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INTERNATIONAL
400 Commonwealth Drive. Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 7716D

Issued 15 MAR 1966
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Superseding AMS 7716C

STEEL SHEET AND STRIP, FLAT-ROLLED, ELECTRICAL, GRAIN-ORIENTED 3.15Si
Type 27G053, Type 30G058, or Type 35G066, Fully-Processed

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of December, 1991. It is recommended, therefore, that this specification not be specified for new designs.

This cover sheet should be attached to the "C" revision of the subject specification.

"NONCURRENT" refers to those materials which have previously been widely used and which may be required on some existing designs in the future. The Aerospace Materials Division, however, does not recommend these as standard materials for future use in new designs. Each of these "NONCURRENT" specifications is available from SAE upon request.

PREPARED UNDER THE JURISDICTION OF AMS COMMITTEE "E".

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AMS 7716C
Superseding AMS 7716B

Issued 3-15-66
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STEEL SHEET AND STRIP, FLAT-ROLLED, ELECTRICAL, GRAIN-ORIENTED 3.15Si Type 27G053, Type 30G058, or Type 35G066, Fully-Processed

1. SCOPE:

1.1 Form: This specification covers three types of fully-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 applications in small transformers and similar apparatus requiring a low core loss and high permeability in the direction of rolling, which has been obtained by appropriate metallurgical processing. The product is usually used in the form of thin laminations with only moderate surface insulation requirements.

1.3 Classification: The steels covered by this specification are classified as follows:

Type 27G053 - Product 0.011 in. (0.27 mm) thick
Type 30G058 - Product 0.012 in. (0.30 mm) thick
Type 35G066 - Product 0.014 in. (0.35 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 specifications 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 3.15% silicon as required to provide a product meeting the requirements of 3.3.

3.2 Condition: The product shall be in the PQ (C-5 coated) condition, fully processed to metallurgically produce a product meeting the technical requirements of this specification and thermally flattened with the inherent AISI Type C-2 (See 8.3.2) coating removed and AISI Type C-5 (See 8.3.3) coating applied for insulating purposes.

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: At 15 kilogausses (1.5 T) shall be not greater than the following, determined in accordance with ASTM A343 on specimens as in 4.3.1, stress relief annealed (after shearing) at 1450°F (790°C) in an atmosphere of pure dry nitrogen with 2 to 15% pure dry hydrogen added and having a dew point within the annealing chamber not higher than 0°F (-18°C). Provision shall be made for obtaining essentially perfect flatness of the magnetic test specimens in the stress-relief anneal.

	Maximum			
	60 Hz		50 Hz	
Type	W/lb	W/kg	W/lb	W/kg
27G053	0.53	1.17	0.40	0.89
30G058	0.58	1.28	0.44	0.97
35G066	0.66	1.46	0.50	1.11

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 (up) shall be greater than 1780 calculated from measurements of peak exciting current at a magnetizing force (H_R) of 10 Oersteds (795 A/m) in accordance with ASTM A343 on annealed, with-grain, Epstein specimens.

3.3.3 Lamination Factor: Shall be as high as practicable consistent with the surface type and material thickness desired. Typical (not minimum) values for lamination factors for C-5 coated surfaces, measured at 100 psi (6.90 kPa), are:

Type	Factor
27G053	96. min
30G058	96. min
35G066	96.5 min

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:

3.5.1 Thickness:

TABLE I

	Thickness Limits			
	Inch		Millimetre	
Type	min	max	min	max
27G053	0.0095	0.0120	0.24	0.305
30G058	0.0105	0.0130	0.265	0.33
35G066	0.0125	0.0150	0.32	0.38

3.5.2 Width:

TABLE XI

Specified Width Inches	Width Tolerance Inch plus and minus
Up to 4, incl	0.005
Over 4 to 9, incl	0.007
Over 9 to 15, incl	0.010
Over 15	0.016

TABLE II (SI)

Specified Width Millimetres	Width Tolerance Millimetre plus and minus
Up to 100, incl	0.12
Over 100 to 225, incl	0.18
Over 225 to 375, incl	0.25
Over 375	0.40

3.5.3 Length:

TABLE III

Specified Length Inches	Length Tolerance, Inch	
	plus	minus
Over 60 to 96, incl	1/2	0
Over 96	3/4	0

TABLE III (SI)

Specified Length Millimetres	Length Tolerance Millimetres	
	plus	minus
Over 1500 to 2400, incl	12.5	0
Over 2400	18.8	0

3.5.4 Camber (Full Width Coils): The deviation of a side edge from a straight line over a 96 in. (2400 mm) length, or fraction thereof, shall not exceed 0.125 in. (3.2 mm).

3.5.5 Out-of-Square (Cut Length): The deviation of an edge from a straight line placed at a right angle to the side, touching one corner and extending to the other side, shall not exceed 0.0625 in. (1.6 mm) per 6 in. (150 mm) of width or fraction thereof.

4. QUALITY ASSURANCE:

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 ingot or slab.

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 the core loss of each lot and stating that the product conforms to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 7716C, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 7716C, 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 either a statement that the material conforms or copies of laboratory reports showing the results of tests to determine conformance,

4.5 Resampling and Retesting: Shall be in accordance with AMS 2370.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet and strip shall be marked on one face, in the respective location indicated below, with AMS 7716C, manufacturer's identification, test lot number, nominal thickness, and core loss. The characters shall be of such size as to be 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 Flat Strip 6 In. (150 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 ft (900 mm).

5.1.2 Flat Sheet and Flat Strip Over 6 In. (150 mm) in Width: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 ft (900 mm), the rows being spaced not more than 6 in. (150 mm) apart and alternately staggered.