SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5754L

Issued MAY 1954
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Superseding AMS 5754K

Nickel Alloy, Corrosion and Heat-Resistant, Bars, Forgings, and Rings
47.5Ni - 22Cr - 1.5Co - 9.0Mo - 0.60W - 18.5Fe
Solution Heat Treated

(Composition similar to UNS N06002)

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:

These products have been used typically for parts, such as turbine rotors, shafts, flanges, blades, and bolts, requiring oxidation resistance up to 2200 °F (1204 °C) and relatively high strength above 1500 °F (816 °C), but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent supplied herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2261	Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Bars, Rods, and Wire
MAM 2261	Tolerances, Metric, Nickel, Nickel Alloy, and Cobalt Alloy Bars, Rods, and Wire
AMS 2269	Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys
AMS 2371	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS 2374	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steel and Alloy Forgings

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.1 (Continued):

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, Austenitic-Type Iron, Nickel, or Cobalt Alloys, or Precipitation Hardenable Alloys

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM E 10 Brinell Hardness of Metallic Materials
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

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 – Composition

Element	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 (3.1.1)	--	0.010
Aluminum (3.1.1)	--	0.50
Titanium	--	0.15
Copper	--	0.50
Nickel	remainder	

3.1.1 Shall be present but not in excess of value specified.

3.1.2 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, solution heat-treated, and descaled, except round bars shall be ground or turned.

3.2.2 Forgings and Flash Welded Rings: Solution heat-treated and descaled.

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 Stock for Heading: Solution heat-treated, cold reduced, and centerless ground.

3.3 Heat Treatment:

Bars, forgings, and flash welded rings shall be solution heat treated by heating within the range 2100 to 2150 °F (1149 to 1177 °C), holding at the selected temperature within ±25 °F (±14 °C) for a time commensurate with cross-sectional thickness but not less than 20 minutes, and cooling at a rate equivalent to an 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 E 10:

3.4.1.1.1 Bars and Forgings: Not higher than 241 HB, or equivalent (See 8.2). Hardness of bars shall be determined at approximately mid-radius of rounds and at approximately T/4 of other shapes.

3.4.1.1.2 Flash Welded Rings: Not higher than 277 HB, or equivalent (See 8.2), after sizing.

3.4.1.2 Stress-Rupture Properties at 1500 °F (816 °C): A tensile specimen, maintained at 1500 °F ± 3 (816 °C ± 2) while a load sufficient to produce an initial axial stress of 15.0 ksi (103 MPa) or higher 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 E 139.

3.4.1.2.1 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 15.0 ksi (103 MPa) or higher shall be used to rupture or for 24 hours, whichever occurs first. After the 24 hours and at intervals of 8 to 16 hours, preferably 8 to 10 hours, thereafter, the stress shall be increased in increments of 5.0 ksi (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 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 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 purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

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

3.6 Tolerances:

Bars shall conform to all applicable requirements of AMS 2261 or MAM 2261.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: The following requirements are acceptance tests and shall be performed on each heat or lot as applicable:

4.2.1.1 Composition (3.1) of each heat.

4.2.1.2 Hardness (3.4.1.1) and stress-rupture properties (3.4.1.2) of each lot of bars, forgings, and flash welded rings.

4.2.1.3 Tolerances (3.6) of bars.

4.2.2 Periodic Tests: Tests of forging stock (3.4.2) and of stock for flash welded rings or heading (3.4.3) to demonstrate ability to develop required properties and grain flow of die forgings (3.5.1) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 Bars, Flash Welded Rings, and Stock for Forging, Flash Welded Rings, or Heading: In accordance with AMS 2371.

4.3.2 Forgings: In accordance with AMS 2374 and as follows.

4.3.2.1 Specimens for stress-rupture tests of forgings shall be taken from any plane perpendicular to the 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.

4.4 Reports:

4.4.1 The vendor of bars, forgings, and flash welded rings shall furnish with each shipment a report showing the results of tests for composition of each heat and for hardness and stress-rupture properties of each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS 5754L, size, and quantity. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.

4.4.2 The vendor of stock for forging, flash welded rings, or heading shall furnish with each shipment a report showing the results of tests for composition of each heat. This report shall include the purchase order number, heat and lot numbers, AMS 5754L, size, and quantity.

4.5 Resampling and Retesting:

Shall be as follows:

4.5.1 Bars, Flash Welded Rings, and Stock for Forging, Flash Welded Rings, or Heading: In accordance with AMS 2371.

4.5.2 Forgings: In accordance with AMS 2374.