



Designation: B693 – 17 (Reapproved 2022)

# Standard Specification for Silver-Nickel Electrical Contact Materials<sup>1</sup>

This standard is issued under the fixed designation B693; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers electrical contact components made from silver nickel by powder metallurgical procedures.

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

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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, health, and 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:*<sup>2</sup>

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for Density, Oil Content, and Interconnected Porosity of Sintered Metal Structural Parts and Oil-Impregnated Bearings (Withdrawn 2009)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

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

<sup>1</sup> 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

**E18** Test Methods for Rockwell Hardness of Metallic Materials

**E384** Test Method for Microindentation Hardness of Materials

## 3. Ordering Information

3.1 Orders for this material under this specification shall include the following information.

3.1.1 Dimensions—Thickness, width, length, diameter, coil size or other pertinent sizes (see Section 6).

3.1.2 Chemical composition and mechanical properties (see reference table in **Appendix X1**).

3.1.3 Physical properties (see Section 5 and reference table in **Appendix X1**).

3.1.4 Certification (see Section 12).

3.1.5 Other features as agreed upon between the seller and the user.

## 4. Alloy Composition and Impurities

4.1 The alloys (material) shall conform to composition and impurity limits as agreed upon between the manufacturer and user.

4.2 The chemical analysis shall be made in accordance with the methods described in the newest edition of *Annual Book of ASTM Standards*, Vol 03.05 and 03.06, or by any other approved method agreed upon between manufacturer and purchaser.

## 5. Physical and Mechanical Requirements

5.1 The manufacturer and purchaser shall agree on qualification tests for determination of physical and mechanical properties.

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

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

5.4 The typical properties of the most common types of silver-nickel electrical contact materials are given in **Table X1.1** of **Appendix X1**.

## 6. Dimensions, Mass, and Permissible Variations

6.1 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.

## 7. Workmanship, Finish, and Appearance

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

## 8. Sampling, Testing and Retesting

8.1 *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 one time.

8.2 *Chemical Analysis*—The manufacturer and purchaser shall agree on a representative number of specimens for composition and impurity analysis. A representative sample of chips may be obtained by milling, drilling, or crushing with dry tools, (without lubrication). In order to obtain free chips, the parts selected for test shall have the oil extracted in accordance with Test Method **B328**, if necessary.

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

## 9. Significance and Use

9.1 Proprietary methods for 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, it is recommended that the user functionally test the materials electrically for all devices applicable to the material's use. This specification provides a means for the contact manufacturer and contact user to reach agreement on the details of 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 contact supplied.

## 10. Inspection

10.1 Inspection of the material shall be in accordance with Specification **B476** or as agreed upon between the purchaser and the supplier as part of the purchase contract.

## 11. Rejection and Rehearing

11.1 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 shipment.

## 12. Certification

12.1 When a request is made at the time of cost quotation and when specified in the purchase order or contract, a producer's or supplier's certification shall be furnished to the purchaser that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements. When specified in the purchase order or contract, a report of the test results shall be furnished.

## 13. Keywords

13.1 contacts; electrical contacts; electrical contact materials; impurities; silver-nickel

<https://standards.iteh.ai/catalog/standards/sist/bf160541-f64a-4ab2-880a-f40dfdcce0378/astm-b693-172022>

## APPENDIX

### (Nonmandatory Information)

#### X1. TYPICAL PROPERTY VALUES

X1.1 The following information provides guidelines for users and manufacturers of silver-nickel contact materials (**Table X1.1**). These properties are influenced by particle size, homogeneity, impurities or additives, and other manufacturing process variables. For example, the specific gravity and hardness of fabricated wire or strip, in general, are higher than for press-sinter-repress materials. Tensile strength values versus the amount of cold work for wire varies considerably depend-

ing upon the annealing temperature used and the microstructure. The best choice for a given application should be mutually decided between the purchaser and the supplier, using their mutual experience and application knowledge.

X1.2 With the knowledge that many manufacturing process variables are available, if a vendor change is made, noticeable property or performance variations are possible.