WELDING ELECTRODE CLASSIFICATIONS

MILD STEEL COATED ELECTRODES

E7018-X
E Indicates that this is an electrode
70 Indicates how strong this electrode is when welded. Measured in thousands of pounds per square inch
1 Indicates in what welding positions it can be used
9 Indicates the coating, penetration, and current type used (see classification table below)
X Indicates that there are more requirements (see additional requirements below)

WELDING POSITIONS
1 Flat, Horizontal, Vertical (up), Overhead
2 Flat, Horizontal
4 Flat, Horizontal, Overhead, Vertical (down)
Flat Position - usually groove welds; fillet welds only if welded like a “V”
Vertical - welds on walls (travel is from side to side)
Overhead - weld that needs to be done upside down

CLASSIFICATION TABLE

<table>
<thead>
<tr>
<th>Class</th>
<th>Electrode Coating</th>
<th>Penetration</th>
<th>Current Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exx0</td>
<td>Cellulose, Sodium</td>
<td>Deep</td>
<td>DC+ (DCEP)</td>
</tr>
<tr>
<td>Exx1</td>
<td>Cellulose, Potassium</td>
<td>Deep</td>
<td>AC, DC+ (DCEP)</td>
</tr>
<tr>
<td>Exx3</td>
<td>Rutile, Sodium</td>
<td>Medium</td>
<td>AC, DC- (DCEN)</td>
</tr>
<tr>
<td>Exx4</td>
<td>Rutile, Iron Powder</td>
<td>Light</td>
<td>AC, DC+ (DCEP), DC- (DCEN)</td>
</tr>
<tr>
<td>Exx5</td>
<td>Low Hydrogen, Sodium</td>
<td>Medium</td>
<td>AC, DC+ (DCEP)</td>
</tr>
<tr>
<td>Exx7</td>
<td>Iron Powder, Iron Oxide</td>
<td>Medium</td>
<td>AC, DC+ (DCEP), DC- (DCEN)</td>
</tr>
<tr>
<td>Exx8</td>
<td>Low Hydrogen, Iron Powder</td>
<td>Medium</td>
<td>AC, DC+ (DCEP)</td>
</tr>
</tbody>
</table>

ADDITIONAL REQUIREMENTS

Suffix  Additional Requirement
-1 Increased toughness (impact strength) for E7018 electrodes. Also increased ductility in E7024 electrodes
-M Meets most military requirements - greater toughness, lower moisture content as received after exposure, diffusible hydrogen limits for weld metal
-H4, -H8 Indicate maximum diffusible hydrogen limit measured in millimeters per 100 grams (mL/100g)
-H16 The 4, 8, and 16 indicates what the limit is. Example: -H4 = 4mL per 100g

LOW ALLOY STEEL COATED ELECTRODES

E7018-X
E Indicates that this is an electrode
70 Indicates how strong this electrode is when welded. Measured in thousands of pounds per square inch
1 Indicates in what welding positions it can be used
9 Indicates the coating, penetration, and current type used (see classification table below)
X Indicates that there are more requirements (see suffix table below)

