Designation: B683 – 01 (Reapproved 2012)

Standard Specification for Pure Palladium Electrical Contact Material[1]

This standard is issued under the fixed designation B683; 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 palladium 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

B589 Specification for Refined Palladium

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 this specification shall meet the requirements of chemical composition prescribed in Table 1.

NOTE 1—The chemical requirements for unfabricated palladium (refined material) are covered in Specification B589.

4.2 By agreement between the purchaser and the 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.

5.2 Mechanical properties shall conform to the listings of Table 2.

5.3 Since it is not always possible to tension test some parts and shapes, the user and supplier should reach an agreement with respect to the type of hardness tests and the acceptable range that should be applicable. See Table 3 for typical hardness values.

5.4 All test specimens shall be full size when practical.

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

6. General Requirements

6.1 The provisions of Specification 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 the Inspection section 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.

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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 Requirements

Element	Weight, %
Pd	99.8 min
Total impurities	0.2 max
Pt group (Ir, Pt, Rh, Os, Ru) and Au, Ag, Cu	0.1 max
Total other impurities (within the following limits)	0.1 max
Pb, Sb, Bi, Sn, As, Cd, Zn	0.01 max each
Fe	0.015 max
Other elements	0.02 max each

TABLE 2 Mechanical Properties

Temper	Reduction, %		Ultimate Tensile Strength psi (MPa)		Minimum Elongation in 2 in. %
	Wire and Rod	Sheet and Strip	min	max	
Annealed	0	0	23 000 (160)	33 000 (230)	10
¼ H	21	11	39 000 (270)	49 000 (340)	2
½ H	37	27	47 000 (320)	57 000 (390)	1
Hard	60	37	50 000 (340)	...	...

TABLE 3 Typical Hardness Values, Sheet and Strip

Temper	Reduction, %	Rockwell 15T	Knoop (100 g)[A]
Annealed	0	57	68
½ H	20.7	81	123
Hard	37.2	82	133

[A] The Knoop hardness indentations shall be made so that the long axis of the indenter is parallel to the rolling direction of the material.

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

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 (at 20°C)	16
Resistivity:	
Ω·cmil/ft	64.8
μΩ·cm	10.8
Density:	
g/cm^3	12.02
tr oz/in.^{3}	6.33
Solidus temperature, °C	1554
Liquidus temperature, °C	1554
Modulus of elasticity:	
psi	16.3×10^6
GPa	112