



Designation: **B663/B663M—16** **B663/B663M – 20**

Standard Specification for Silver-Tungsten Carbide Electrical Contact Material¹

This standard is issued under the fixed designation B663/B663M; 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 electrical contact components made from silver-tungsten carbide materials by powder metallurgical processes.

1.2 This specification covers compositions within the silver-tungsten carbide system normally specified by users of contacts.

NOTE 1—Table X1.1 and Table X1.2 in Appendix X1 provide a list of typical compositions used for various applications.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 *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~~ safety, health, and health environmental practices, and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

B328 Test Method for Density, Oil Content, and Interconnected Porosity of Sintered Metal Structural Parts and Oil-Impregnated Bearings (Withdrawn 2009)³

3. Significance and Use

3.1 This specification provides a means for the contact manufacturer and contact user to establish agreement on the material to be supplied for a specific application including microstructure and other properties.

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, 2016/Oct. 1, 2020. Published May 2016/October 2020. Originally approved in 1979. Last previous edition approved in 2012 as B663 – 94 (2012):B663/B663M – 16. DOI: 10.1520/B0663/B0663M-16.10.1520/B0663_B0663M-20.

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.

³ The last approved version of this historical standard is referenced on www.astm.org.



3.2 Proprietary methods for the manufacture of these materials vary significantly among suppliers, and these methods influence such properties as arc erosion, contact resistance, and the tendency to weld in service. Since the performance of contacts in a device depends on numerous factors outside the contact itself (opening speed, closing speed, contact pressure, contact bounce, environmental variations, assembly technique and variations, etc.), this specification cannot ensure performance control in the application. As part of the qualification on initial samples, qualification, it is recommended that the user functionally and electrically test the materials for all devices applicable to the material's use. This specification will provide a means for the contact manufacturer and contact user to reach agreement on the details of the material to be supplied for a specific use, and reasonable assurance that future lots will be similar in properties and microstructure to the initial test or sample contacts supplied: material's use.

NOTE 2—The performance of contacts in a device depends on numerous factors outside the contact itself (opening speed, closing speed, contact pressure, contact bounce, environmental variations, assembly technique and variations, etc.). Proprietary methods for the manufacture of these materials vary significantly among suppliers, and these methods influence such properties as arc erosion, contact resistance, and the tendency to weld in service.

4. Ordering Information

4.1 Orders for this material under this specification shall include the following information:

4.1.1 Dimensions (see Section 4.09),

4.1.2 Chemical composition (see Table X1.1 and Table X1.2 in Appendix X1 as a guideline),

4.1.3 Physical properties (see Section 6 and Appendix X1 as a guideline),

4.1.4 Certification (see Section 4.12), and

4.1.5 Other features as agreed upon between the manufacturer and purchaser.

5. Chemical Composition

5.1 The material shall conform to composition limits as agreed upon between the manufacturer and the purchaser. Typical chemical ranges are listed in Table X1.1 and Table X1.2 of Appendix X1. 20

5.2 The chemical analysis shall be made in accordance with the methods prescribed in the newest edition of Volume 01.02 of the *Annual Book of ASTM Standards* or by any other approved method agreed upon between the manufacturer and the purchaser.

6. Physical Properties

6.1 The manufacturer and the purchaser shall agree on qualification tests for determination of physical properties.

6.2 The tests shall be performed on production parts, wherever practical or applicable. (Small size contacts do not lend themselves to accurate conductivity measurement.)

6.3 The tests shall be determined after consideration of the function of the part.

6.4 The typical properties of three most common types of silver-tungsten carbide contacts are given in Appendix X1.

7. Dimensions, Mass, and Permissible Variations

7.1 Permissible variations in dimensions shall be within the limits specified on drawings describing the contacts and accompanying the order, or shall be within the limits specified in the purchase order.

8. Finishing of Contacts—Workmanship, Finish, and Appearance

8.1 The parts shall be free of defects, in material or processing, that would seriously affect their performance.



8.2 *Finishing of Contacts*—The material shall be finished by such operations as necessary to meet requirements agreed upon between the manufacturer and the purchaser of the contacts (braze alloy backing, tumbling to polish surfaces, special surface finish, silver-rich surface layer, cleaning, etc.).

~~9. Workmanship, Finish, and Appearance~~

~~9.1 The parts shall be free of defects in material or processing, that would seriously affect their performance.~~

9. Sampling

9.1 *Lot*—Unless otherwise specified, a lot shall consist of parts of the same form and dimensions, made of powders of the same particle size range and composition, processed under the same conditions, and submitted for inspection at the same time.

9.2 *Chemical Analysis*

9.2.1 At least one sample for chemical analysis shall be taken from each lot. A representative sample of chips may be obtained by milling, drilling, or crushing at least two pieces with dry tools, without lubrication. In order to obtain oil free chips, the parts selected for test shall have the oil extracted in accordance with Test Method B328, if necessary.

9.2.2 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.

9.3 *Physical Tests*—The manufacturer and the purchaser shall agree on a representative number of specimens for physical tests including microstructure.

10. Inspection

10.1 Unless otherwise specified, inspection of parts supplied on contract shall be made by the purchaser.

11. Rejection and Rehearing

[ASTM B663/B663M-20](https://standards.iteh.ai/catalog/standards/sist/a3f546d0-3f7f-4b06-9c47-5f9641e8812c/astm-b663-b663m-20)

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11.1 *Rejection:*

11.1.1 Product that fails to conform to the specification requirements when tested by the purchaser or purchaser's agent shall be subject to rejection.

11.1.2 Rejection shall be reported to the manufacturer or supplier promptly. In addition, a written notification of rejection shall follow.

11.1.3 In case of dissatisfaction with results of the test upon which rejection is based, the manufacturer, or supplier, shall have the option to make claim for a rehearing.

~~11.2 Unless otherwise specified, rejections based on tests made in accordance with the specification shall be reported to the manufacturer within 30 days of the receipt of the shipment.~~*Rehearing:*

11.2.1 As a result of product rejection, the manufacturer, or supplier, shall have the option to make claim for a retest to be conducted by the manufacturer, or supplier, and the purchaser. Samples of the rejected product shall be taken in accordance with the product specification and subjected to test by both parties using the test method(s) specified in the product specification, or alternately, upon agreement of both parties, an independent laboratory may be selected for the test(s) using the test method(s) specified in the product specification.

12. Certification

~~12.1 A certification, when requested by the user, based on the manufacturer's quality control that the material conforms to the~~