



AEROSPACE MATERIAL

Society of Automotive Engineers, Inc.

400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

SPECIFICATION

AMS 7705A

Superseding AMS 7705

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MAGNETIC ALLOY BARS AND FORGINGS Nickel-Iron Alloy

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: Primarily for parts used in magnetic circuits requiring high magnetic permeability at low flux densities after high temperature annealing in hydrogen.
2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

- 2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2241 - Tolerances, Corrosion and Heat Resistant Steel Bars and Wire and Titanium and Titanium Alloy Bars and Wire
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings
AMS 2374 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Forgings and Forging Stock
AMS 2806 - Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Heat and Corrosion Resistant Steels and Alloys
AMS 2808 - Identification, Forgings

- 2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM A596 - Direct Current Magnetic Properties of Materials Using Ring Test Procedures and the Ballistic Methods

ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

- 2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

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, 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:

SAE Technical Board rules provide that: "All technical reports, including standards, approved practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against infringement of patents."

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 Forging:

3.3.1.1 Hardness: Bars, and forgings after being annealed, shall have hardness not higher than 75 HRB or equivalent, determined in accordance with ASTM E18.

3.3.1.2 Magnetic Properties: Shall be as follows, determined in accordance with ASTM A596 after annealing the product by heating, in a dry hydrogen atmosphere having a dew point of -60°F (-51°C) or lower, to $2150^{\circ}\text{F} \pm 25$ ($1177^{\circ}\text{C} \pm 15$) holding at heat for $4 \text{ hr} \pm 0.25$, and cooling to 1100°F (593°C) or below at a rate not greater than $100 \text{ F (56 C) deg per hr}$ in a non-oxidizing atmosphere:

3.3.1.2.1 Maximum permeability, min 70,000

3.3.1.2.2 Permeability at 100 gaussess, min 15,000

3.3.1.2.3 Induction at 100 oersteds, gaussess, min 7,500

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

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

3.5 Tolerances: Unless otherwise specified, tolerances for bars shall conform to all applicable requirements of AMS 2241.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests.

4.3 Sampling: Shall be in accordance with the following; a lot shall be all product of the same nominal size from the same heat:

4.3.1 Bars: AMS 2371.

4.3.2 Forgings and Forging Stock: AMS 2374.

4.3.3 Sampling for magnetic properties shall be as agreed upon by purchaser and vendor.

4.4 Reports:

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