

AEROSPACE MATERIAL SPECIFICATION



AMS 5755F

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Revised AUG 2002
Reaffirmed APR 2007

Superseding AMS 5755E

Nickel Alloy, Corrosion and Heat-Resistant, Bars, Forgings, and Rings
64Ni - 5.0Cr - 24.5Mo - 5.5Fe
Solution Heat Treated

(Composition similar to UNS N10004)

RATIONALE

This document has been reaffirmed to comply with the SAE 5-year Review policy.

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:

These products have been used typically for parts requiring oxidation resistance up to 1600 °F (871 °C), good strength up to 1200 °F (649 °C), and low coefficient of expansion, 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 specified 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.

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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
- AMS 2750 Pyrometry
- 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 21 Elevated Temperature Tension 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	--	0.12
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	4.00	6.00
Molybdenum	23.00	26.00
Iron	4.00	7.00
Vanadium	--	0.60
Cobalt (3.1.1)	--	2.50
Nickel + Cobalt	remainder	

3.1.1 Determination not required for routine acceptance.

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

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 Bars: Hot rolled, solution heat treated, and descaled. Rounds 0.75 inch (19.0 mm) and over in nominal diameter shall be ground.

3.2.2 Forgings: Solution heat treated and descaled.

3.2.3 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 $2150^{\circ}\text{F} \pm 25$ ($1177^{\circ}\text{C} \pm 14$), holding at heat for a time commensurate with section thickness but not less than 20 minutes, and cooling at a rate equivalent to a rapid air cool or faster. Pyrometry shall be in accordance with AMS 2750.

3.4 Properties:

The product shall conform to the following requirements:

3.4.1 Bars, Forgings, and Flash Welded Rings:

- 3.4.1.1 Tensile Properties at 1500°F (816°C): Shall be as shown in Table 2, determined in accordance with ASTM E 21 on specimens heated to $1500^{\circ}\text{F} \pm 5$ ($816^{\circ}\text{C} \pm 3$), held at heat for 20 to 30 minutes before testing, and tested at $1500^{\circ}\text{F} \pm 5$ ($816^{\circ}\text{C} \pm 3$).

TABLE 2 – Minimum Elevated Temperature Tensile Properties

Property	Value
Tensile Strength	55 ksi (379 MPa)
Elongation in 4D	10%

- 3.4.1.2 Hardness: Shall be 170 to 241 HB, or equivalent (See 8.2), determined in accordance with ASTM E 10.

- 3.4.2 Stock for Forging or Flash Welded Rings: As agreed upon by purchaser and vendor.

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 specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for 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 Elevated temperature tensile properties (3.4.1.1) and hardness (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 to determine ability of stock for forging or flash welded rings to develop required properties (3.4.2) and tests for 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 or Flash Welded Rings: In accordance with AMS 2371.

4.3.2 Forgings: In accordance with AMS 2374.

4.4 Reports:

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, for elevated temperature tensile properties and hardness 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 5755F, size, and quantity. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.