



Designation: B 603 – 90 (Reapproved 2001)

Standard Specification for Drawn or Rolled Iron-Chromium-Aluminum Alloys for Electrical Heating Elements¹

This standard is issued under the fixed designation B 603; 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.

1. Scope

1.1 This specification covers annealed, drawn, or rolled shapes for electrical heating and resistance purposes of alloys consisting mainly of iron, chromium, and aluminum as detailed in Table 1.

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.

2. Referenced Documents

2.1 ASTM Standards:

- A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products²
- B 63 Test Method for Resistivity of Metallically Conducting Resistance and Contact Materials³
- B 70 Test Method for Change of Resistance with Temperature of Metallic Materials for Electrical Heating³
- B 78 Test Method of Accelerated Life of Iron-Chromium-Aluminum Alloys for Electrical Heating³

3. Terminology

3.1 Definitions:

3.1.1 *lot size*—the lot size for determining compliance with the requirements of this specification shall be one heat.

4. Significance and Use

4.1 This specification on iron-chromium-aluminum alloys contains the requirements for chemistry, electrical resistance, mechanical properties, resistance change with temperature, and packaging.

4.2 Determination of properties is not required for routine acceptance of material unless specified by the purchaser.

5. Chemical Requirements

5.1 The alloys shall conform to the requirements as to chemical composition prescribed in Table 1.

¹ This test method is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.10 on Thermostat Metals.

Current edition approved May 25, 1990. Published July 1990. Originally published as B 603 – 75. Last previous edition B 603 – 77.

² Annual Book of ASTM Standards, Vol 01.03.

³ Annual Book of ASTM Standards, Vol 03.04.

TABLE 1 Chemical Requirements

Class	Resistivity Range		Composition Range, %	
	Ω -cmil/ft	$\mu\Omega$ -cm	Al	Cr
I	825 to 920	135 to 150	5.00 to 6.00	20 to 24
IIA	795 to 880	130 to 144	4.75 to 5.75	20 to 24
IIB	770 to 855	130 to 144	4.00 to 5.25	20 to 24
III	715 to 785	119 to 130	3.75 to 4.75	13 to 16
IV	665 to 735	111 to 122	2.75 to 3.75	12 to 15

5.2 *Samples for Chemical Analysis*—Specimens for chemical analysis may be taken either from the melt or from a sample of finished material that is representative of the lot.

5.3 *Chemical Analysis*—The chemical analysis shall be made in accordance with accepted practices.

6. Physical Requirements

6.1 The material shall be thoroughly and uniformly annealed.

6.2 Wire shall conform to the following elongation requirements:

Size	Elongation in 10-in. (250-mm) minimum, %
0.0035 in. (No. 39 Awg)(0.089 mm) and larger	12
0.0031 to 0.0020 in. (Nos. 40 to 44 Awg) (0.079 to 0.015 mm)	6

7. Nominal Resistivity

7.1 The nominal resistivity shall be the resistivity of the wire as quenched from a temperature above 1450°F(788°C). The numerical values of the resistivity range at 77°F(25°C) shall be as shown in Table 1.

8. Test for Resistivity

8.1 The resistivity shall be determined in accordance with Test Method B 63.

9. Nominal Electrical Resistance for Unit Length

9.1 The nominal resistance per unit length for round wire shall be calculated from the nominal resistivities and the nominal cross-sectional area.

NOTE 1—Actual values of resistivity and resistance change with temperature have not been tabulated as they vary considerably with minor composition differences. Individual manufacturers should be contacted for