Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

AEROSPACE MATERIAL SPECIFICATION

AMS 4980

Issued 11-1-70
Revised

TITANIUM ALLOY BARS AND WIRE
11.5Mo - 6.0Zr - 4.5Sn
1375 F (746.1 C) Solution Heat Treated

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

2. APPLICATION: Primarily for parts requiring high strength-to-weight ratio up to 700 F (371 C), after appropriate precipitation heat treatment, and suitable for aerospace parts requiring high strength and deep hardenability.

3. COMPOSITION:

	min	max	
Molybdenum	10.00	13.00	
Zirconium	4.50	7.50	
Tin	3.75	5.25	
Iron	--	0.35	
Oxygen	--	0.18	
Hydrogen	--	0.0200	(200 ppm)
Carbon	--	0.10	
Nitrogen	--	0.05	(500 ppm)
Other elements, total (1)	--	0.40	
Titanium	remainder		

(1) Determination not required for routine acceptance.

3.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2249.

4. CONDITION: Unless otherwise ordered, the product shall be supplied in the following condition:

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

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

5. TECHNICAL REQUIREMENTS:

5.1 Solution Heat Treatment: The product shall be solution heat treated by heating to a temperature within the range 1300 - 1450 F (704 - 788 C), holding at the selected temperature within ±25 F (±14 C) for not more than 15 min. and quenched in water.

5.2 Properties as Solution Heat Treated:

5.2.1 Longitudinal Tensile Properties: These properties apply when the rate of strain is maintained at 0.003 - 0.007 in. per in. per min. through the yield strength and then is 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 test machine having a strain rate pacer, using a rate of 0.005 in. per in. per min. through the yield strength and a minimum crosshead speed of 0.10 in. per min. above the yield strength.

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Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation % in 2 in. or 4D, min	Reductions of Area (round specimens) %, 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

5.2.1.1 Tensile properties for sizes over 3.000 in. in diameter or distance between parallel sides shall be as agreed upon by purchaser and vendor.

5.2.2 Hardness: The product should have hardness not higher than Rockwell C 30 or equivalent but shall not be rejected on the basis of hardness if the tensile property requirements are met.

5.3 Properties after Precipitation Heat Treatment: Material shall be capable of meeting the following requirements after being heated to 925 F ± 15 (496.1 C ± 8.3) held at heat for 8 hr, cooled in air, and descaled. Precipitation heat treatment shall precede final descaling and machining of specimens.

5.3.1 Longitudinal Tensile Properties: These properties apply when the rate of strain is maintained at 0.003-0.007 in. per in. per min. through the yield strength and then is 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. through the yield strength and a minimum crosshead speed of 0.10 in. per min. above the yield strength.

Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation % in 2 in. or 4D, min	Reductions of Area (round specimens) %, min
Up to 1.625, incl	180,000	175,000	8	22
Over 1.625 to 3.000, incl	180,000	170,000	4	10

5.3.1.1 Tensile properties for sizes over 3.000 in. in diameter or distance between parallel sides shall be as agreed upon by purchaser and vendor.

5.3.2 Hardness: The product should have hardness not higher than Rockwell C 34 - 45 or equivalent but shall not be rejected on the basis of hardness if the tensile property requirements are met.

6. QUALITY: Unless otherwise specified, material shall be produced by multiple melting using consumable electrode practice; at least one of the melting cycles shall be under vacuum. The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

7. TOLERANCES: Unless otherwise specified, tolerances for bars and wire shall conform to all applicable requirements of the latest issue of AMS 2241. Tolerances for sizes not covered by AMS 2241 shall be as agreed upon by purchaser and vendor.

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