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 4980B

Issued 11-1-70
Revised 4-1-87

Superseding AMS 4980A

TITANIUM ALLOY BARS
11.5Mo - 6.0Zr - 4.5Sn
1375°F (745°C) Solution Heat Treated

UNS R58030

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of 23 October 1985. It is recommended that this specification not be specified for new designs.

This cover sheet should be attached to the "B" 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 does not recommend these as standard materials for future use in new designs. Each of these "Noncurrent" specifications is available on request.

This specification is under the jurisdiction of AMS Committee "G".

REAFFIRMED 4/92

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

AEROSPACE MATERIAL SPECIFICATION

AMS 4980B
Superseding AMS 4980A

Issued 11-1-70
Revised 4-15-80

UNS R58030

TITANIUM ALLOY BARS
11.5Mo - 6.0Zr - 4.5Sn
1375°F (745°C) Solution Heat Treated

1. SCOPE:

1.1 Form: This specification covers a titanium alloy in the form of bars and wire.

1.2 Application: Primarily for parts requiring high strength-to-weight ratio up to 700°F (370°C) after appropriate precipitation heat treatment and where cold formability in the solution heat treated condition is desirable. Suitable for parts requiring high strength and deep hardenability.

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 2249 - Chemical Check Analysis Limits, Titanium and Titanium Alloys
AMS 2350 - Standards and Test Methods

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

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 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, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

ø

	min	max
Molybdenum	10.00 -	13.00
Zirconium	4.50 -	7.50
Tin	3.75 -	5.25
Iron	--	0.35
Oxygen	--	0.18
Carbon	--	0.10
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: The product shall be supplied in the following condition:

3.2.1 Bars: Hot finished with or without subsequent cold reduction, solution heat treated, straightened, and descaled.

3.2.2 Wire: Hot finished with or without subsequent cold reduction, solution heat treated, and descaled.

3.3 Heat Treatment: The product shall be solution heat treated by heating to a temperature within the range 1300° - 1450°F (705° - 790°C), holding at the selected temperature within ± 25°F (± 15°C) for not more than 15 min., and quenching in water.

3.4 Properties: Product 3.000 in. (76.20 mm) and under in nominal diameter or distance between parallel sides shall conform to the following requirements; property requirements for bars over 3.000 in. (76.20 mm) in nominal diameter or distance between parallel sides shall be as agreed upon by purchaser and vendor:

3.4.1 Tensile Properties: Shall be as specified in 3.4.1.1 and 3.4.1.2, determined in accordance with ASTM E8 with the rate of strain maintained at 0.003 - 0.007 in. per in. per min. (0.003 - 0.007 (mm/mm)/min.) 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 in. per in. per min. (0.005 (mm/mm)/min.) through the yield strength and a minimum crosshead speed of 0.10 in. (2.5 mm) per min. above the yield strength.

3.4.1.1 As Solution Heat Treated: Product 3.000 in. (76.20 mm) and under in nominal diameter or distance between parallel sides shall have the following properties:

TABLE I

Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 4D %, min	Reduction of Area %, min
Up to 1.625, incl	110,000	90,000	15	50
Over 1.625 to 3.000, incl	100,000	90,000	15	50

TABLE I (SI)

Nominal Diameter or Distance Between Parallel Sides Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 4D %, min	Reduction of Area %, min
Up to 41.28, incl	758	621	15	50
Over 41.28 to 76.20, incl	690	621	15	50

3.4.1.2 After Precipitation Heat Treatment: Product 3.000 in. (76.20 mm) and under in nominal diameter or distance between parallel sides shall have the following properties after being precipitation heat treated by heating to 925°F ± 15 (495°C ± 8), holding at heat for not less than 4 hr, and cooling in air and descaled; precipitation heat treatment shall precede final machining of specimens:

TABLE II

Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 4D %, min	Reduction of Area %, min
Up to 1.625, incl	180,000	175,000	8	22
Over 1.625 to 3.000, incl	180,000	175,000	4	10

TABLE II (SI)

Nominal Diameter or Distance Between Parallel Sides Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 4D %, min	Reduction of Area %, min
Up to 41.28, incl	1241	1207	8	22
Over 41.28 to 76.20, incl	1241	1207	4	10

3.4.1.3 Yield strength and reduction of area requirements do not apply to wire less than 0.125 in. (3.18 mm) in nominal diameter.

3.4.1.4 Tensile properties shall be determined in the long-transverse direction on product from which Ø tensile specimens 2.50 in. (63.5 mm) or greater in length can be obtained.

3.4.1.5 Tests in the longitudinal direction are not required on product tested in the transverse direction.

3.5 Quality:

3.5.1 Alloy shall be produced by multiple melting using consumable electrode practice; the final melting Ø cycle shall be under vacuum.

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

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements Ø of AMS 2241.

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 Ø to the purchaser as required by 4.4. Purchaser reserves the right to sample and 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:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), tensile Ø properties as solution heat treated (3.4.1.1), and tolerances (3.6) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for tensile properties after Ø precipitation heat treatment (3.4.1.2) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

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 and presented for vendor's inspection at one time:

4.3.1 For Acceptance Tests:

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

4.3.1.2 Tensile Properties: At least one sample from each lot.

4.3.3 For Periodic Tests: As agreed upon by purchaser and vendor.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests for chemical composition of each heat and for the hydrogen content and tensile properties as solution heat treated 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 4980B, size, specific solution heat treatment used, and quantity from each heat.