



Standard Specification for Iron-Nickel-Cobalt Alloys for Metal-to-Ceramic Sealing Applications¹

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1. Scope

1.1 This specification covers two iron-nickel-cobalt alloys, the former, (UNS No. K94630), containing nominally 29 % nickel, 17 % cobalt, and 53 % iron, the latter, (UNS No. K94620), nominally 27 % nickel, 25 % cobalt and 48 % iron, in the forms of wire, rod, bar, strip, sheet, and tubing, intended primarily for brazed metal-to-ceramic seals with alumina ceramics, for vacuum electronic applications. Unless otherwise indicated, all articles apply to both alloys.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 The following hazard caveat pertains only to the test method portion, Sections 14 and 16 of this specification. *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.*

2. Referenced Documents

2.1 ASTM Standards:

- D 171 Practices for Digestion of Samples for Determination of Metals by Flame Atomic Absorption or Plasma Emission Spectroscopy²
- E 3 Methods of Preparation of Metallographic Specimens³
- E 8 Test Methods for Tension Testing of Metallic Materials³
- E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials³
- E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁴
- E 45 Practice for Determining the Inclusion Content of Steel³
- E 92 Test Method for Vickers Hardness of Metallic Materials³
- E 112 Test Methods for Determining Average Grain Size³

¹ This specification is under the jurisdiction of ASTM Committee F-1 on Electronics and is the direct responsibility of Subcommittee F01.03 on Metallic Materials.

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² Annual Book of ASTM Standards, Vol 11.01.

³ Annual Book of ASTM Standards, Vol 03.01.

⁴ Annual Book of ASTM Standards, Vol 14.02.

E 140 Standard Hardness Conversion Tables for Metals³

E 228 Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer⁴

E 354 Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic and Other Similar Iron, Nickel and Cobalt Alloys⁵

E 1019 Test Methods for Determination of Carbon, Sulfur, Nitrogen, Oxygen and Hydrogen in Steel and in Iron, Nickel and Cobalt Alloys⁶

E 1060 Practice for Interlaboratory Testing of Spectrochemical Methods of Analysis⁶

F 15 Specification for Iron-Nickel-Cobalt Sealing Alloy⁷

3. Ordering Information

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

- 3.1.1 Alloy, as indicated with UNS number,
- 3.1.2 Size,
- 3.1.3 Temper designation (Section 6),
- 3.1.4 Surface finish (Section 10),
- 3.1.5 Marking and packaging (Section 19), and
- 3.1.6 Certification, if required. Please note that certification should include traceability of the heat to the original manufacturer.

4. Chemical Requirements

4.1 Each alloy shall conform to the requirements as to chemical composition prescribed in Table 1.

5. Surface Lubricants

5.1 All lubricants used during cold-working operations, such as drawing, rolling, or spinning, shall be capable of being removed readily by any of the common organic degreasing solvents.

6. Temper

6.1 The desired temper of the material shall be specified in the purchase order.

6.2 *Tube*—Unless otherwise agreed upon between the supplier or the manufacturer and the purchaser, these forms shall

⁵ Annual Book of ASTM Standards, Vol 03.05.

⁶ Annual Book of ASTM Standards, Vol 03.06.

⁷ Annual Book of ASTM Standards, Vol 10.04.

