Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 5754G
Superseding AMS 5754F
Issued 5-1-54
Revised 7-15-77

UNS N06002

ALLOY BARS, FORGINGS, AND RINGS, CORROSION AND HEAT RESISTANT
47.5Ni - 22Cr - 1.5Co - 9.0Mo - 0.60W - 18.5Fe

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, flash welded rings, or heading.

1.2 Application: Primarily for parts such as turbine rotors, shafts, flanges, blades, and bolts, requiring oxidation resistance up to 2200°F (1205°C) and relatively high strength above 1500°F (815°C).

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2261 - Tolerances, Nickel, Nickel Base, and Cobalt Base Alloy Bars and Forging Stock
AMS 2269 - Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings
AMS 2374 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Forgings and Forging Stock
AMS 2375 - Approval and Control of Critical Forgings
AMS 2808 - Identification, Forgings
AMS 2806 - Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Heat and Corrosion Resistant Steels and Alloys
AMS 7490 - Rings, Flash Welded, Corrosion and Heat Resistant Austenitic Steels and Austenitic-Type Alloys

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E10 - Brinell Hardness of Metallic Materials
ASTM E139 - Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials
ASTM E354 - Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt-Base Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 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
Ø in accordance with ASTM E354, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Carbon	0.05	0.15
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	20.50	23.00
Cobalt	0.50	2.50
Molybdenum	8.00	10.00
Tungsten	0.20	1.00
Iron	17.00	20.00
Boron	--	0.010
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, Forgings, and Flash Welded Rings: Solution heat treated.

3.2.1.1 Bars less than 0.750 in. (19.05 mm) in nominal diameter or distance between parallel sides shall be descaled.

3.2.1.2 Round bars 0.750 in. (19.05 mm) and over in nominal diameter shall be ground.

3.2.1.3 Bars, other than round, 0.750 in. (19.05 mm) and over in distance between parallel sides shall be descaled.

3.2.1.4 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 AMS 7490.

3.2.2 Stock for Forging, Flash Welded Rings, or Heading: As ordered by the forging, flash welded rings,
Ø or heading manufacturer.

3.3 Solution Heat Treatment: Bars, forgings, and flash welded rings shall be solution heat treated by heat-
Ø ing to 2150°F ± 25 (1177°C ± 15), holding at heat for a time commensurate with section thickness but not less than 20 min., and cooling at a rate equivalent to air cool or faster.

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

3.4.1 Bars, Forgings, and Flash Welded Rings:

3.4.1.1 Hardness: Shall be as follows, determined in accordance with ASTM E10:

3.4.1.1.1 Bars and Forgings: Not higher than 241 HB or equivalent. Hardness of bars shall be determined at approximately midradius.

3.4.1.1.2 Flash Welded Rings: Not higher than 277 HB or equivalent after sizing.

3.4.1.2 Stress-Rupture Properties at 1500°F (816°C): A tensile test specimen, maintained at 1500°F ± 3 (816°C ± 2) while a load sufficient to produce an initial axial stress of 15,000 psi (103 MPa) is applied continuously, shall not rupture in less than 24 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 E139.

3.4.1.2.1 The test of 3.4.1.2 may be conducted using a load higher than required to produce an initial axial stress of 15,000 psi (103 MPa) but load shall not be changed while test is in progress. Time to rupture and elongation requirements shall be as specified in 3.4.1.2.

3.4.1.2.2 When permitted by purchaser, the test of 3.4.1.2 may be conducted using incremental loading. In such case, the load required to produce an initial axial stress of 15,000 psi (103 MPa) shall be used to rupture or for 24 hr, whichever occurs first. After the 24 hr and at intervals of 8 - 16 hr, preferably 8 - 10 hr, thereafter, the stress shall be increased in increments of 5,000 psi (34.5 MPa). Time to rupture and elongation requirements shall be as specified in 3.4.1.2.

3.4.2 Forging Stock: When a sample of stock is forged to a test coupon and heat treated as in 3.3, specimens Ø taken from the heat treated coupon shall conform to the requirements of 3.4.1.1 and 3.4.1.2. If specimens taken from the stock after heat treatment as in 3.3 conform to the requirements of 3.4.1.1 and 3.4.1.2, the tests shall be accepted as equivalent to tests of a forged coupon.

3.4.3 Stock for Flash Welded Rings or Heading: Specimens taken from the stock after heat treatment as in Ø 3.3 shall conform to the requirements of 3.4.1.1 and 3.4.1.2.

3.5 Quality: The product, as received by the purchaser, shall be uniform in quality and condition, sound, Ø and free from foreign materials and from internal and external imperfections detrimental to usage of the product.

3.6 Sizes: Except when exact length or multiples of exact lengths are ordered, straight bars will be accept- Ø able in mill lengths of 6 - 24 ft (1.8 - 7.3 m) but not more than 25% of any shipment shall be supplied in lengths of 6 - 9 ft (1.8 - 2.7 m) except that for bars weighing over 25 lb per ft (37.2 kg/m), short lengths down to 2 ft (610 mm) may be supplied.

3.7 Tolerances: Unless otherwise specified, tolerances for bars and forging stock shall conform to all Ø applicable requirements of AMS 2261.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsi- Ø ble for performing all required tests. Results ofsuch tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: The following are classified as acceptance tests:

Ø 4.2.1.1 Tests of the product to determine conformance to composition (3.1) requirements.

4.2.1.2 Tests of bars, forgings, and flash welded rings to determine conformance to hardness (3.4.1.1) Ø and stress-rupture property (3.4.1.2) requirements.

4.2.2 Periodic Tests: Tests of forging stock (3.4.2) and stock for flash welded rings or heading (3.4.3) to Ø determine ability to develop required properties are classified as periodic tests.

4.2.3 Preproduction Te sts of forgings to determine conformance to all technical requirements of Ø this specification are classified as preproduction tests.

4.2.3.1 For direct U.S. Military procurement of forgings, substantiating test data and, when requested, Ø preproduction forgings shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with the following:

Ø 4.3.1 Bars, Flash Welded Rings, and Stock for Flash Welded Rings or Heading: AMS 2371.

4.3.1.1 Specimens for stress-rupture tests of flash welded rings shall be taken from parent metal not Ø including the weld-heat-affected zone.

Ø 4.3.2 Forgings and Forging Stock: AMS 2374.

4.3.2.1 Specimens for stress-rupture tests of forgings shall be taken from any plane perpendicular to the Ø axis of the forging with axis of specimen in the selected plane perpendicular to a radius. When size and shape permit, additional specimens shall be taken with the axis of specimen approximately parallel to the axis of the forging. Size, location, and number of specimens shall be as agreed upon by purchaser and vendor.

Ø 4.4 Approval: When specified, approval and control of forgings shall be in accordance with AMS 2375.

4.5 Reports:

4.5.1 The vendor of the product shall furnish with each shipment three copies of a report showing the Ø results of tests for chemical composition of each heat and the results of tests on each size from each heat to determine conformance to the other acceptance test requirements of this specification. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.5.2 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 and its revision letter, 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.