Designation: B628 – 98 (Reapproved 2016)

Standard Specification for Silver-Copper Eutectic Electrical Contact Alloy[1]

This standard is issued under the fixed designation B628; 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 72 % silver-28 % copper (eutectic) alloy rod, wire, strip, and sheet material for electrical contacts.

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]

B277 Test Method for Hardness of Electrical Contact Materials

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

3. General Requirements

3.1 Specification B476 and Test Method B277 shall apply to all materials produced to this specification.

4. 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 the specification shall conform to the requirements as to chemical composition prescribed in Table 1.

6. Mechanical Requirements

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

6.2 All test specimens shall be full thickness or diameter when practical.

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

7. Inspection and Testing

7.1 Material furnished under this specification shall be inspected by the manufacturer as detailed in the applicable provisions of Specification B476 and as listed below.

7.1.1 Visual inspection at 10 ×.

7.1.2 Temper test (hardness or tension, but not both). A tension test is recommended for strip below 0.030-in. (0.8-mm) thickness and for wire of any diameter. A tension test is preferred when permitted by part size and quantity.

7.1.3 Dimensional tests.

7.1.4 Spectrographic or chemical analysis when indicated by the purchase order.

8. Keywords

8.1 composition; electrical contacts; impurities; precious metals; silver copper alloy

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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.

TABLE 1 Chemical Composition[A]

Element	Weight %
Silver	71.0 to 73.0
Copper	balance
Total of all impurities	0.15
Zinc	0.06 max
Iron	0.05 max
Cadmium	0.05 max
Lead	0.03 max
Nickel	0.01 max
Aluminum	0.005 max
Phosphorus	0.03 max
Total others	0.06 max

[A] 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 are not in excess of the total impurities limit.

TABLE 2 Mechanical Properties of Sheet and Strip

Temper	Reduction in B & S Numbers (Reference)	Percent Reduction (Reference)	Ultimate Tensile Strength, psi (MPa)		Minimum Elongation in 2 in., %	Hardness, Rockwell 30 T
			Minimum	Maximum		
A	0	0	45 000 (310)	55 000 (380)	15	56–64
1/4H	1	11	56 000 (390)	66 000 (460)	7	61–69
1/2H	2	21	60 000 (410)	70 000 (480)	3	64–72
3/4H	3	29	66 000 (460)	76 000 (520)	2	65–73
Hard	4	37	69 000 (480)	79 000 (550)	2	66–74
Extra hard	6	50	75 000 (520)	85 000 (590)	1	67–75
Spring	8	60	83 000 (570)	93 000 (640)	1	68–76

TABLE 3 Mechanical Properties of Wire and Rod

Temper	Reduction in B & S Numbers (Reference)	Percent Reduction (Reference)	Ultimate Tensile Strength, psi (MPa)		Minimum Elongation in 2 in., %
			Minimum	Maximum	
A	0	0	45 000 (310)	55 000 (380)	15
1/8H	½	11	52 000 (360)	62 000 (430)	7
1/4H	1	21	58 000 (400)	68 000 (470)	5
1/2H	2	37	65 000 (450)	75 000 (520)	4
3/4H	3	50	70 000 (480)	80 000 (550)	4
Hard	4	60	76 000 (520)	86 000 (590)	3
Extra hard	6	75	85 000 (590)	95 000 (660)	2
Spring	8	84	95 000 (660)	105 000 (724)	2
Extra spring	10	90	105 000 (724)	115 000 (793)	1

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser in the inquiry, contract, or order, for agencies of the U.S. Government.

S1. Applicable Documents

S1.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

S1.1.1 *U.S. Federal Standards:* [3]

Fed. Std. No. 102 Preservation, Packaging and Packing Levels

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

S1.1.2 *U.S. Military Standards:* [3]

MIL-STD-129 Marking for Shipment and Storage

S2. Quality Assurance

S2.1 *Responsibility for Inspection*—Unless otherwise specified in the contract or purchase order, the manufacturer is responsible for the performance of all inspection and test requirements specified. Except as otherwise specified in the contract or purchase order, the manufacturer may use his own or any other suitable facilities for the performance of the inspection and test requirements, unless disapproved by the purchaser at the time the order is placed. The purchaser shall have the right to perform any of the inspections and tests set forth when such inspections and tests are deemed necessary to assure that the material conforms to prescribed requirements.

S3. Preparation for Delivery

S3.1 *Preservation, Packaging and Packing*

S3.1.1 *Civil Agencies*—The requirements of Fed. Std. No. 102 shall be referenced for definitions of the various levels of packaging protection.

S3.2 *Marking:*

S3.2.1 *Military Agencies*—In addition to any special marking required by the contract or purchase order, marking for shipment shall be in accordance with MIL-STD-129.

S3.2.2 *Civil Agencies*—In addition to any special marking required by the contract or purchase order, marking for shipment shall be in accordance with Fed. Std. No. 123.

[3] Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.

APPENDIX

(Nonmandatory Information)

X1. TYPICAL PROPERTY VALUES

X1.1 The following is a list of typical property values which are useful for engineering calculations in electrical contact design and application.

Electrical conductivity,% IACS	84
Resistivity,	
Ω·cmil/ft	12.3
μΩ·cm	2.05
Solidus temperature, °C	779
Liquidus temperature, °C	779
Density,	
g/cm^3	10.0
tr oz/in.^{3}	5.27
Elastic modulus,	
psi	11 800 000
GPa	81.4