SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS7705	REV. F

Issued 1957-07
Revised 2006-02
Cancelled 2010-12

Superseded by ASTM A 753

Nickel-Iron Magnetic Alloy, Bars and Forgings

RATIONALE

AMS7705F has been designated Cancelled based on results of a survey to aerospace users and producers.

CANCELLATION NOTICE

This specification has been declared “CANCELLED” by the Aerospace Materials Division, SAE, as of December 2010 and has been superseded by ASTM A 753 as shown below. The requirements of the latest issue of ASTM A 753 shall be fulfilled whenever reference is made to the cancelled AMS7705. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications, noting that it has been superseded by ASTM A 753.

Cancelled specifications are available from SAE.

AMS7705 Bars superseded by ASTM A753, Alloy Type 4 Bars "Wrought Nickel-Iron Soft Magnetic Alloys (UNS K94490, K94840, N14076, N14080)"

AMS7705 Forging Stock superseded by ASTM A753, Alloy Type 4 Forging Billets "Wrought Nickel-Iron Soft Magnetic Alloys (UNS K94490, K94840, N14076, N14080)"

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
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SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS7705F

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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS 2241	Tolerances, 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 International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A 596 Direct-Current Magnetic Properties of Materials Using Ballistic Method and Ring Specimens
ASTM A 773 DC Magnetic Properties of Materials Using Ring and Permeameter Procedures with DC Electronic Hysteresigraphs
ASTM E 18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

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 (See 8.2) 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 8.3), 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 on specimens as in 4.3.3 annealed 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 in a non-contaminating atmosphere to 800 °F (427 ºC) or below at a rate not greater than 100 F (56 C) degrees per hour or at a cooling rate recommended by the alloy producer (see 8.2).

TABLE 1 – Annealed Minimum Magnetic Properties

Property	Value
Maximum permeability	175,000
Permeability at 100 gauss (0.01T)	42,000
Induction at 100 oersteds (7958 A/m), gauss	7,500 (0.75T)

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.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

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

4.2 Classification of Tests

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

4.3 Sampling and Testing

Shall be as follows:

4.3.1 Bars and Forging Stock

In accordance with AMS 2371.

4.3.2 Forgings

In accordance with AMS 2374.

4.3.3 For magnetic property tests, one or more samples shall be 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 tests for the three Table 1 magnetic properties and hardness of each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS 7705E, cooling rate if other than 100 F (56 C) degrees per hour, size, and quantity. If forgings are supplied, 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.