



# AEROSPACE MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

485 Lexington Ave., New York, N. Y. 10017

## AMS 5666

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Revised

### ALLOY BARS, FORGINGS, AND RINGS, CORROSION AND HEAT RESISTANT Nickel Base - 21.5Cr - 9.0Mo - 3.7(Cb + Ta)

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **FORM:** Bars, forgings, flash welded rings, extrusions, and stock for forgings or flash welded rings.
3. **APPLICATION:** Primarily for parts and assemblies requiring both corrosion and oxidation resistance at temperatures up to approximately 2000 F (1093 C) and where such parts may require welding during fabrication.
4. **COMPOSITION:**

	min	max
Carbon	--	0.10
Manganese	--	0.50
Silicon	--	0.50
Phosphorous	--	0.015
Sulfur	--	0.015
Chromium	20.00 - 23.00	
Molybdenum	8.00 - 10.00	
Columbium + Tantalum	3.15 - 4.15	
Iron	--	5.00
Cobalt (1)	--	1.00
Titanium	Present but not exceeding	0.40
Aluminum	Present but not exceeding	0.40
Nickel		remainder

(1) Determination not required for routine acceptance.

- 4.1 **Check Analysis:** Composition variations shall meet the requirements of the latest issue of AMS 2269.
5. **CONDITION:** Unless otherwise ordered, the product shall be supplied in the following condition:
  - 5.1 **Bars:** Hot finished and annealed; round bars shall be ground or turned.
  - 5.2 **Forgings, Extrusions, and Flash Welded Rings:** Annealed.
    - 5.2.1 Flash welded rings shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, they shall be manufactured in accordance with the latest issue of AMS 7490, unless otherwise specified.
  - 5.3 **Stock for Forgings or Flash Welded Rings:** As ordered by the forging or welded ring manufacturer.
6. **TECHNICAL REQUIREMENTS:**
  - 6.1 **Bars, Forgings, and Flash Welded Rings:**

SAE Technical Board rules provide that: "All technical reports, including standards, approved practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

- 6.1.1 Tensile Properties at Room Temperature: Tensile test specimens cut from bars, forgings, and parent metal of flash welded rings shall conform to the following requirements:

Tensile Strength, psi	120,000 min
Yield Strength at 0.2% Offset or at 0.0080 in. in 2 in. Extension Under Load (E = 29,800,000), psi	60,000 min
Elongation, % in 2 in. or 4D	30 min

- 6.1.2 Hardness: Should be not higher than Rockwell C 30 or equivalent but the product shall not be rejected on the basis of hardness if the tensile property requirements are met.
- 6.1.3 Stress-Rupture Test at 1500 F (815.6 C): A tensile test specimen, maintained at 1500 F  $\pm$  5 (815.6 C  $\pm$  2.8) while an axial load of 16,500 psi is applied continuously, shall not rupture in less than 23 hours. The test shall be continued to rupture. Elongation after rupture measured at room temperature, shall be not less than 15% in 4D.
- 6.1.3.1 The test of 6.1.3 may be conducted at a stress higher than 16,500 psi but stress shall not be changed while test is in process, unless otherwise specified or allowed. Time to rupture and elongation requirements shall be as specified in 6.1.3.
- 6.1.4 Grain Size: Predominantly 5 or finer for material with a least cross-section dimension up to 2-1/2 in., when determined in accordance with the issue of ASTM E112 specified in the latest issue of AMS 2350. For material with a least cross-section dimension 2-1/2 in. and over, grain size shall be as agreed upon by purchaser and vendor.
- 6.2 Extrusions: Shall have properties as agreed upon by purchaser and vendor.
7. QUALITY: 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, tolerances for bars shall conform to all applicable requirements of the latest issue of AMS 2261.
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: Unless otherwise specified, the product shall be identified as follows:
- 10.1 Bars: