Society of Automotive Engineers, Inc.
485 LEXINGTON AVENUE, NEW YORK, N.Y. 10017

AEROSPACE MATERIAL SPECIFICATION

AMS 5746B
Superseding AMS 5746A
Issued 6-30-60
Revised 5-1-68

ALLOY, CORROSION AND HEAT RESISTANT
15Cr - 45Ni - 4.1Mo - 4.1W - 3.0Ti - 1.0Al
Consumable Electrode Vacuum Melted

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

2. FORM: Bars, forgings, and stock for forging or heading.

3. APPLICATION: Primarily for parts such as turbine rotors, shafts, buckets or blades, bolts, dowels, and fittings requiring high strength up to 1600 F (871 C) and oxidation resistance up to 1800 F (982 C).

4. COMPOSITION:

	min	max
Carbon	--	0.08
Manganese	--	0.75
Silicon	--	0.75
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	14.00	- 16.00
ø Nickel	42.00	- 48.00
Molybdenum	3.75	- 4.50
Tungsten	3.75	- 4.50
Titanium	2.70	- 3.30
Aluminum	0.75	- 1.30
Boron	0.008	- 0.016
Zirconium	--	0.050
Iron	remainder	

4.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2248.

5. CONDITION:

5.1 Bars and Forgings: Solution and precipitation heat treated, unless otherwise specified.

5.2 Stock for Forging or Heading: As ordered by the forging or heading manufacturer.

6. TECHNICAL REQUIREMENTS:

6.1 Bars and Forgings:

6.1.1 Heat Treatment: Unless otherwise specified, the product shall be heat treated as follows:

6.1.1.1 Solution Heat Treatment: Heat to a temperature within the range 1850 - 1900 F (1010 - 1037.8 C), hold at the selected temperature within ±10 F (±5.6 C) for 1 - 4 hr, and quench in water.

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6.1.1.2 Precipitation Heat Treatment: Heat to 1550 F ± 15 (843.3 C ± 8.3), hold at heat for 6 - 12 hr, air
Ø cool, heat to 1300 F ± 15 (704.4 C ± 8.3), hold at heat for 16 hr, and air cool.

6.1.2 Tensile Properties: Tensile test specimens taken from bars and forgings and tested at room temperature shall conform to the following requirements:

6.1.2.1 Bars:

Tensile Strength, psi	190,000 min
Yield Strength at 0.2% Offset or at 0.0123 in. in 2 in. Extension Under Load (E = 30,000,000), psi	125,000 min
Elongation, % in 2 in. or 4D	
Up to 0.75 in., incl, diameter or equivalent cross-section	12 min
Over 0.75 in. diameter or equivalent cross-section	10 min
Reduction of Area (round specimens), %	
Up to 0.75 in., incl, diameter or equivalent cross-section	15 min
Over 0.75 in. diameter or equivalent cross-section	12 min

6.1.2.2 Forgings:

Tensile Strength, psi	175,000 min
Yield Strength at 0.2% Offset or at 0.0123 in.	
Ø in 2 in. Extension Under Load (E = 30,000,000), psi	125,000 min
Elongation, % in 2 in. or 4D	8 min
Reduction of Area (round specimens), %	10 min

6.1.2.3 When a dispute occurs between purchaser and vendor over the yield strength values, yield strength determined by the offset method shall apply.

6.1.3 Hardness: Shall be Brinell 340 - 418 or equivalent.

6.1.4 Stress-Rupture Test at 1200 F (648.9 C): A combination smooth and notched test specimen machined to the dimensions shown in Fig. 1 and Table I, maintained at 1200 F ± 3 (648.9 C ± 1.7) while an axial stress of 95,000 psi is applied continuously, shall not rupture in less than 23 hours. The test
Ø shall be continued to rupture. Rupture shall occur in the smooth section and elongation of this section after rupture, measured at room temperature, shall be not less than 5% in 4D if the specimen ruptures in 48 hr or less and not less than 3% in 4D if the specimen ruptures in more than 48 hours. Test shall be conducted in accordance with the issue of ASTM E139 specified in the latest issue of AMS 2350.

6.1.4.1 As an alternate procedure, separate smooth and notched test specimens, machined from adjacent sections of the same piece, with gage sections conforming to the respective dimensions of Table I may be tested individually under the above conditions. The smooth specimen shall not rupture in less than 23 hr and elongation after rupture, measured at room temperature, shall be as specified above. The notched specimen shall not rupture in less time than the companion smooth specimen but need not be tested to rupture.

6.1.4.2 The tests of 6.1.4 and 6.1.4.1 may be conducted at a stress higher than 95,000 psi but stress shall
Ø not be changed while test is in process, unless otherwise specified or allowed. Time to rupture and elongation requirements shall be as specified in 6.1.4 and 6.1.4.1.

6.2 Stock for Forging or Heading: When a sample of stock is forged to a test coupon as agreed upon by purchaser and vendor and heat treated as in 6.1.1, specimens taken from the heat treated coupon shall conform to the requirements of 6.1.2.2, 6.1.3, and 6.1.4. If specimens taken from the stock after heat treatment as in 6.1.1 conform to the requirements of 6.1.2.2, 6.1.3 and 6.1.4, the tests shall be accepted as equivalent to tests of the forged coupon.

7. QUALITY: Material shall be multiple melted using vacuum consumable electrode practice in the remelt cycle, unless otherwise specified. 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, tolerance for bars 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 heat to determine the conformance to the technical requirements of this specification. This report shall include the purchase order number, heat number, material specification number and its revision letter, 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.

9.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, 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 a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

10. IDENTIFICATION: Unless otherwise specified, the product shall be identified as follows:

10.1 Bars:

10.1.1 Each straight bar 0.500 in. and over in diameter or least width of flat surface shall be marked in a row of characters recurring at intervals not greater than 3 ft with AMS 5746B, heat number, and manufacturer's identification. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the material or its performance and shall be sufficiently stable to withstand normal handling.

10.1.2 Straight bars less than 0.500 in. in diameter or least width of flat surface shall be securely bundled and identified by a metal or plastic tag embossed with the purchase order number, AMS 5746B, heat number, nominal size, and manufacturer's identification and attached to each bundle or shall be boxed and the box marked with the same information.

10.2 Forgings: Shall be identified in accordance with the latest issue of AMS 2808.

10.3 Stock for Forging or Heading: Shall be identified as agreed upon by purchaser and vendor.

11. REJECTIONS: Material not conforming to this specification or to authorized modifications will be subject to rejection.