The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive. Warrendale. PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS4908F

Issued NOV 1952
Revised APR 1994

Superseding AMS 4908E

Submitted for recognition as an American National Standard

TITANIUM ALLOY, SHEET AND STRIP
8Mn
Annealed, 110 ksi (758 MPa) Yield Strength

UNS R56080

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of April, 1994. It is recommended, therefore, that this specification not be specified for new designs.

This cover sheet should be attached to the "E" 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 "G"

SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®

400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4908E

Issued 11-1-52
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Superseding AMS 4908D

REAFFIRMED
MAY '93

TITANIUM ALLOY SHEET AND STRIP
8Mn
Annealed, 110,000 psi (760 MPa) Yield Strength

UNS R56080

THIS REVISION CONTAINS ONLY EDITORIAL CHANGES.

1. SCOPE:

1.1 Form: This specification covers a titanium alloy in the form of sheet and strip.

1.2 Application: Primarily for parts requiring good formabil ity and strength up to 600°F (315°C). Certain processing procedures and service conditions may cause these products to become subject to stress-corrosion cracking; ARP 982 recommends practices to minimize such conditions.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications and Aerospace Recommended Practices 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 2242 - Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
MAM 2242 - Tolerances, Metric, Corrosion and heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
AMS 2249 - Chemical Check Analysis Limits, Titanium and Titanium Alloys
AMS 2350 - Standards and Test Methods
AMS 2809 - Identification, Titanium and Titanium Alloy Wrought Products

2.1.2 Aerospace Recommended Practices:

ARP 982 - Minimizing Stress-Corrosion Cracking in Wrought Titanium Alloy Products

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E8 - Tension Testing of Metallic Materials
ASTM E120 - Chemical Analysis of Titanium and Titanium Alloys
ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials

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 conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E120 or by spectrochemical or other analytical methods approved by purchaser:

	min	max
Manganese	6.5	9.0
Iron	--	0.50
Oxygen	--	0.20
Carbon	--	0.08
Nitrogen	--	0.05 (500 ppm)
Hydrogen	--	0.015 (150 ppm)
Yttrium	--	0.005 (50 ppm)
Residual Elements, each (3.1.1)		0.10
Residual Elements, total (3.1.1)	--	0.40
Titanium	remainder	

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis: Composition variations shall meet the requirements of AMS 2249.

3.2 Condition: Hot rolled with or without subsequent cold reduction, annealed, descaled, and leveled, having a surface appearance comparable to a commercial corrosion-resistant steel No. 2D finish.

3.3 Annealing: The product shall be annealed by heating to 1275°F ± 25 (690°C ± 15), holding at heat for not less than 60 minutes, cooling to 1050°F (565°C) or lower at a rate not greater than 300°F (170°C) per hr, and cooling in air to room temperature.

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

3.4.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E8 with the rate of strain maintained at 0.003 - 0.007 inch/inch/minute (0.003 - 0.007 mm/mm/minute) through the yield strength and then increased so as to produce failure in approximately one additional minute. When a dispute occurs between purchaser and vendor over the yield strength values, a referee test shall be performed on a machine having a strain rate pacer, using a rate of 0.005 inch/inch/minute (0.005 mm/mm/minute) through the yield strength and a minimum cross head speed of 0.010 inch (2.5 mm) per minute above the yield strength:

Tensile Strength, minimum	125,000 psi (860 MPa)
Yield Strength at 0.2% Offset, minimum	110,000 psi (760 MPa)
Elongation in 2 inches (50 mm), minimum	10%

3.4.1.1 Yield strength, determined with axis of specimen parallel to direction of rolling, shall be not higher than 140,000 psi (965 MPa).

3.4.2 Bending: The product shall withstand, without evidence of cracking when examined at 20X magnification, bending in accordance with ASTM E290 at room temperature through an angle of 105 degrees around a diameter equal to the bend factor times the nominal thickness of the product, using either V-block, U-channel, or free bend procedure, with axis of bend parallel to direction of rolling. Only one of these tests will be required in routine inspection. In case of dispute, results of bend tests using the V-block procedure shall govern:

Nominal Thickness		Bend
Inch	Millimetres	Factor
Up to 0.070, incl	Up to 1.78, incl	.6
Over 0.070 to 0.1875, excl	Over 1.78 to 4.76, excl	7

3.4.3 Microstructure: Shall be essentially that resulting from alpha-beta processing. Microstructure shall not be cause for rejection unless standards for acceptance have been agreed upon by purchaser and vendor except that continuous network of alpha in the prior beta grain boundaries is not acceptable.

3.4.4 Surface Contamination: Product shall be free of any oxygen-rich layer, such as alpha case, or any other surface contamination determined as in 3.4.4.1, 3.4.4.2, or other method agreed upon by purchaser and vendor.

3.4.4.1 The bend test of 3.4.2.

3.4.4.2 Microscopic examination at 100X.

3.5 Quality:

3.5.1 Alloy shall be multiple melted; at least one of the melting cycles shall be under vacuum. The first melt shall be made by either consumable electrode, nonconsumable electrode, electron beam, or plasma melting practice. The subsequent melt or melts shall be made using consumable electrode practice with no alloy additions permitted in the last consumable electrode melt.

3.5.1.1 The atmosphere for nonconsumable electrode melting shall be vacuum or shall be inert gas at a pressure not higher than 250 mm of mercury.

3.5.1.2 The electrode tip for nonconsumable electrode melting shall be water-cooled copper.

3.5.2 The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from "oil cans" (See 8.2) of depth in excess of the flatness tolerance, ripples, and foreign materials and from imperfections detrimental to its use.

3.6 Tolerances: Shall conform to the following:

3.6.1 Thickness, Width, Length, and Straightness: All applicable requirements of AMS 2242 or MAM 2242.

3.6.2 Flatness: Flatness tolerance for product 36 inches (914 mm) and under in width shall be 5% if nominal thickness is less than 0.025 inch (0.64 mm) and 3% if nominal thickness is 0.025 to 0.1875 inch (0.64 to 4.76 mm), exclusive. Flatness tolerance for product under 0.1875 inch (4.76 mm) in nominal thickness and over 36 inches (914 mm) wide shall be as agreed upon by purchaser and vendor.

3.6.2.1 Flatness shall be determined from the expression 100 H/L where "H" is the distance from the straight edge to the product at the point of greatest separation and "L" is the distance between contact points of a straight edge laid in any direction on the product..

3.6.2.2 Flatness tolerances do not apply to coiled products.

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 the following; a lot shall be all product of the same nominal size from the same heat processed at the same time:

4.3.1 Composition: One sample from each heat, except that for hydrogen determinations one sample from each lot obtained after thermal and chemical processing is completed.

4.3.2 Tensile Property, Bending, Microstructure, and Surface Contamination Requirements: At least one sample from each lot.

4.3.2.1 Tensile specimens from widths 9 inches (230 mm) and over shall be taken with the axis of the specimen perpendicular to the direction of rolling; for widths less than 9 inches (230 mm), specimens shall be taken with the axis parallel to the direction of rolling.

4.3.2.2 For V-block or U-channel bend tests, specimen width shall be not less than 10 times the nominal thickness but not less than 1 inch (25 mm). For free bend tests, minimum specimen width shall, when possible, be not less than 10 times the nominal thickness; maximum width need not be greater than 1 inch (25 mm).

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for the hydrogen con tent, tensile and bending properties, and surface contamination 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, heat number, AMS 4908E, size, and quantity.