WELDING POSITIONS
Same as for Mild Steel Coated Electrodes

CLASSIFICATION
Same as for Mild Steel Coated Electrodes

SUFFIX TABLE

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Steel Alloy Type</th>
<th>Steel Alloy Type</th>
<th>Steel Alloy Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>-A1</td>
<td>Carbon-Molybdenum</td>
<td>0.40 - 0.65 Mo</td>
<td>0.40 - 0.65 Mo</td>
</tr>
<tr>
<td>-B1</td>
<td>Chromium-Molybdenum</td>
<td>1.00 - 1.50 Cr</td>
<td>0.40 - 0.65 Mo</td>
</tr>
<tr>
<td>-B2</td>
<td>Chromium-Molybdenum</td>
<td>2.00 - 2.50 Cr</td>
<td>0.90 - 1.20 Mo</td>
</tr>
<tr>
<td>-B2L</td>
<td>Chromium-Molybdenum</td>
<td>1.75 - 2.25 Cr</td>
<td>0.40 - 0.65 Mo</td>
</tr>
<tr>
<td>-B4</td>
<td>Chromium-Molybdenum</td>
<td>0.40 - 0.60 Cr</td>
<td>1.00 - 1.25 Mo</td>
</tr>
<tr>
<td>-B5</td>
<td>Chromium-Molybdenum</td>
<td>4.5 - 5.0 Cr</td>
<td>0.45 - 0.65 Mo</td>
</tr>
<tr>
<td>-B6</td>
<td>war E502</td>
<td>8.0 - 10.5 Cr</td>
<td>0.8 - 1.2 Mo</td>
</tr>
<tr>
<td>-C1</td>
<td>Nickel Steel</td>
<td>2.00 - 2.75 Ni</td>
<td>Ni, Cr, Mo, Cu</td>
</tr>
<tr>
<td>-C1L</td>
<td>Nickel Steel</td>
<td>3.00 - 3.75 Ni</td>
<td>Nickel Steel</td>
</tr>
<tr>
<td>-C2</td>
<td>Nickel Steel</td>
<td>4.5 - 5.0 Cr</td>
<td>Nickel Steel</td>
</tr>
<tr>
<td>-C3</td>
<td>Nickle Steel</td>
<td>8.0 - 1.10 Ni</td>
<td>0.40 - 0.65 Mo</td>
</tr>
<tr>
<td>-D1</td>
<td>Manganese-Molybdenum</td>
<td>1.00 - 1.75 Mn</td>
<td>0.25 - 0.45 Mo</td>
</tr>
<tr>
<td>-D2</td>
<td>Manganese-Molybdenum</td>
<td>1.65 - 2.00 Mn</td>
<td>0.25 - 0.45 Mo</td>
</tr>
<tr>
<td>-D3</td>
<td>Manganese-Molybdenum</td>
<td>1.00 - 1.80 Mn</td>
<td>0.40 - 0.65 Mo</td>
</tr>
<tr>
<td>-W</td>
<td>Weathering Steel</td>
<td>Ni, Cr, Mo, Cu</td>
<td>May have more requirements</td>
</tr>
<tr>
<td>-G</td>
<td>No required chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-M</td>
<td>Military grade</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHEMICAL SYMBOLS FOR THE ELEMENTS

C Carbon  Most effective hardening element in steel
Mn Manganese  Hardening element second to carbon
Si Silicon  Deoxidizer, moderate strengthener
P Phosphorus  Causes cracking if too high
S Sulfur  Aids in machining - cracking problems like P
Cr Chromium  Hardness (low) - corrosion resistance (high)
Ni Nickel  Hardenability - better cold toughness
Mo Molybdenum  Hardenability - high temp tensile - creep strength
B Boron  Very small amounts increase hardness
Cu Copper  Corrosion resistance (low) - cracking (high)
Al Aluminum  Deoxidizer - improves mechanical properties
Ti Titanium  Removes: Oxygen, S, N, and C
N Nitrogen  Improves strength - lowers toughness
 Nb Niobium  Hardness - improves mechanical properties (formerly Columbium [Cb])
V Vanadium  Hardness - improves mechanical properties

Additional Requirement

-X Indicates that there are more requirements (see suffix table below)

Suffix Description
-G No required chemistry
-M Military grade
-N Required chemistry
-W Weathering Steel
-1 Increased toughness (impact strength) for E7018 electrodes. Also increased ductility in E7024 electrodes
-M Meets most military requirements - greater toughness, lower moisture content as received after exposure, diffusible hydrogen limits for weld metal
-H4, -H8 Indicate maximum diffusible hydrogen limit measured in millimeters per 100 grams (mL/100g)
-H16 The 4, 8, and 16 indicates what the limit is. Example: -H4 = 4mL per 100g

CLASSIFICATION

E60xx
Class  Min. Tensile Strength  Min. Yield Strength
E60xx  62,000 psi  50,000 psi
E70xx  70,000 psi  57,000 psi
E80xx  80,000 psi  67,000 psi
E90xx  90,000 psi  77,000 psi
E100x  100,000 psi  87,000 psi
E110x  110,000 psi  95,000 psi
E120x  120,000 psi  107,000 psi

Suffix Number Description
-E Same as for Mild Steel Coated Electrodes
-NM Same as for Mild Steel Coated Electrodes
-B8 Same as for Mild Steel Coated Electrodes
-B3L Same as for Mild Steel Coated Electrodes
-B3 Same as for Mild Steel Coated Electrodes
-B1L Same as for Mild Steel Coated Electrodes
-B1 Same as for Mild Steel Coated Electrodes