AEROSPACE MATERIAL SPECIFICATION

AMS5887™	REV. D

Issued 1990-01
Reaffirmed 2006-04
Revised 2015-12

Superseding AMS5887C

Nickel Alloy, Corrosion and Heat-Resistant, Bars, Forgings, and Rings
54Ni - 22Cr - 12.5Co - 9.0Mo - 1.2Al
Consumable Electrode or Vacuum Induction Melted
Annealed
(Composition similar to UNS N06617)

RATIONALE

AMS5887D revises Condition (3.3.1.2), Properties (3.4.1.1.3), and Reports (4.4), and is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a corrosion and heat-resistant nickel alloy in the form of bars, forgings, flash welded rings under 4 inches (102 mm) in least cross-sectional dimension, and stock of any size for forging or flash welded rings (see 8.4).

1.2 Application

These products have been used typically 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, 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.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2261 Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Bars, Rods, and Wire

AMS2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5887D

AMS2371 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

AMS2374 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steel and Alloy Forgings

AMS2806 Identification Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys

AMS2808 Identification Forgings

AMS7490 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 International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E21 Elevated Temperature Tension Tests 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 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 E354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element	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 applicable requirements of AMS2269.

3.2 Melting Practice

Alloy shall be multiple melted 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 for remelting.

3.3 Condition

The product shall be supplied in the following condition:

3.3.1 Bars

3.3.1.1 Hot finished or cold finished, then annealed; round bars shall be ground or turned.

3.3.1.2 Bar shall not be cut from plate (also see 4.4.1).

3.3.2 Forgings and Flash Welded Rings

Annealed and descaled.

3.3.2.1 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 AMS7490.

3.3.3 Stock for Forging or Flash Welded Rings

As ordered by the forging or flash welded ring manufacturer.

3.3.4 Heat Treatment

Bars, forgings, and flash welded rings shall be annealed by heating within the range 2075 to 2200 °F (1135 to 1204 °C), holding at the selected temperature within ±25 °F (±14 °C) for a time commensurate with cross-sectional thickness, 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 Tensile Properties

Shall be as follows for product under 4 inches (102 mm) in least cross-sectional dimension, determined in accordance with ASTM E8/E8M:

3.4.1.1.1 At Room Temperature

Shall be shown in Table 2.

Table 2 - Minimum tensile properties

Property	Value
Tensile Strength	95 ksi (655 MPa)
Yield Strength at 0.2% Offset	35.0 ksi (241 MPa)
Elongation in 4D	35%

3.4.1.1.2 At 1000 °F (538 °C)

Shall be shown in Table 3, determined in accordance with ASTM E21 on specimens heated to 1000 °F ± 5 °F (538 °C ± 3 °C), held at heat for not less than 20 minutes before testing, and tested at 1000 °F ± 5 °F (538 °C ± 3 °C).

Table 3 - Minimum elevated temperature tensile properties

Property	Value
Tensile Strength	66 ksi (455 MPa)
Yield Strength at 0.2% Offset	23.0 ksi (159 MPa)
Elongation in 4D	45%

3.4.1.1.3 Mechanical property requirements for product outside the size range covered by 1.1 shall be agreed upon between purchaser and producer.

3.4.1.2 Stress-Rupture Properties at 1600 °F (871 °C)

A tensile specimen, maintained at 1600 °F ± 3 °F (871 °C ± 2 °C) while a load sufficient to produce an initial axial stress of 13.0 ksi (90 MPa) or higher 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. Testing shall be conducted in accordance with ASTM E139.

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 13.0 ksi (90 MPa) or higher shall be used to rupture or for 23 hours. After the 23 hours and at intervals of 8 hours minimum thereafter, the stress shall be increased in increments of 2.0 ksi (13.8 MPa). Time to rupture and elongation requirements shall be as specified in 3.4.1.2.

3.4.2 Stock for Forging or Flash Welded Rings

Shall be as agreed upon by purchaser and producer.

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 AMS2261.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for producer'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

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 Tensile properties (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

Grain flow of die forgings (3.5.1) is a periodic test and shall be performed at a frequency selected by the producer 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 AMS2371.

4.3.2 Forgings

In accordance with AMS2374.

4.4 Reports

The producer of the product shall furnish with each shipment a report showing the producer's name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), and the results of tests for composition of each heat and for tensile properties 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, AMS5887D, size, and quantity. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.

4.4.1 If the ship size/shape is cut from a larger cross section, report the nominal metallurgically worked size (see 3.3.1.2).

4.4.2 When the product size is outside the range covered by 1.1, the report shall contain a statement to that effect.

4.4.3 The producer of forging stock shall furnish with each shipment a report showing the producer's name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), and the results of tests for composition of each heat. This report shall include the purchase order number, heat number, AMS5887D, size and quantity.