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

AEROSPACE MATERIAL SPECIFICATION

AMS 4978

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Revised

TITANIUM ALLOY BARS, FORGINGS, AND RINGS
6Al - 6V - 2Sn
Annealed, 140,000 Yield

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

2. FORM: Bars, wire, forgings, flash welded rings, and stock for forging and flash welded rings.

3. APPLICATION: Primarily for parts requiring high strength-to-weight ratio up to 750 F (399 C).

4. COMPOSITION:

	min	max	
Aluminum	5.00	6.00	
Vanadium	5.00	6.00	
Tin	1.50	2.50	
Iron	0.35	1.00	
Copper	0.35	1.00	
Carbon	--	0.05	
Oxygen	--	0.20	
Nitrogen	--	0.04	(400 ppm)
Hydrogen	--	0.015	(150 ppm)
Other Elements, total (1)	--	0.40	
Titanium	remainder		

(1) Determination not required for routine acceptance.

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

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

5.1 Bars: Hot finished, with or without subsequent cold reduction, annealed, and descaled.

5.2 Wire: Cold drawn, annealed, and descaled.

5.3 Forgings and Flash Welded Rings: Annealed and descaled.

5.3.1 Flash welded rings shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, they shall be manufactured in accordance with the latest issue of AMS 7498, unless otherwise specified.

5.4 Stock for Forging and Flash Welded Rings: As ordered by the forging or flash welded ring manufacturer.

6. TECHNICAL REQUIREMENTS:

6.1 Bars, Wire, Forgings, and Flash Welded Rings:

6.1.1 Annealing: Unless otherwise specified, the product shall be annealed by heating in suitable atmosphere to a temperature within the range 1300 - 1500 F (704.4 - 815.6 C) holding at the selected temperature within ± 25 F (± 14 C) for 2 hr, and cooling as required.

6.1.2 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 value, 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. Transverse elongation and reduction of area requirements apply only to material from which a specimen not less than 2-1/2 in. long can be taken.

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		Reduction of Area %, min	
			Long	Trans	Long	Trans
Up to 1.50, incl	150,000	140,000	10	8	20	15
Over 1.50 to 3.00, incl	145,000	135,000	10	8	20	15
Over 3.00 to 4.00, incl	140,000	130,000	10	8	20	15

6.1.3 Surface Contamination: Material shall be free of any oxygen-rich layer, such as alpha case, or other surface contamination.

6.1.4 Microstructure: Microstructure shall be essentially that resulting from alpha-beta processing. Microstructure shall not be cause for rejection unless standards have been agreed upon by purchaser and vendor.

6.2 Stock for Forging and Flash Welded Rings: When a sample of stock is forged to a test coupon and heat treated as in 6.1.1, specimens taken from the heat treated coupon shall conform to the requirements of 6.1.2. If specimens taken from the stock after heat treatment as in 6.1.1 conform to the requirements of 6.1.2, the tests shall be accepted as equivalent to tests of the forged coupon.

7. 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.

8. TOLERANCES: Unless otherwise specified, tolerances for bars, other than forged bars, and wire shall conform to all applicable requirements of the latest issue of AMS 2241.

9. REPORTS:

9.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment and the results of tests on each size from each lot to determine conformance to the hydrogen and tensile requirements of this specification. A lot is defined as all material of the same nominal size from the same heat processed at the same time. This report shall include the purchase order number, heat number, material specification number, size, and quantity from each heat. If forgings are supplied, the part number and size of stock used to make the forgings shall also be included.