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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 7701C

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Superseding AMS 7701B

Submitted for recognition as an American National Standard

NICKEL-IRON ALLOY, MAGNETIC, SHEET AND STRIP
Annealed

1. SCOPE:

1.1 Form:

This specification covers two types of magnetic nickel-iron alloy in the form of sheet and strip.

1.2 Application:

These products have been used typically for magnetic circuit parts that require high magnetic permeability at low flux densities with the fabricated parts to be annealed in dry hydrogen, but usage is not limited to such applications.

1.3 Classification:

The magnetic alloys covered by this specification are classified as follows:

Type 1 - Nickel plus iron and other alloying elements, usually copper and chromium. Type 1 may be required for applications involving severe forming.

Type 2 - Nickel plus iron and other alloying elements, usually copper and/or molybdenum.

1.3.1 Unless a specific type is specified, either type may be supplied.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2262 Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate
MAM 2262 Tolerances, Metric, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate
AMS 2371 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS 2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 596 Direct-Current Magnetic Properties of Materials Using Ring Test Procedures and the Ballistic Methods
ASTM A 773 D-C Magnetic Properties of Materials Using Ring and Permeameter Procedures with D-C Electronic Hysteresigraphs.
ASTM E 18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall be an alloy containing approximately 80% nickel plus iron and other alloying elements (see 1.3) in such proportions as required to provide a product meeting the requirements of 3.3.

3.2 Condition:

Hot rolled with or without subsequent cold reduction, annealed, and descaled, having a surface appearance comparable to the following commercial corrosion-resistant steel finishes as applicable (see 8.2).

3.2.1 Sheet: No. 2D finish.

3.2.2 Strip: No. 1 strip finish.
(R)

3.3 Properties:

The product shall conform to the following requirements:

3.3.1 Hardness: Shall be not higher than 75 HRB, or equivalent (see 8.3), determined in accordance with ASTM E 18.

3.3.2 Magnetic Properties: Shall be as shown in Table 1, determined in accordance with ASTM A 596 or ASTM A 773 on specimens as in 4.3.1 annealed by heating to 2150 °F ± 25 (1177 °C ± 14) in a dry hydrogen atmosphere having a dew point of -60 °F (-51 °C) or lower, holding at heat for 4 hours ± 0.25, and cooling in a non-oxidizing atmosphere at a rate not greater than 100 F (56 C) degrees per hour to 800 °F (427 °C) or lower or at a cooling rate recommended by the alloy producer (see 8.4).

TABLE 1 - Minimum Magnetic Properties

Property	Value
3.3.2.1 Maximum permeability	250,000
3.3.2.2 Permeability at 100 gauss (0.01T)	70,000
3.3.2.3 Induction at 100 Oersteds (7958 A/m)	7,500 gauss (0.75T)

3.4 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

3.5 Tolerances:

Shall conform to all applicable requirements of AMS 2262 or MAM 2262.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:
(R)

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2371 and the following:

4.3.1 Samples for magnetic properties testing shall be selected in accordance with one of the following methods; the sampling method used shall be reported with the test results:

4.3.1.1 A pilot sample nominally 0.014 inch (0.36 mm) thick from each heat of alloy.

4.3.1.2 One or more samples selected at random from each lot.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of test for hardness of each lot and the magnetic properties of each heat or lot, as applicable. This report shall include the purchase order number, heat and lot number, AMS 7701C, cooling rate if other than 100 F (55 C) degrees per hour, method of test and sampling for magnetic properties, size, and quantity.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2371.

5. PREPARATION FOR DELIVERY:

5.1 Identification:
(R)

Shall be in accordance with AMS 2807.

5.2 Packaging:

5.2.1 (R) The product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.

5.2.2 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-163, Commercial Level, unless Level A is specified in the request for procurement.

6. ACKNOWLEDGMENT:

A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS:

Product not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.