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

AMS 5733B

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STEEL, CORROSION AND HEAT RESISTANT
13.5Cr - 26Ni - 3Mo - 1.8Ti

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, forging stock, and heading stock.

3. APPLICATION: Primarily for parts and assemblies, such as bolts, dowels, fittings, turbine discs, and turbine nozzle assemblies, requiring high strength up to 1250 F.

4. COMPOSITION:

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			Check Analysis Under Min	Check Analysis Over Max
Carbon	0.08	max	--	0.01
Manganese	0.60	- 1.50	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	12.00	- 15.00	0.15	0.15
Nickel	24.00	- 28.00	0.20	0.20
Molybdenum	2.50	- 3.50	0.10	0.10
Titanium	1.55	- 2.00	0.05	0.05
Copper	0.50	max	--	0.03
Aluminum	0.35	max	--	0.05
Boron	0.0010	- 0.010	0.0004	0.001

5. CONDITION:

5.1 Bars and Forgings: Solution and precipitation heat treated.

5.1.1 Bars 1.25 in. and under in diameter or distance between parallel sides shall be cold drawn with not less than 15% reduction of cross-sectional area.

5.1.2 Bars over 1.25 in. in diameter or distance between parallel sides shall be cold drawn with not less than 15% reduction of cross-sectional area or shall be hot rolled with finishing temperature not higher than 1800 F.

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: The product shall be solution heat treated by heating to not lower than 1750 F but not higher than 1900 F, holding at heat for not less than 1 hr, and quenching in oil or water. It shall then be precipitation heat treated by heating to not lower than 1250 F but not higher than 1400 F, holding at heat for not less than 5 hr, cooling slowly in not less than 5 hr to 1200 F, ±15 holding at 1200 F ± 15 for not less than 20 hr, and cooling in air.

6.1.2 Tensile Properties: Tensile test specimens cut from the product and tested at room temperature shall conform to the following requirements:

	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 29,100,000) psi, min	Extension Under Load in. in 2 in.	Elongation % in 4D min	Reduction of Area %, min
Bars	130,000	85,000	0.0098	15	18
Forgings	125,000	80,000	0.0095	10	12

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

Ø6.1.3 Hardness: Shall be Brinell 248 - 321 or equivalent.

6.1.4 Stress-Rupture Test at 1200 F: A combination smooth and notched test specimen machined to the dimensions shown in Figure 1 and Table I, maintained at 1200 F + 3 while an axial stress of 60,000 psi is applied continuously, shall not rupture in less than 15 hours. The test shall be continued to rupture, either Ø maintaining the same stress or increasing the stress in 5000 psi increments after 48 hours 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.

6.1.4.1 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, including increase of stress after 48 hours. The smooth specimen Ø shall not rupture in less than 15 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.

6.2 Stock for Forging or Heading: When a sample of stock is forged to a test coupon and heat treated as in 6.1.1, specimens taken from the heat treated coupon shall conform to the requirements of 6.1.2, 6.1.3, and 6.1.4. If specimens taken from Ø the stock after heat treatment as in 6.1.1 conform to the requirements of 6.1.2, 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 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 latest issue of AMS 2241 as applicable and as specified below:

8.1 All hexagons, and other bars 2.75 in. and under in diameter or distance between parallel sides, Table I.

8.2 Bars, other than hexagons, over 2.75 in. in diameter or distance between parallel sides, Table II.

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 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.

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: Individual pieces or bundles shall have attached a metal tag stamped with the purchase order number, AMS 5733B, 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.

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