Designation: B780 – 16

Standard Specification for 75 % Silver, 24.5 % Copper, 0.5 % Nickel Electrical Contact Alloy[1]

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 U.S. 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 Safety Data Sheet (SDS) 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 pickling) 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 contacts; precious metals; silver alloy; silver-copper alloy; wire

[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.

TABLE 1 Chemical Composition

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.

Element	Weight,%
Silver	74.0–76.0
Copper	(23.5 min) report by difference
Nickel	0.35–0.65
Impurities	
Zinc	0.06 max
Iron	0.05 max
Cadmium	0.01 max
Lead	0.03 max
Total of all impurities	0.15 max

TABLE 2 Mechanical Properties of Wire and Rod

Area Reduction, %	Temper Designation	B and S No.	Tensile Strength		% Elongation in 2 in. (51 mm), min
			ksi	MPa	
0	annealed	0	40–55	280–380	10
11	⅛ hard		50–62	350–430	5
21	¼ hard	1	58–68	400–470	4
37	½ hard	2	64–74	440–510	4
60	hard	4	70–80	480–550	2
84	spring	8	80–92	550–630	1

TABLE 3 Mechanical Properties of Sheet and Strip

Thickness Reduction, %	Temper Designation	B and S No.	Tensile Strength		Elongation% in 2 in. (51 mm), min	Hardness Rockwell 30T
			ksi	MPa		
annealed	annealed	0	45–57	310–390	8	46–58
11	¼ hard	1	50–62	340–430	4	56–62
21	½ hard	2	55–67	370–450	3	60–66
37	hard	4	63–75	430–520	2	64–70

APPENDIX

(Nonmandatory Information)

X1. Typical Property Values

X1.1 *Electrical Conductivity:*

Temper	Annealed	¼ Hard	½ Hard	Hard	Extra Hard	Spring	Extra Spring
B and S No.	0	1	2	4	6	8	10
Electrical Conductivity IACS, percent	76	74	74	73	72	70	70
MS/m	44.1	42.9	42.9	42.3	41.8	40.6	40.6

X1.2 *Density:*

Nominal 10.04 Mg/m^3(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:*

12.3×10^6 psi (84.8 GPa)

X1.5 *Typical Mechanical Properties (Spring Temper—.010 inch diameter wire):*

(a) Fatigue strength (Rotating Bending) at 10^8 cycles 40,000 psi (280 MPa)
(b) Proportional limit 65,000 psi (455 MPa)
(c) Microhardness 160 HK 100g