-600</td>
</tr>
<tr>
<td>AISI 4130</td>
<td>.30</td>
<td>.50</td>
<td>.28</td>
<td>.90</td>
<td>.20</td>
<td></td>
<td></td>
<td></td>
<td>500-700</td>
</tr>
<tr>
<td>AISI 4140</td>
<td>.40</td>
<td>.55</td>
<td>.28</td>
<td>.90</td>
<td>.20</td>
<td></td>
<td></td>
<td></td>
<td>600-700</td>
</tr>
<tr>
<td>AISI 4320</td>
<td>.20</td>
<td>.55</td>
<td>.28</td>
<td>.50</td>
<td>1.80</td>
<td>.25</td>
<td></td>
<td></td>
<td>650-700</td>
</tr>
<tr>
<td>AISI 4340</td>
<td>.40</td>
<td>.70</td>
<td>.28</td>
<td>.80</td>
<td>1.80</td>
<td>.25</td>
<td></td>
<td></td>
<td>650-700</td>
</tr>
<tr>
<td>H-12</td>
<td>.35</td>
<td>.30</td>
<td>1.00</td>
<td>5.00</td>
<td>1.50</td>
<td>.30</td>
<td>1.40</td>
<td></td>
<td>700-800</td>
</tr>
<tr>
<td>52100</td>
<td>1.00</td>
<td>.30</td>
<td>.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>700-800</td>
</tr>
<tr>
<td>CAST IRON †</td>
<td>3.25</td>
<td>.80</td>
<td>2.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>800-800</td>
</tr>
<tr>
<td>INTERNATIONAL</td>
<td>.40</td>
<td>.55</td>
<td>.30</td>
<td>1.10</td>
<td>1.40</td>
<td>.15</td>
<td></td>
<td></td>
<td>700-800</td>
</tr>
<tr>
<td>DIN 21 Cr.Mo.V.5-11</td>
<td>.20</td>
<td>.40</td>
<td>.45</td>
<td>1.35</td>
<td>.20</td>
<td>1.10</td>
<td>.30</td>
<td></td>
<td>700-800</td>
</tr>
<tr>
<td>DIN 1700G 13Cr.Mo 44</td>
<td>.15</td>
<td>.55</td>
<td>.25</td>
<td>.85</td>
<td>.45</td>
<td></td>
<td></td>
<td></td>
<td>600-800</td>
</tr>
<tr>
<td>EFC 21</td>
<td>.23</td>
<td>.40</td>
<td>.45</td>
<td>1.35</td>
<td>1.10</td>
<td>.30</td>
<td></td>
<td></td>
<td>700-800</td>
</tr>
</tbody>
</table>

† Gray or unalloyed ductile (nodular) iron.

*Soak time varies with Roll Mass (usually 1/2 hour per inch of roll diameter once the surface has reached soak temperature).
Technical Section

Oven Storage and Reconditioning of Filler Metals

Welding electrodes, wire, and flux may be damaged by atmospheric moisture. The following table recommends proper storage conditions, and time and temperature for reconditioning electrodes that have absorbed excess moisture.

Notes for table: Pallets and unopened cartons of electrodes and wire should be stored away from exposure to water in the form of rain, snow, spray, or humidity. Only hermetically sealed cans are safe against these conditions. Damaged cartons permit entry of damp air which may be picked up by the product and lower its quality. Humidity below 50% should be avoided for 6010, 6011, 6012 and 6013 electrodes. At no times should these classes of electrodes be stored in an oven above 175°F.

The instruction, “Dry at Room Temperature” in the table signifies that the humidity should be below 70% and the temperature should be within the limits 40°F and 120°F.

When reconditioning flux, it is important that the complete mass be brought up to the temperature desired. If the flux is held in large containers, this can take a very long time – perhaps over 24 hours. In thin layers, reduction in moisture can be accomplished in as little as one hour, for example, in layers one to two inches thick. Fossil fuel burners (natural gas, oil, etc.) are not recommended.

CAUTION: Welding characteristics of agglomerated flux may suffer if temperature exceeds 650°F.

