

AEROSPACE MATERIAL SPECIFICATION

AMS 5887

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Submitted for recognition as an American National Standard

ALLOY BARS, FORGINGS, AND RINGS, CORROSION AND HEAT RESISTANT
54Ni - 22Cr - 12.5Co - 9.0Mo - 1.2Al
Consumable Electrode or Vacuum Induction Melted
Annealed

UNS N06617

1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant nickel alloy in the form of bars, forgings, flash welded rings, and stock for forging or flash welded rings.

1.2 Application: Primarily for parts requiring high strength and resistance to oxidation and corrosion up to 2200°F (1204°C) and where such parts may require welding during fabrication.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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2.1.1 Aerospace Material Specifications:

- AMS 2261 - Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Bars
- MAM 2261 - Tolerances, Metric, Nickel, Nickel Alloy, and Cobalt Alloy Bars
- AMS 2269 - Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt Alloys
- AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Wrought Products Except Forgings and Forging Stock
- AMS 2374 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Forgings and Forging Stock
- AMS 2806 - Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys
- AMS 2808 - Identification, Forgings
- AMS 7490 - Rings, Flash Welded, Corrosion and Heat Resistant Austenitic Steels and Austenitic-Type Alloys

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

- ASTM E 8 - Tension Testing of Metallic Materials
- ASTM E 8M - Tension Testing of Metallic Materials (Metric)
- ASTM E 10 - Brinell Hardness of Metallic Materials
- ASTM E 21 - Elevated Temperature Tension Tests of Metallic Materials
- ASTM E 112 - Determining Average Grain Size
- ASTM E 139 - Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials
- ASTM E 354 - Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

2.3 U.S. Government Publications: Available from Naval Publications and Forms Center, Attn: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

2.3.1 Military Standards:

- MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	0.05	0.15
Manganese	--	0.50
Silicon	--	0.50
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	20.00	24.00
Cobalt	10.00	15.00
Molybdenum	8.00	10.00
Aluminum	0.80	1.50
Titanium	--	0.60
Boron	--	0.006
Iron	--	3.00
Copper	--	0.50
Nickel	remainder	

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2269.

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Bars: Hot finished and annealed; round bars shall be ground or turned.

3.2.2 Forgings and Flash Welded Rings: Annealed.

3.2.2.1 Flash welded rings shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, rings shall be manufactured in accordance with AMS 7490.

3.2.3 Stock for Forging or Flash Welded Rings: As ordered by the forging or flash welded ring manufacturer.

3.2.4 Heat Treatment: Bars, forgings, and flash welded rings shall be annealed by heating within the range 2075° - 2200°F (1135° - 1204°C), holding at heat within $\pm 25^\circ\text{F}$ ($\pm 14^\circ\text{C}$) for a time commensurate with section thickness, and cooling at a rate equivalent to an air cool or faster.

3.3 Properties: The product shall conform to the following requirements:

3.3.1 Bars, Forgings, and Flash Welded Rings:

3.3.1.1 Tensile Properties: Shall be as follows for product under 4 inches (102 mm) in least cross-sectional dimension, determined in accordance with ASTM E 8 or ASTM E 8M; tensile property requirements for product 4 inches (102 mm) and over in least cross-sectional dimension shall be as agreed upon by purchaser and vendor:

3.3.1.1.1 At Room Temperature:

Tensile Strength, minimum	95,000 psi (655 MPa)
Yield Strength at 0.2% Offset, minimum	35,000 psi (241 MPa)
Elongation in 4D, minimum	35%

3.3.1.1.2 At 1000°F (538°C): Shall be as follows, determined in accordance with ASTM E 21 on specimens heated to 1000°F \pm 5 (538°C \pm 3), held at heat for 20 - 30 minutes before testing, and tested at 1000°F \pm 5 (538°C \pm 3):

Tensile Strength, minimum	66,000 psi (455 MPa)
Yield Strength at 0.2% Offset, minimum	23,000 psi (159 MPa)
Elongation in 4D, minimum	45%

3.3.1.2 Stress-Rupture Properties at 1600°F (871°C): A tensile specimen, maintained at 1600°F \pm 3 (871°C \pm 2) while a load sufficient to produce an initial axial stress of 13,000 psi (90 MPa) is applied continuously, shall not rupture in less than 23 hours. The test shall be continued to rupture without change of load. Elongation after rupture, measured at room temperature, shall be not less than 10% in 4D. Test shall be conducted in accordance with ASTM E 139.

3.3.1.2.1 The test of 3.3.1.2 may be conducted using a load higher than required to produce an initial axial stress of 13,000 psi (90 MPa) but load shall not be changed while test is in progress. Time to rupture and elongation requirements shall be as specified in 3.3.1.2.

3.3.1.2.2 When permitted by purchaser, the test of 3.3.1.2 may be conducted using incremental loading. In such case, the load required to produce an initial axial stress of 13,000 psi (90 MPa) shall be used to rupture or for 23 hours. After the 23 hours and at intervals of 8 - 16 hours, preferable 8 - 10 hours, thereafter, the stress shall be increased in increments of 2000 psi (13.8 MPa). Time to rupture and elongation requirements shall be as specified in 3.3.1.2.

3.3.2 Stock for Forging or Flash Welded Rings: Shall be as agreed upon by purchaser and vendor.

3.4 Quality:

3.4.1 Alloy shall be produced by multiple melting using consumable electrode practice in the remelt cycle or shall be induction melted under vacuum. If consumable electrode remelting is not performed in vacuum, electrodes which have been produced by vacuum induction melting shall be used.