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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 7705C

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Superseding AMS 7705B

Submitted for recognition as an American National Standard

NICKEL-IRON MAGNETIC ALLOY, BARS AND FORGINGS

1. SCOPE:

1.1 Form:

This specification covers a magnetic nickel-iron alloy in the form of bars, forgings, and forging stock.

1.2 Application:

These products have been used typically in magnetic circuits requiring high magnetic permeability at low flux densities after high temperature annealing in hydrogen, but usage is not limited to such applications.

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 2241	Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
MAM 2241	Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
AMS 2371	Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS 2374	Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steel and Alloy Forgings
AMS 2806	Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys
AMS 2808	Identification, Forgings

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 DC 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 a metallic alloy containing approximately 80% nickel plus iron and other alloying elements, usually copper and chromium or molybdenum, in such proportions as will provide a product meeting the requirements of 3.3.

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 Bars: Annealed and descaled.

3.2.2 Forgings: As ordered.

3.2.3 Forging Stock: As ordered by the forging manufacturer.

3.3 Properties:

The product shall conform to the following requirements:

3.3.1 Bars and Forgings:

3.3.1.1 Hardness: Bars, and forgings after being annealed, shall have hardness not higher than 75 HRB, or equivalent (see 8.2), determined in accordance with ASTM E 18.

3.3.1.2 Magnetic Properties: Shall be as shown in Table 1, determined in accordance with ASTM A 596 or ASTM A 773 after annealing the product by heating, in a dry hydrogen atmosphere having a dew point of -60 °F (-51 °C) or lower, to 2150 °F ± 25 (1177 °C ± 14), holding at heat for 4 hours ± 0.25, and cooling to 800 °F (427 °C) or below at a rate not greater than 100 F (56 C) degrees per hour in a nonoxidizing atmosphere.

TABLE 1 - Minimum Magnetic Properties

Maximum Permeability	175,000
Permeability at 100 gauss	42,000
Induction at 100 oersteds, gauss	7,500

3.3.2 Forging Stock: As agreed upon by purchaser and vendor.

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:

Bars shall conform to all applicable requirements of AMS 2241 or MAM 2241.

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 the following.
(R)

4.3.1 Bars and Forging Stock: AMS 2371

4.3.2 Forgings: AMS 2374

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests for composition, when specified, and magnetic properties of each heat and for hardness of each lot. This report shall include the purchase order number, heat and lot number, AMS 7705C, size, and quantity. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.5 Resampling and Retesting:

Shall be in accordance with the following:

4.5.1 Bars and Forging Stock: AMS 2371

4.5.2 Forgings: AMS 2374

5. PREPARATION FOR DELIVERY:

5.1 Identification:

Shall be as follows:

5.1.1 Bars: In accordance with AMS 2806.

5.1.2 Forgings: In accordance with AMS 2808.

5.1.3 Forging Stock: As agreed upon by purchaser and vendor.

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.

8. NOTES:

8.1 Revision Indicator:

The (R) symbol is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this specification. If the symbol is next to the specification title, it indicates a complete revision of the specification.

8.2 The Fahrenheit temperatures are primary; the Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.