Designation: B780 – 98 (Reapproved 2010)

Standard Specification for
75 % Silver, 24.5 % Copper, 0.5 % Nickel Electrical Contact Alloy

This standard is issued under the fixed designation B780; the number immediately following the designation indicates the year of
original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A
superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers an electrical contact material
with the nominal composition of 75 % silver, 24.5 % copper,
and 0.5 % nickel in the form of rod, wire, strip, and sheet.

1.2 The values stated in inch-pound units are to be regarded
as standard. The values given in parentheses are mathematical
conversions to SI units that are provided for information only
and are not considered standard.

1.3 This standard does not purport to address all of the
safety concerns, if any, associated with its use. It is the
responsibility of the user of this standard to become familiar
with all hazards including those identified in the appropriate
Material Safety Data Sheet (MSDS) for this product/material
as provided by the manufacturer, to establish appropriate
safety and health practices, and determine the applicability of
regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards: 2

B476 Specification for General Requirements for Wrought
Precious Metal Electrical Contact Materials

3. Ordering Information

3.1 Refer to Specification B476.

4. Materials and Manufacture

4.1 Raw materials shall be of such quality and purity that
the finished product will have the properties and characteristics
prescribed in this specification.

4.2 The material shall be finished by such operations (cold
working, heat-treating, annealing, turning, grinding, or pick-
ling) as are required to produce the prescribed properties.

5. Chemical Composition

5.1 Material produced under this specification shall conform
to the chemical composition limits prescribed in Table 1.

5.2 These specification limits do not preclude the possible
presence of other unnamed elements, impurities, or additives.
Analysis shall be regularly made only for the minor elements
listed in the table. However, if a user knows of elements that
might be detrimental to their application or has other reasons
for requiring analysis for specific elements, then agreement
between manufacturer and purchaser for both limits and
methods of analysis should be required for elements not
specified.

6. Mechanical Properties

6.1 The material shall conform to the applicable mechanical
properties prescribed in Table 2 or Table 3.

6.2 All test specimens shall be the full thickness or diameter
as the size supplied when practical. The test procedures shall
follow the ASTM specifications referred to in Specification
B476.

6.3 All tests are to be conducted at room temperature, about
68°F (20°C).

7. Inspection, Rejection and Rehearing, Certification,
Product Marking, and Supplementary Requirements

7.1 Material furnished to this specification shall meet the
requirements listed in Specification B476.

8. Keywords

8.1 arcing contacts; contacts; conductivity; electrical con-
tacts; precious metals; silver alloy; silver-copper alloy; wire

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1 This specification is under the jurisdiction of ASTM Committee B02 on
Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee
B02.05 on Precious Metals and Electrical Contact Materials.

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2 For referenced ASTM standards, visit the ASTM website, www.astm.org, or
contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM
Standards volume information, refer to the standard’s Document Summary page on
the ASTM website.
NOTE 1—Analysis is regularly made for the elements for which specific limits are listed. If however, the presence of “other” elements is suspected or indicated in the course of routine analysis, further analysis shall be made to determine that the total of these “other” elements and the listed impurities is not in excess of the total impurities limit.

NOTE 2—Refer to 5.2.

### TABLE 1 Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Weight, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver</td>
<td>74.0–76.0</td>
</tr>
<tr>
<td>Copper</td>
<td>(23.5 min) report by difference</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.35–0.65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impurities</th>
<th>Limit, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc</td>
<td>0.06 max</td>
</tr>
<tr>
<td>Iron</td>
<td>0.05 max</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.05 max</td>
</tr>
<tr>
<td>Lead</td>
<td>0.03 max</td>
</tr>
<tr>
<td>Total of all impurities</td>
<td>0.15 max</td>
</tr>
</tbody>
</table>

### TABLE 2 Mechanical Properties of Wire and Rod

<table>
<thead>
<tr>
<th>Area Reduction, %</th>
<th>Temper Designation</th>
<th>B and S No.</th>
<th>Tensile Strength</th>
<th>Elongation in 2 in. (51 mm), min</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>annealed</td>
<td>0</td>
<td>40–55</td>
<td>280–380</td>
</tr>
<tr>
<td>11</td>
<td>¼ hard</td>
<td>1</td>
<td>50–62</td>
<td>350–430</td>
</tr>
<tr>
<td>21</td>
<td>¼ hard</td>
<td>2</td>
<td>58–68</td>
<td>400–470</td>
</tr>
<tr>
<td>37</td>
<td>½ hard</td>
<td>2</td>
<td>64–74</td>
<td>440–510</td>
</tr>
<tr>
<td>60</td>
<td>hard</td>
<td>4</td>
<td>70–80</td>
<td>480–550</td>
</tr>
<tr>
<td>84</td>
<td>spring</td>
<td>8</td>
<td>80–92</td>
<td>550–630</td>
</tr>
</tbody>
</table>

### TABLE 3 Mechanical Properties of Sheet and Strip

<table>
<thead>
<tr>
<th>Thickness Reduction, %</th>
<th>Temper Designation</th>
<th>B and S No.</th>
<th>Tensile Strength</th>
<th>Elongation in 2 in. (51 mm), min</th>
<th>Hardness Rockwell 30Tksi</th>
</tr>
</thead>
<tbody>
<tr>
<td>annealed</td>
<td>annealed</td>
<td>0</td>
<td>45–57</td>
<td>310–390</td>
<td>8</td>
</tr>
<tr>
<td>11</td>
<td>¼ hard</td>
<td>1</td>
<td>50–62</td>
<td>340–430</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td>½ hard</td>
<td>2</td>
<td>55–67</td>
<td>370–450</td>
<td>3</td>
</tr>
<tr>
<td>37</td>
<td>hard</td>
<td>4</td>
<td>63–75</td>
<td>430–520</td>
<td>2</td>
</tr>
</tbody>
</table>

### APPENDIX

(Nonmandatory Information)

**X1. Typical Property Values**

**X1.1 Electrical Conductivity:**

<table>
<thead>
<tr>
<th>Temper</th>
<th>annealed</th>
<th>¼ hard</th>
<th>½ hard</th>
<th>Hard</th>
<th>Extra Hard</th>
<th>Spring</th>
<th>Extra Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>B and S No.</td>
<td>76</td>
<td>74</td>
<td>74</td>
<td>73</td>
<td>72</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Electrical Conductivity IACS, percent</td>
<td>44.1</td>
<td>42.9</td>
<td>42.9</td>
<td>42.3</td>
<td>41.8</td>
<td>40.6</td>
<td>40.6</td>
</tr>
<tr>
<td>MS/m</td>
<td>44.1</td>
<td>42.9</td>
<td>42.9</td>
<td>42.3</td>
<td>41.8</td>
<td>40.6</td>
<td>40.6</td>
</tr>
</tbody>
</table>
X1.2 Density:
Nominal 10.04 Mg/m³ (5.29 troy oz/in.³)

X1.3 Linear Coefficient of Expansion:
9.90 × 10⁻⁶ in./in.-°F
17.82 × 10⁻⁶ m/m°C

X1.4 Modulus of Elasticity:
12.3 × 10⁶ psi (84.8 GPa)

X1.5 Typical Mechanical Properties (Spring Temper—.010 inch diameter wire):
(a.) Fatigue strength (Rotating Bending) at 10⁸ cycles
40,000 psi (280 MPa)
(b.) Proportional limit
65,000 psi (455 MPa)
(c.) Microhardness
160 HK 100g

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