Designation: B684/B684M – 16

Standard Specification for Platinum-Iridium Electrical Contact Materials[1]

This standard is issued under the fixed designation B684/B684M; 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 85 % platinum—15 % iridium alloy, and a 90 % platinum—10 % iridium alloy, in the form of rod, wire, strip, and sheet material for electrical contacts.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the 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

B542 Terminology Relating to Electrical Contacts and Their Use

E8/E8M Test Methods for Tension Testing of Metallic Materials

E384 Test Method for Microindentation Hardness of Materials

3. Terminology

3.1 For definitions of terms related to electrical contact materials, refer to Terminology B542.

4. General Requirements

4.1 The requirements of Specification B476 shall apply to all materials produced to this specification.

4.2 In addition, when a section with a title identical to that referenced in 4.1 appears in this specification, it contains additional requirements which supplement those appearing in Specification B476.

5. Ordering Information

5.1 Include the following information when placing orders for product under this specification, as applicable:

5.1.1 ASTM designation and year of issue,

5.1.2 Grade of material (see Table 1),

5.1.3 Temper (annealed or work hardened, see Table 2 and Table 3),

5.1.4 Form (rod, wire, sheet, or strip),

5.1.5 Dimensions and tolerances,

5.1.6 Quantity, total weight or total length or number of pieces of each size,

5.1.7 Heat identification or traceability details, if required,

5.1.8 Certification and/or Test Report, if required.

6. Materials and Manufacture

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

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

7. Chemical Composition

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

7.2 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.

[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.

***A Summary of Changes section appears at the end of this standard**

TABLE 1 Chemical Requirements

Element	85 Pt/15 Ir	90 Pt/10 Ir
	Weight %	Weight %
Pt	balance	balance
Ir	14.50-15.50	9.50-10.50
Total Impurities	0.2 max.	0.2 max.
Total Platinum Group (Pd, Rh, Os, Ru), Au	0.1 max.	0.1 max.
Total Other Impurities (including the elements below)	0.1 max.	0.1 max.
Pb, Sb, Bi, Sn, As, Cd, Zn	0.01 max each	0.01 max each
Fe	0.015 max each	0.015 max each
Other elements	0.02 max each	0.02 max each

TABLE 2 Mechanical Properties of Wire and Rod

Property	85 Pt/15 Ir		90 Pt/10 Ir	
	Annealed	Work Hardened	Annealed	Work Hardened
Ultimate Tensile Strength, ksi [MPa]	75 - 85 [520-590]	90 - 120 [620-830]	35 - 60 [240-410]	70 min [480 min]
Elongation, % in 2 in. gage length [51 mm]	30 min	1 - 10	30 min	1 min
Microhardness, HK	—	—	—	—

TABLE 3 Mechanical Properties of Strip and Sheet

Property	85 Pt/15 Ir		90 Pt/10 Ir	
	Annealed	Work Hardened	Annealed	Work Hardened
Ultimate Tensile Strength, ksi [MPa]	75 - 85 [520-590]	90 - 120 [620-830]	35 - 60 [240-410]	70 min [480 min]
Elongation, % in 2 in. gage length [51 mm]	30 min	1 - 10	30 min	1 - 10
Microhardness, HK	130 - 190	200 min	130 - 190	200 min

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.

8. Mechanical Property Requirements

8.1 The contract or purchase 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.

8.2 The mechanical properties shall conform to those properties listed in Table 2 and Table 3. The term "work hardened," as used in these tables, refers to material which has been subjected to a minimum of 30 % reduction in cross–sectional area.

8.3 All test specimens shall be full size when practical.

8.4 All tests are to be conducted at room temperature, 65 to 85°F [18 to 29°C].

9. Test Methods

9.1 Test methods shall be in accordance with Specification B476.

9.1.1 Knoop hardness tests shall be in accordance with Test Method E384. Material 0.005 in. [0.13 mm] in thickness (diameter) and larger shall be tested using a 100-g indenter load. Material less than 0.005 in. [0.13 mm] in thickness (diameter) shall be tested using a 50-g indenter load. A minimum of five hardness indentations shall be made on each specimen. All indentations shall be made so that the long axis of the indenter is parallel to the rolling or drawing direction of the material. The hardness value reported shall be the average of the five indentations.

9.1.2 All tension test specimens shall be full cross-section size when practical (see Test Methods E8/E8M).

9.1.3 All tests shall be conducted in room temperature, 65 to 85°F [18.3 to 29.4°C].

9.2 Chemical analysis shall be performed by spectrochemical or wet analysis methods.

10. Inspection and Testing

10.1 Material furnished under this specification shall be inspected and tested by the manufacturer as listed below:

10.1.1 Visual inspection per Specification B476,

10.1.2 Tension or hardness tests, or both, for temper verification,

10.1.3 Dimensional inspection, and

10.1.4 Chemical analysis.

11. Keywords

11.1 electrical contact materials; iridium alloy; medical material; platinum alloy; platinum iridium alloys

APPENDIX

(Nonmandatory Information)

X1. TYPICAL PROPERTY VALUES

X1.1 Typical property values of 85 % platinum–15 % iridium are as follows:

Density, g/cm^3	21.6
resistivity, μΩ.cm at 20°C approx.	28
solidus temperature, °C approx.	1790
liquidus temperature, °C approx.	1820

SUMMARY OF CHANGES

Committee B02 has identified the location of selected changes to this standard since the last issue (B684–97(2012)) that may impact the use of this standard. (Approved June 1, 2016.)

(1) Added Tensile requirements.
(2) Created dual designation specification (inch-pound/SI).
(3) General editorial and form and style revisions.