Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 7718A
Superseding AMS 7718
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MAGNETIC ALLOY BARS, TUBING, AND FORGINGS
50Ni - 50Fe

1. SCOPE:

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

1.2 Application: Primarily for parts used in magnetic circuits requiring high magnetic permeability and saturation induction 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, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
AMS 2243 - Tolerances, Corrosion and Heat Resistant Steel Tubing
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Wrought Products Except Forgings and Forging Stock
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 A341 - Direct-Current Magnetic Properties of Materials Using D-C Permeameters and the Ballistic Test 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.

2.3.1 Military Standards:

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

Printed in U.S.A.

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall be an alloy containing approximately 50% nickel and 50% iron with other alloying elements in such proportions as required to 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, Rods, and Tubing: Cold drawn; standards for acceptance of surface appearance shall be as agreed upon by purchaser and vendor.

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:

ø 3.3.1 Hardness: Shall be not lower than 90 HRB or equivalent, determined in accordance with ASTM E18.

3.3.2 Magnetic Properties: Shall be as follows, determined in accordance with ASTM A341 on specimens
ø as in 4.3.1 annealed by heating to 2150° F ± 25 (1175° C ± 15) in a dry hydrogen atmosphere having a dew point of -60° F (-50° C) or lower, holding at heat for 4 hr ± 0.25, and cooling in a non-oxidizing atmosphere at a rate not greater than 100 F (56 C) deg per hr to 1100° F (595° C) or lower or at a cooling rate recommended by the alloy producer:

3.3.2.1 Maximum Permeability, min

Nominal Diameter or Distance Between Parallel Sides		
Inches	(Millimetres)	
Up to 5/16, excl	(Up to 7.9, excl)	40,000
5/16 and Over	(7.9 and Over)	20,000

3.3.2.2 Permeability at 100 Gausses (0.001T), min

Nominal Diameter or Distance Between Parallel Sides		
Inches	(Millimetres)	
Up to 5/16, excl	(Up to 7.9, excl)	6,000
5/16 and Over	(7.9 and Over)	4,000

3.3.2.3 Induction at 100 Oersteds (7958 A/m), min 15,000 gausses (1.5T)

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

3.5 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight bars, rods, and
ø tubing will be acceptable in mill lengths of 6 - 20 ft (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 ft (3 m).

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of the following:

3.6.1 Bars and Rods: AMS 2241.

3.6.2 Tubing: AMS 2243.

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 and shall be performed on each lot.

4.3 Sampling: Shall be in accordance with the following; a lot shall be all product of the same nominal diameter or distance between parallel sides from the same heat of alloy:

4.3.1 Bars, Rods, and Tubing: AMS 2371.

4.3.2 Forgings and Forging Stock: AMS 2374.

4.3.3 Samples for magnetic properties (3.3.2) testing shall, unless otherwise specified, be selected in accordance with either 4.3.3.1 or 4.3.3.2; the sampling method used shall be reported with the test results.

4.3.3.1 A pilot sample nominally 0.014 in. (0.35 mm) thick from each heat of alloy.

4.3.3.2 A sample taken at random from finished product of the same nominal thickness from the same heat of alloy.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report showing the method of sampling for magnetic properties and the results of tests for hardness of each lot and the magnetic properties of each heat. This report shall include the purchase order number, heat number, material specification number and its revision letter, cooling rate if other than 100 F (56 C) deg per hr, thickness of sample used for magnetic properties testing, 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.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with the following:

4.5.1 Bars, Rods, and Tubing: AMS 2371.