Designation: B685 – 01 (Reapproved 2012)

Standard Specification for Palladium-Copper Electrical Contact Material[1]

This standard is issued under the fixed designation B685; 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 a 60 % palladium-40 % copper alloy in the form of 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 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. Manufacture

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

3.2 The material shall be finished by such operations (cold working, annealing, turning, grinding, or pickling) as are required to produce the prescribed properties.

4. Chemical Composition

4.1 Material produced under the specification shall meet the requirements of chemical composition prescribed in Table 1.

4.2 By agreement between purchaser and manufacturer, analysis may be required and limits established for elements or compounds not specified in the table of chemical composition.

5. Mechanical Requirements

5.1 The contract or order may specify ultimate tensile strength, elongation, microhardness (Knoop or Vickers), hardness (Rockwell or Rockwell Superficial), or a combination of these mechanical properties as temper criterion. If the contract or order does not specify a temper criterion, then the criterion for temper designation will be ultimate tensile strength and elongation (Table 2).

5.2 Mechanical properties shall conform to the listings of Table 3.

5.3 All test specimens shall be full size when practical.

5.4 All tests are to be conducted at room temperature, 65 to 85°F (18 to 29°C).

6. General Requirements

6.1 The provisions of Specifications B476 shall apply to all materials produced to this specification.

7. Inspection and Testing

7.1 Material furnished under this specification shall be inspected by the manufacturer as listed below:

7.1.1 Visual inspection in accordance with 11.2.1 in Specification B476.

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.

7.2 The purchaser shall perform such tests as are required to verify the quality of material procured under the specification.

8. Keywords

8.1 contact alloy; electrical contact alloy; palladium; palladium copper

[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.

Current edition approved May 1, 2012. Published May 2012. Originally approved in 1981. Last previous edition approved in 2006 as B685 – 01 (2006). DOI: 10.1520/B0685-01R12.

[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 Requirements

Element	Weight, %
Pd	Balance
Cu	40.00 ± 0.5
Ag	0.10 max
Fe	0.05 max
Zn	0.06 max
Cd	0.05 max
Pb	0.03 max
Al	0.005 max
Total other impurities	0.1
Total impurities	0.2

TABLE 2 Typical Hardness Values for Strip[A]

Temper	HR30T	HR15T	HK (100 g)[B]
Annealed	64	82	155
37 % reduction	81	92	255

[A] Specification for tensile and elongation properties or hardness ranges, but not both, shall be agreed to between supplier and purchaser at the time of contracting for delivery.
[B] The Knoop hardness indentations shall be made so that the long axis of the indenter is parallel to the rolling direction of the material.

TABLE 3 Mechanical Properties, Wire and Rod

Temper	Ultimate Tensile Strength, psi (MPa)		Minimum Elongation in 2 in. (51 mm), %
	min	max	
Annealed	85 000 (590)	105 000 (720)	20
75 % reduction	135 000 (930) typical		...

APPENDIX

(Nonmandatory Information)

X1. TYPICAL PHYSICAL PROPERTIES OF 60 Pd-40 Cu

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

Electrical resistivity, μΩ·cm	35 (quenched)
	3.5 (ordered)
Density, g/cm^3 at 20°C	10.6
Approximate liquidus, °C	1225
Approximate solidus, °C	1195