<table>
<thead>
<tr>
<th>Item Designation</th>
<th>Storage of Contents of Open Cartons*</th>
<th>Reconditioning*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Steel – 6010, 6011</td>
<td>Dry at room temperature</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Mild Steel – 6012, 6013, 7014, 7024</td>
<td>100°F - 175°F</td>
<td>250°F - 300°F</td>
</tr>
<tr>
<td>Mild Steel, Low Hydrogen, Low Alloy – 7016 and all XXX18</td>
<td>215°F - 450°F</td>
<td>700°F - 800°F</td>
</tr>
<tr>
<td>Stainless Steel Stick Electrodes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sterling AP &amp; AC/DC (AWS-16), DC Lime (AWS-15)</td>
<td>215°F - 260°F</td>
<td>400°F - 600°F</td>
</tr>
<tr>
<td>Sterling (AWS-17)</td>
<td>215°F - 260°F</td>
<td>350°F - 425°F</td>
</tr>
<tr>
<td>Hardalloy Surfacing</td>
<td>215°F - 260°F</td>
<td>450°F - 600°F</td>
</tr>
<tr>
<td>Special Maintenance - GP</td>
<td>215°F - 260°F</td>
<td>500°F</td>
</tr>
<tr>
<td>Cast Iron Electrodes</td>
<td>215°F - 230°F</td>
<td>250°F - 300°F</td>
</tr>
<tr>
<td>Sub-Arc Fluxes</td>
<td>250°F</td>
<td>600°F</td>
</tr>
<tr>
<td>Mild Steel Solid Wire</td>
<td>Dry at room temperature</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Tubular Wires – Speed-Alloy, Tube-Alloy, In-Flux 0, ChromaWeld</td>
<td>Dry at room temperature</td>
<td>Not recommended</td>
</tr>
</tbody>
</table>

*Be sure that electrodes, wire, or fluxes are properly removed from packaging that may be damaged. For more detailed information, please refer to McKay publication ITR-53G.
You can contact the McKay offices nearest you as listed below. You can also call 1-800-424-1543 (U.S.) to locate your nearest McKay distributor or visit our Web site - www.hobartbrothers.com

Hobart Brothers
101 Trade Square East
Troy, OH 45373
Phone: 937-332-4000
Fax: 937-332-5700

Canadian Welding Products Group
P.O. Box 1558
807 Pattullo Ave.
Woodstock, Ontario
Canada N4S 0A7
Phone: (519)-537-6291

www.MillerWelds.com  1-800-4-A-Miller  (1-800-426-4553)
Founded in 1929, and a world leader in the manufacturing of arc welding and cutting equipment. Miller Electric manufactures welding power sources, wire feeders, welding guns and accessories, engine driven welding power sources/generators, automation welding controls, plasma arc cutting power sources, and resistance spot welding equipment.

www.bernardwelds.com  1-800-946-2281
Manufacturers premium MIG (GMAW) welding guns, including both air-cooled and water-cooled semi-automatic, fully-automatic, and robotic products, as well as all accessory and replacement items. Also manufactures the complete line of OXO brand heavy-duty air-cooled MIG guns.

www.tempil.com  1-800-757-8301
Manufactures precise temperature-indicating markers, inks, paints, labels, welding accessories, and sterilization indicators. For almost 60 years, welders, engineers and scientists have relied on premium Tempil products to indicate temperature from 100°F to 2500°F.

www.jetline.com  1-949-951-1515
Designers and manufacturers of a full range of mechanized equipment and arc controls for welding, including Jetline and Cyclomatic. Jetline is your partner in welding automation - providing fixtures, arc controls, and system integration.

www.magnaflux.com  1-847-657-5300
Offers a complete line of liquid penetrant and magnetic particle inspection equipment and accessories, as well as processing materials, all of which are designed specifically for the nondestructive testing (NDT) industry.
We're ISO 9002 certified.
When you partner with McKAY, you can feel good knowing we meet ISO 9002 standards — the most rigorous standards for production and distribution around. It's your guarantee that the highest levels of quality, satisfaction and efficiency go into everything bearing the McKAY name.

We're on the web.
Our web site is a resource on welding, with detailed explanations of process applications and McKAY products. New products are featured regularly, so bookmark our address and visit often! Within the website, you can download data sheets and msds sheets in pdf format. Also for your convenience, we have posted our Distributor Locator on the site. You can find us at http://www.hobartbrothers.com.

NOTICE:
The foregoing values represent test results under controlled laboratory conditions, not guarantees for use in the field. Actual use of the product may produce varying results due to conditions and welding techniques over which McKAY has no control, including but not limited to plate chemistry, weldment design, fabrication methods, wire size, welding procedure, service requirements and the environment. The purchaser is solely responsible for determining the suitability of McKAY products for the purchaser’s own use. Any prior representation shall not be binding. McKAY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE WITH RESPECT TO ITS PRODUCTS.

CAUTION:
Consumers should be thoroughly familiar with the safety precautions shown in the Warning Label posted on each shipment and American National Standard Z49.1 "Safety in Welding and Cutting" published by the American Welding Society, 550 NW LeJeune Road, Miami, Florida 33135: OSHA Safety and Health Standards, 29 CFT 1910 available from the U.S. Department of Labor, Washington, D.C. 20210.