AERONAUTICAL MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

AMS 5736A

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STEEL, CORROSION AND HEAT RESISTANT 15Cr - 26Ni - 1.3Mo - 2.1Ti - 0.3V Solution Treated

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

Ø 2. FORM: Bars, forgings, mechanical tubing, forging stock, and heading stock.

3. APPLICATION: Primarily for parts, such as turbine rotors, shafts, buckets or blades, bolts, dowels, and fittings, requiring high strength up to 1300 F and Ø oxidation resistance up to 1500 F, including those which are welded and then heat treated to develop required properties.

4. COMPOSITION:

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			Check Analysis Under Min or Over Max	
Carbon	0.08	max	--	0.01
Manganese	1.00	- 2.00	0.04	0.04
Silicon	0.40	- 1.00	0.05	0.05
Phosphorus	0.040	max	--	0.005
Sulfur	0.030	max	--	0.005
Chromium	13.50	- 16.00	0.20	0.20
Nickel	24.00	- 27.00	0.20	0.20
Molybdenum	1.00	- 1.50	0.05	0.05
Titanium	1.90	- 2.30	0.05	0.05
Boron	0.0010	- 0.010	0.0004	0.001
Vanadium	0.10	- 0.50	0.03	0.03
Aluminum	0.35	max	--	0.03

5. CONDITION:

5.1 Bars: Solution heat treated. Bars 2.75 in. and less in diameter or distance between parallel sides shall be cold finished.

Ø 5.2 Tubing: Cold finished and solution heat treated, unless otherwise specified.

Ø 5.3 Forgings: Solution heat treated and descaled, unless otherwise specified.

Ø 5.4 Stock for Forging or Heading: As ordered by the forging or heading manufacturer.

6. TECHNICAL REQUIREMENTS:

6.1 Bars, Forgings, and Tubing:

6.1.1 Heat Treatment: The product shall be solution heat treated by heating to 1800 F ± 25, holding at heat for 1 hr, and quenching in oil or water.

Ø 6.1.2 Hardness: Shall be not higher than Brinell 201 or equivalent.

6.1.3 Properties After Precipitation Heat Treatment: Material shall conform to the following requirements after being heated to 1325 F ± 15, held at heat for 16 hr, and cooled in air. When agreed upon by purchaser and vendor and if material fails to meet these requirements after being heat treated as above, Ø separate specimens may be heated to a temperature not lower than 1300 F but not higher than 1400 F, held at heat for 16 hr, and cooled in air. If such specimens meet the following requirements, material will be considered acceptable.

6.1.3.1 Tensile Properties:

Tensile Strength, psi	130,000 min
Yield Strength at 0.2% Offset or at 0.0098 in. in 2 in. Extension Under Load (E = 29,100,000), psi	85,000 min
Elongation, % in 4D	15 min
Reduction of Area, %	18 min

6.1.3.1.1 Ø When tensile test specimens are machined from approximately the center of large disc forgings (over 50 sq in. cross sectional area), the elongation may be as low as 10% and the reduction of area as low as 12%.

6.1.3.1.2 Ø Reduction of area requirement does not apply to tubing from which a solid round test specimen cannot be cut.

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

Ø 6.1.3.2 Hardness: Shall be Brinell 248 - 341 or equivalent.

6.1.3.3 Stress-Rupture Test at 1200 F: A combination smooth and notched test specimen machined to the dimensions shown in Figure 1 and Table 1, maintained at 1200 F ± 3 while an axial stress of 65,000 psi is applied continuously, shall not rupture in less than 23 hours. The test shall be continued to rupture, either maintaining the same stress or increasing the stress in 5,000 psi increments Ø after 48 hr and at intervals of not less than 8 hr thereafter. 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.

6.1.3.3.1 Ø As an alternate procedure, separate smooth and notched specimens, machined from adjacent sections of the same piece, with gage sections conforming to the respective dimensions of Table 1 may be tested individually under the above conditions, including increase of stress after 48 hours. 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 need not be tested to rupture but shall not rupture in less time than the companion smooth specimen.

6.1.3.3.2 Ø For tubing from which a solid round test specimen cannot be cut, a full section of tubing shall be tested and shall meet the smooth bar requirements of 6.1.3.3.1.

6.2 Stock for Forging or Heading: When a sample of stock is forged to a test coupon and heat treated as in 6.1.1 and 6.1.3, specimens taken from the heat treated coupon shall conform to the requirements of 6.1.3.1, 6.1.3.2, and 6.1.3.3. If Ø specimens taken from the stock after heat treatment as in 6.1.1 and 6.1.3 conform to the requirements of 6.1.3.1, 6.1.3.2, and 6.1.3.3, the tests shall be accepted as equivalent to tests of the forged coupon.

7. QUALITY: Material 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 shall conform to the following:

8.1 Bars: The latest issue of AMS 2241 as applicable and as specified below:

8.1.1 All hexagons, and other bars 2.75 in. and less in diameter or distance between Ø parallel sides, Table I.

8.1.2 Bars, other than hexagons, over 2.75 in. in diameter or distance between par- Ø allel sides, Table II.

8.2 Tubing: The latest issue of AMS 2243 as applicable. Diameter tolerances shall Ø conform to Table I, columns headed "Annealed or Solution Heat Treated".

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 conformance to the technical requirements of this specification. This Ø report shall include the purchase order number, heat number, material specification number, size, quantity from each heat, and precipitation heat treatment temperature used. 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, 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:

10.1 Bars and Tubing: Individual pieces or bundles shall have attached a metal tag stamped with the purchase order number, AMS 5736A, nominal size, and heat number, or shall be boxed and the box marked with the same information. In addition to the above identification, flats 2 x 1 in. and larger and other bars 1 in. and over in diameter or distance between parallel sides shall be stamped with the heat number within 2 in. of one end.

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.