



# Standard Specification for Electroplated Engineering Nickel Coatings<sup>1</sup>

This standard is issued under the fixed designation B689; 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 the requirements for electroplated nickel coatings applied to metal products for engineering applications, for example, for use as a buildup for mismatched or worn parts, for electronic applications, including as underplates in contacts or interconnections, and in certain joining applications.

1.2 Electroplating of nickel for engineering applications (**Note 1**) requires technical considerations significantly different from decorative applications because the following functional properties are important:

- 1.2.1 Hardness, strength, and ductility,
- 1.2.2 Wear resistance,
- 1.2.3 Load bearing characteristics,
- 1.2.4 Corrosion resistance,
- 1.2.5 Heat scaling resistance,
- 1.2.6 Fretting resistance, and
- 1.2.7 Fatigue resistance.

**NOTE 1**—Functional electroplated nickel coatings usually contain about 99 % nickel, and are most frequently electrodeposited from a Watts nickel bath or a nickel sulfamate bath. Typical mechanical properties of nickel electroplated from these baths, and the combined effect of bath operation and solution composition variables on the mechanical properties of the electrodeposit are given in Guide B832. When electroplated nickel is required to have higher hardnesses, greater wear resistance, certain residual stress values and certain leveling characteristics, sulfur and other substances are incorporated in the nickel deposit through the use of certain addition agents in the electroplating solution. For the effect of such additives, see Section 4 and Annex A3. Cobalt salts are sometimes added to the plating solution to produce harder nickel alloy deposits.

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 establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B08 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.03 on Engineering Coatings.

Current edition approved Dec. 1, 2013. Published December 2013. Originally approved in 1981. Last previous edition approved in 2008 as B689 – 97(2008). DOI: 10.1520/B0689-97R13.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- B183 Practice for Preparation of Low-Carbon Steel for Electroplating
- B242 Guide for Preparation of High-Carbon Steel for Electroplating
- B252 Guide for Preparation of Zinc Alloy Die Castings for Electroplating and Conversion Coatings
- B253 Guide for Preparation of Aluminum Alloys for Electroplating
- B254 Practice for Preparation of and Electroplating on Stainless Steel
- B281 Practice for Preparation of Copper and Copper-Base Alloys for Electroplating and Conversion Coatings
- B320 Practice for Preparation of Iron Castings for Electroplating
- B322 Guide for Cleaning Metals Prior to Electroplating
- B343 Practice for Preparation of Nickel for Electroplating with Nickel
- B374 Terminology Relating to Electroplating
- B480 Guide for Preparation of Magnesium and Magnesium Alloys for Electroplating
- B487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section
- B499 Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals
- B507 Practice for Design of Articles to Be Electroplated on Racks
- B530 Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Electrodeposited Nickel Coatings on Magnetic and Nonmagnetic Substrates
- B558 Practice for Preparation of Nickel Alloys for Electroplating
- B568 Test Method for Measurement of Coating Thickness by X-Ray Spectrometry

<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.