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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 7712D

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Superseding AMS 7712C

Steel Sheet and Strip, Flat-Rolled, Electrical, Non-Oriented 3.0(Si + Al) Type 47S178 or Type 64S194, Semi-Processed

CANCELLATION NOTICE

This specification has been "CANCELLED" by the Aerospace Materials Division, SAE, as of September 2000. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications noting that it has been cancelled.

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1. SCOPE:

1.1 Form:

This specification covers two types of semi-processed silicon steel in the form of sheet and strip supplied in coils or cut lengths.

1.2 Application:

Primarily for 50 to 60 Hz power frequency applications in magnetic devices such as motors and generators, and similar apparatus where medium core losses are desired; where purchaser anneals the product to develop the desired core loss and permeability characteristics.

1.3 Classification:

The steels covered by this specification are classified as follows:

Type 47S178 - Product 0.0185 in. (0.47 mm) thick
Type 64S194 - Product 0.025 in. (0.64 mm) thick

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 SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 Standards and Test Methods
AMS 2370 Quality Assurance Sampling of Carbon and Low-Alloy Steels, 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 A343 Alternating-Current Magnetic Properties of Materials at Power Frequencies Using the Wattmeter-Ammeter-Voltmeter Method and 25-cm Epstein Test Frame

2.3 U.S. 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 a low-carbon steel containing approximately 3% silicon and other alloying elements, usually aluminum, in such applications as required to provide a product meeting the requirements of 3.3.

3.2 Condition:

Semi-processed (See 8.3) and, unless otherwise specified, uncoated.

3.3 Magnetic Properties:

The product shall conform to the following requirements (density of 7.65 g/cm^3 is assumed):

3.3.1 Core Loss: Shall be not greater than the following, determined in accordance with ASTM A343 on 50/50 Epstein specimens as in 4.3.1, annealed by heating in a non-carburizing atmosphere to not lower than 1450°F (790°C) and furnace cooling:

	Maximum		
	W/lb	W/kg	W/kg
Type	60 Hz	60 Hz	50 Hz
47S178	1.78	3.92	3.10
64S194	1.94	4.28	3.38

3.3.2 Permeability: Typical permeability shall be as high as possible consistent with the required core loss limits (See 3.3.1) that govern the grade. Typical permeability (μp) shall be as follows, calculated from measurements of peak exciting current at an induction of 15 kilogausses (1.5 T) in accordance with ASTM A343 on annealed 50/50 grain Epstein specimens:

Type	Typical μP
47S178	1000
64S194	1300

3.3.3 Exciting Current: The root-mean-square (rms) exciting current required to produce a given flux density in terms of rms ampere-turns per centimetre (At/cm) of magnetic path length (A-C exciting force) equivalent to the permeability values (See 3.3.2) are approximately:

Type	Typical At/cm
47S178	6.5
64S194	5.5

3.3.4 Lamination Factor: The lamination factor, measured at 100 psi (6.90 kPa), shall be as high as practicable consistent with the thickness, surface smoothness, coating, and amount of oxide; and shall be between 95 and 98 percent.

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, the following tolerances shall apply.

3.5.1 Thickness:

TABLE I

Specified Thickness Inch	Thickness Tolerance, Inch, Plus and Minus Specified Width, Inches			
	Up to 6, incl	Over 6 to 12, incl	Over 12 to 36, incl	Over 36 to 48, incl
0.0185	0.0015	0.002	0.002	0.003
0.025	0.002	0.002	0.003	0.003

TABLE I (SI)

Specified Thickness Millimetre	Thickness Tolerance, Millimetre, Plus and Minus Specified Width, Millimetres			
	Up to 150, incl	Over 150 to 300, incl	Over 300 to 900, incl	Over 900 to 1200, incl
0.47	0.038	0.050	0.050	0.075
0.64	0.050	0.050	0.075	0.075

3.5.2 Width:

TABLE II

Specified Width Inches	Tolerance, Inch plus	Tolerance, Inch minus
Up to 6, incl	0.008	0.008
Over 6 to 10, incl	0.016	0.016
Over 10 to 15, incl	0.032	0.032
Over 15 to 20, incl	1/8	0
Over 20 to 32, incl	3/16	0
Over 32 to 48, incl	1/4	0

TABLE II (SI)

Specified Width Millimetres	Tolerance, Millimetres plus	Tolerance, Millimetres minus
Up to 150, incl	0.20	0.20
Over 150 to 250, incl	0.40	0.40
Over 250 to 375, incl	0.80	0.80
Over 375 to 500, incl	3.1	0
Over 500 to 800, incl	4.8	0
Over 800 to 1200, incl	6.2	0

3.5.3 Length:

TABLE III

Specified Length Inches	Tolerance, Inch plus	Tolerance, Inch minus
Up to 30, incl	1/8	0
Over 30 to 60, incl	1/4	0
Over 60 to 96, incl	1/2	0
Over 96 to 120, incl	3/4	0
Over 120 to 144, incl	1	0

TABLE III (SI)

Specified Length Millimetres	Tolerance, Millimetres plus	Tolerance, Millimetres minus
Up to 750, incl	3.2	0
Over 750 to 1500, incl	6.2	0
Over 1500 to 2400, incl	12.5	0
Over 2400 to 3000, incl	18.8	0
Over 3000 to 3600, incl	25.0	0

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 performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. 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 to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling:

Shall be in accordance with AMS 2370 and the following; a lot shall be all product of the same specified thickness from the same heat of alloy.

4.3.1 Samples for magnetic properties (3.3.1, 3.3.2, and 3.3.3) testing, unless otherwise specified, shall be taken at random from finished product from each lot; the sampling method used shall be reported with the test results.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment a report showing the results of tests on each lot to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, heat number, coil number (if applicable), test number, AMS 7712D, size, and quantity from each heat.