AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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AMS 5765

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Revised

ALLOY, CORROSION AND HEAT RESISTANT
Cobalt Base - 20Cr - 20Ni - 4Mo - 4W - 4Cb

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

2. FORM: Bars, billets, and forgings.

3. APPLICATION: Parts and assemblies, such as turbine rotors, shafts, buckets, and bolts, requiring high strength up to 1500 F and oxidation resistance up to 1800 F.

4. COMPOSITION:

		Check Analysis Under Min or Over Max	
Carbon	0.32 - 0.42	0.00	0.00
Manganese	1.00 - 2.00	0.04	0.04
Silicon	1.00 max	--	0.05
Phosphorus	0.040 max	--	0.005
Sulfur	0.030 max	--	0.005
Chromium	19.00 - 21.00	0.25	0.25
Nickel	19.00 - 21.00	0.20	0.20
Molybdenum	3.50 - 4.50	0.10	0.10
Tungsten	3.50 - 4.50	0.10	0.10
Columbium	3.50 - 4.50	0.05	0.05
Iron	5.00 max	--	0.10
Cobalt	40.00 min	0.20	--

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

5.1 Bars: Hot rolled, solution heat treated, and aged.

5.2 Forging Stock: Hot rolled and centerless ground.

5.3 Forgings: Solution heat treated, aged, and anodically pickled.

6. TECHNICAL REQUIREMENTS:

6.1 Heat Treatment: Unless otherwise specified, bars, excluding forging stock, and forgings shall be solution heat treated by heating at 2150 F ± 20 for 1 hour and water quenching, and then aged by heating at 1400 F ± 10 for 12-16 hours and air cooling.

6.2 Grain Size: Unless otherwise specified, the grain size of material heat treated as in 6.1 shall be an average of 1 or finer in accordance with grain size chart in ASTM E19-46.

6.3 Hardness (Bars only): Brinell 248-331 or Rockwell C24-35.

6.4 Physical Properties at 1350 F: Tensile test specimens cut from bars, and from forging stock heat treated in accordance with 6.1, heated to 1350 F ± 10, held at 1350 F ± 10 for 30 minutes before testing, and tested at 1350 F ± 10 at a rate of 0.045 - 0.062 in. per minute, shall conform to the following requirements:

Tensile Strength, psi	80,000 min
Elongation, % 4D	10 min

6.5 Tensile Strength at 1500 F: Unless otherwise specified, one suitable tensile test specimen shall be prepared from each of two forgings from each heat after heat treatment in accordance with 6.1. These specimens, heated to 1500 F ± 10, held at 1500 F ± 10 for 30 minutes before testing, and tested at 1500 F ± 10 at a rate of 0.045 - 0.062 in. per minute, shall have tensile strength not lower than 65,000 psi.

6.6 Stress Rupture Test at 1350 F: Tensile test specimens cut from bars and forgings, and from forging stock heat treated in accordance with 6.1, shall be capable of meeting the following requirements:

6.6.1 A tensile test specimen, maintained at a temperature of 1350 F ± 10 while an axial load of 38,000 psi is applied continuously, shall not rupture in less than 100 hours. The test shall be continued, after the 100 hours, until the specimen ruptures, either maintaining the same load or increasing the load to not over 50,000 psi as necessary to produce rupture. In either case the elongation after rupture, measured at room temperature, shall be not less than 8% in 4D.

7. QUALITY:

7.1 Material shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external defects detrimental to fabrication or to performance of parts.

7.2 Inspection standards and procedures shall be as agreed upon by purchaser and vendor.

8. TOLERANCES: Unless otherwise specified, tolerances for bars shall conform to the latest issue of AMS 2241 as applicable to hot finished.

9. REPORTS:

9.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a notarized report of the results of tests for chemical composition of each heat in the shipment. 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 notarized 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 certification that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.