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

AEROSPACE MATERIAL SPECIFICATION

AMS 7717A
Superseding AMS 7717

Issued 1-15-61
Revised 10-15-79

MAGNETIC ALLOY SHEET AND STRIP
50Ni - 50Fe
Forming Grade

1. SCOPE:

1.1 Form: This specification covers a magnetic nickel-iron alloy in the form of sheet and strip.

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 2242 - Tolerances, Corrosion and Heat Resistant Steel and Iron-Base Alloy Sheet, Strip, and Plate and Titanium and Titanium Alloy Sheet, Strip, and Plate
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

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

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: Hot rolled with or without subsequent cold reduction, annealed, and descaled having a surface appearance comparable to a commercial corrosion-resistant steel No. 2D finish; standards for acceptance shall be as agreed upon by purchaser and vendor.

3.3 Properties: The product shall conform to the following requirements:

3.3.1 Hardness: Shall be not higher than the following, determined in accordance with ASTM E18:

Nominal Thickness		Hardness
Inch	(Millimetres)	HRB
0.006 to 0.059, incl	(0.15 to 1.50, incl)	75
Over 0.059	(Over 1.50)	85

3.3.2 Magnetic Properties: Shall be as follows, determined in accordance with ASTM A341 on specimens 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 unless another cooling rate is recommended by the alloy producer:

3.3.2.1 Maximum Permeability, min

Nominal Thickness		
Inch	(Millimetres)	
Up to 0.020, excl	(Up to 0.51, excl)	60,000
0.020 and over	(0.51 and Over)	40,000

3.3.2.2 Permeability at 100 Gausses (0.001T), min

Nominal Thickness		
Inch	(Millimetres)	
Up to 0.020, excl	(Up to 0.51, excl)	8,000
0.020 and over	(0.51 and Over)	6,000

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

3.4 Quality: The product, as received by purchaser, shall be uniform in quality and condition, 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 shall conform to all applicable requirements of AMS 2242.

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 AMS 2371 and the following; a lot shall be all product of the same nominal thickness from the same heat of alloy:

4.3.1 Samples for magnetic properties (3.3.2) testing shall, unless otherwise specified, be selected in ø accordance with either 4.3.1.1 or 4.3.1.2; the sampling method used shall be reported with the test results:

ø 4.3.1.1 A pilot sample nominally 0.014 in. (0.35 mm) thick from each heat of alloy.

ø 4.3.1.2 A sample taken at random from finished product from each lot.

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 ø 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 and test specimen thickness used for magnetic properties, size, and quantity from each heat.

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.

ø 4.5 Resampling and Retesting: Shall be in accordance with AMS 2371.

5. PREPARATION FOR DELIVERY:

ø 5.1 Identification: The product shall be identified as in 5.1.1 unless purchaser permits a method from 5.1.2.

5.1.1 Each sheet and strip shall be marked on one face, in the respective location indicated below, with AMS 7717A, heat number, manufacturer's identification, and nominal thickness. The characters shall ø be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the product or its performance and shall be sufficiently stable to withstand normal handling.

5.1.1.1 Flat Strip 6 In. (152 mm) and Under in Width: Shall be marked in one or more lengthwise rows of ø characters recurring at intervals not greater than 3 ft (914 mm).

5.1.1.2 Flat Sheet and Flat Strip Over 6 In. (152 mm) in Width: Shall be marked in lengthwise rows of ø characters recurring at intervals not greater than 3 ft (914 mm), the rows being spaced not more than 6 in. (152 mm) apart and alternately staggered.

5.1.1.3 Coiled Sheet and Strip: Shall be marked near both the outside and inside ends of the coil; the ø markings shall be applied as in 5.1.1 or shall appear on a durable tag or label attached to the coil and marked with the information of 5.1.1. When the inside end of the coil is inaccessible, as when the product is wound on cores, the tag or label may be attached to the core.

5.1.2 When purchaser permits, each sheet and strip may be marked near one end, coils being marked near the outside end, with AMS 7717A, heat number, manufacturer's identification, and nominal thickness, ø using any suitable marking fluid. As an alternate method, individual pieces and bundles shall have attached a durable tag marked with the above information or shall be boxed and the box marked with the same information.