AERONAUTICAL
MATERIAL SPECIFICATIONS

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

AMS 5391

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Revised

ALLOY CASTINGS, INVESTMENT, CORROSION AND HEAT RESISTANT
Nickel Base - 13Cr - 4.5Mo - 0.75Ti - 6Al - 2.3(Cb+Ta)
Vacuum Melted

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

2. APPLICATION: Primarily for parts such as turbine blades or buckets requiring high strength up to 1800 F and oxidation resistance up to 2000 F.

3. COMPOSITION: Castings shall conform to the following:

Carbon	0.08 - 0.20
Manganese	0.25 max
Silicon	0.50 max
Sulfur	0.015 max
Chromium	12.0 - 14.0
Molybdenum	3.8 - 5.2
Columbium + Tantalum	1.8 - 2.8
Titanium	0.50 - 1.0
Aluminum	5.5 - 6.5
Boron	0.005 - 0.015
Zirconium	0.05 - 0.15
Iron	2.5 max
Copper	0.50 max
Nickel + Cobalt	remainder
Cobalt, if determined	1.0 max

4. CONDITION: As cast, unless otherwise specified.

5. TECHNICAL REQUIREMENTS:

5.1 Casting: Castings shall be produced from master heat metal remelted and poured under vacuum without loss of vacuum between melting and pouring or under protective atmosphere as agreed upon between purchaser and vendor. A master heat is metal of a single furnace charge melted and cast into ingot under vacuum. Gates, sprues, risers, and rejected castings shall be used only in preparation of master heats; they shall not be remelted directly, without refining, for pouring of castings.

5.1.1 Temperature of Metal for Pouring: The temperature of the metal for pouring of castings shall be held within ± 50 F of that agreed upon by purchaser and vendor.

5.1.2 Temperature of Molds: The temperature of the mold cavities at time of receiving metal from the furnace of ladle shall be held within ± 50 F of that agreed upon by purchaser and vendor.

5.2 Test Specimens:

5.2.1 Tensile Test Specimens: Unless otherwise specified, tensile test specimens shall be cast to represent each master heat of metal in castings and, when requested, shall be supplied with the castings. The specimens shall be of standard proportions with 0.25 in. diameter at the reduced parallel section, shall be cast to size in molds made of the same refractory and heated to the same temperature as the molds for castings, and shall be cooled at approximately the same rate as the castings. Center gating may be used but, if specimens are so gated, the gate shall be completely removed before testing. If the metal for castings is given any treatment such as fluxing or cooling and reheating, metal for the specimens shall be so treated.

5.3 Hardness: Castings shall have hardness of Rockwell C 30 - 42 or equivalent.

5.4 Tensile Properties: Tensile test specimens produced in accordance with 5.2.1 and tested at room temperature shall conform to the following requirements. If supplied tensile test specimens fail to meet requirements, or are not available, suitable specimens may be prepared from castings for test.

Tensile Strength, psi	110,000 min
Yield Strength at 0.2% Offset, psi	100,000 min
Elongation, % in 4D	3 min

5.5 Stress-Rupture Test at 1800 F: Material shall conform to the following requirements:

5.5.1 A tensile test specimen, maintained at 1800 F ± 5 while an axial stress of 22,000 psi is applied continuously, shall not rupture in less than 30 hours. The test shall be continued until the specimen ruptures. The elongation after rupture, measured at room temperature, shall be not less than 5% in 4D. If supplied tensile test specimens fail to meet requirements or are not available, suitable specimens may be prepared from castings for test.

6. QUALITY:

6.1 Castings shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts. Castings shall have smooth surfaces and shall be well cleaned. Unless otherwise specified, metallic shot or grit shall not be used for final cleaning.

6.2 When castings are broken for fracture test, the fracture shall have uniform color and be substantially free from oxides and other defects.

6.3 Radiographic and other quality standards shall be as agreed upon by purchaser and vendor.

6.4 Unless otherwise specified, castings shall be produced under radiographic control. This shall consist of radiographic examination of castings until proper foundry technique, which will produce castings free from harmful internal imperfections, is established for each part number, and of production castings as necessary to ensure maintenance of satisfactory quality.