NOTICE OF
ADOPTION

ADOPTION NOTICE
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AMS 5854
1 January 1991

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Title of Document: Alloy Bars, Forgings, and Rings
Corrosion and Heat Resistant
61Ni - 20.5Cr - 8.5Mo - 3.4Cb - 1.3Ti - 5.0Fe
Consumable Electrode or Vacuum Induction Melted
Solution Heat Treated

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SAE The Engineering Society For Advancing Mobility Land Sea Air and Space INTERNATIONAL®

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-5854

Issued 1991-01-01

Submitted for recognition as an American National Standard

ALLOY BARS, FORGINGS, AND RINGS, CORROSION AND HEAT RESISTANT
61Ni - 20.5Cr - 8.5Mo - 3.4Cb - 1.3Ti - 5.0Fe
Consumable Electrode or Vacuum Induction Melted
Solution Heat Treated UNS NO7716

1. SCOPE:

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

1.2 Application: Primarily for parts requiring both corrosion and oxidation resistance up to 1000°F (538°C) and where such parts may require welding during fabrication and then precipitation heat treated to develop required properties.

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.

2.1.1 Aerospace Material Specifications:

AMS-2261 - Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Bars and Forging Stock
MAM-2261 - Tolerances, Metric, Nickel, Nickel Alloy, and Cobalt Alloy Bars and Forging Stock
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.

2.1.1 Aerospace Material Specifications (Cont'd):

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 - Brine11 Hardness of Metallic Materials
ASTM E 18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E 112 - Determining Average Grain Size
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 Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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	--		0.03
Manganese	--		0.20
Silicon	--		0.20
Phosphorus	--		0.015
Sulfur	--		0.010
Chromium	19.00	-	22.00
Nickel	59.00	-	63.00
Molybdenum	7.50	-	9.50
Columbium	2.75	-	4.00
Titanium	1.00	-	1.60
Cobalt	--		1.00
Aluminum	--		0.35
Iron	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 solution heat treated; round bars shall be ground or turned.

3.2.2 Wire : Cold drawn and solution heat treated.

3.2.3 Forgings, Extrusions, and Flash Welded Rings: Solution heat treated.

3.2.3.1 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.

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

3.3 Heat Treatment: Bars, forgings, and flash welded rings shall be solution heat treated by heating to a temperature within the range 1850° - 1950°F (1010° - 1066°C), holding at the selected temperature within ±25°F (±14°C) for a time commensurate with cross-sectional thickness, and cooling in air.

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

3.4.1 Bars, Wire, Forgings, and Flash Welded Rings:

3.4.1.1 As Solution Heat Treated:

3.4.1.1.1 Hardness of Bars, Forgings, and Flash Welded Rings: Shall be not higher than 287 HB, or equivalent, determined in accordance with ASTM E 10.

3.4.1.1.2 Tensile Strength of Wire: Shall be not higher than 135,000 psi (931 MPa), determined in accordance with ASTM E 8 or ASTM E 8M.

3.4.1.1.3 Grain Size: Predominantly ASTM No. 3 or finer, determined in accordance with ASTM E 112, for product with a least cross-section dimension under 2-1/2 inches (63.5 mm). For product with a least cross-section dimension 2-1/2 inches (63.5 mm) and over, grain size shall be as agreed upon by purchaser and vendor.

3.4.1.2 After Precipitation Heat Treatment: Product, 4 inches (102 mm) and under in nominal diameter or least distance between parallel sides, shall meet the requirements of 3.4.1.2.1 after being precipitation heat treated by heating to a temperature within the range 1325° - 1375°F (718° - 746°C), holding at the selected temperature within ±15°F (±8°C) for not less than 8 hours, cooling at a rate of 1OOF ± 15 (55C ± 8) degrees per hour to 1150°F ± 15 (621°C ± 8), holding at 1150°F ± 15 (621°C ± 8) for not less than 8 hours, and cooling in air. Instead of the 100 F (55 C) degrees per hour cooling rate to 1150°F ± 15 (621°C ± 8), product may be furnace cooled at any rate provided the time at 1150°F ± 15 (621°C ± 8) is adjusted to give a total precipitation heat treatment time of not less than 18 hours.

3.4.1.2.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E 8 or ASTM E 8M on specimens taken from product under 4 inches (102 mm) in least cross-sectional dimension:

Tensile Strength, minimum	150,000 psi (1034 MPa)
Yield Strength at 0.2% Offset, minimum	115,000 psi (793 MPa)
Elongation in 4D, minimum	25%
Reduction in Area, minimum	40%

3.4.1.2.2 Hardness: Shall be not lower than 30 HRC, or equivalent, determined in accordance with ASTM E 18, but the product shall not be rejected on basis of hardness if the tensile properties of 3.4.1.2.1 are met.

3.4.2 Forging Stock: When a sample of stock is forged to a test coupon and heat treated as in 3.3 and 3.4.1.2, specimens taken from the heat treated coupon shall conform to the requirements of 3.4.1.2.1. If specimens taken from the stock after heat treatment as in 3.3 and 3.4.1.2 conform to the requirements of 3.4.1.2.1, the test shall be accepted as equivalent to tests of a forged coupon.

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

3.5 Quality:

3.5.1 Alloy shall be produced by multiple melting using consumable electrode practice in the remelt cycle or shall be induction melted under vacuum.

3.5.2 The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

3.5.3 Grain flow of die forgings, except in areas which contain flash-line end grain, shall follow the general contour of the forging showing no evidence of re-entrant grain flow.

3.6 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight bars will be acceptable in mill lengths of 6 - 24 feet (1.8 - 7.3 m) but not more than 25% of any shipment shall be supplied in lengths of 6 - 9 feet (1.8 - 2.7 m) except that for bars weighing over 25 pounds per foot (37 kg/m), short lengths down to 2 feet (61 mm) may be supplied.