SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS5665 REV. N

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Superseding AMS5665M

Nickel Alloy, Corrosion and Heat Resistant, Bars, Forgings, and Rings
74Ni - 15.5Cr - 8.0Fe

UNS N06600

RATIONALE

AMS5665N revises Composition (Table 1), 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, and stock for forging or flash welded rings.

1.2 Application

These products have been used typically for parts requiring both corrosion and oxidation resistance and where such parts may require welding during fabrication and for parts requiring oxidation resistance up to 2000 °F (1093 °C) but useful at the higher temperatures only when stresses are low, but usage is not limited to such applications. Strength at elevated temperatures is similar to that of the 18-8 type steels.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order form 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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
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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/AMS5665N

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 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

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 E 8/E 8M Tension Testing of Metallic Materials

ASTM E 10 Brinell Hardness of Metallic Materials

ASTM E 18 Rockwell Hardness 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	--	0.15
Manganese	--	1.00
Silicon	--	0.50
Sulfur	--	0.015
Chromium	14.00	17.00
Nickel	72.00	--
Iron	6.00	10.00
Cobalt	--	1.00
Columbium (Niobium)	--	1.00
Titanium	--	0.50
Aluminum	--	0.35
Copper	--	0.50

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS2269.

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Bars

3.2.1.1 Rounds 2.50 Inches (63.5 mm) and Under in Nominal Diameter: Cold drawn unless ordered hot finished, and turned or ground.

3.2.1.2 Rounds Over 2.50 Inches (63.5 mm) in Nominal Diameter: Hot finished or hot finished and turned or ground.

3.2.1.3 Squares, Hexagons, and Rectangles: Hot finished.

3.2.2 Forgings and Flash Welded Rings: Annealed.

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 AMS7490.

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

3.3 Properties

The product shall conform to the following requirements.

3.3.1 Bars, Forgings, and Flash Welded Rings

3.3.1.1 Tensile Properties: Shall be as shown in Table 2, determined in accordance with ASTM E 8/E 8M on specimens taken from round bars over 2.50 to 4.50 inches (over 63.5 to 114.3 mm), inclusive, in nominal diameter and from forgings over 2.50 inches (63.5 mm) in nominal thickness.

TABLE 2 - MINIMUM TENSILE PROPERTIES

Properties	Bars	Forgings
Tensile Strength	85 ksi (586 MPa)	80 ksi (552 MPa)
Yield Strength at 0.2% Offset	35 ksi (241 MPa)	30 ksi (207 MPa)
Elongation in 4D	30%	35%

3.3.1.1.1 Tensile property requirements for square, hexagonal, and rectangular bars, for round bars 2.50 inches (63.5 mm) and under in nominal diameter, for forgings 2.50 inches (63.5 mm) and under in nominal thickness, and flash welded rings, shall be as agreed upon by purchaser and vendor.

3.3.1.2 Hardness: Shall be as follows, or equivalent (See 8.2), determined in accordance with ASTM E 10 or ASTM E 18.

3.3.1.2.1 Bars: As shown in Table 3.

TABLE 3 – HARDNESS

Properties	Thickness Inches	Thickness Millimeters	Hardness
Cold Drawn	Up to 1.00, incl	Up to 25.4, incl	229 - 311 HB
	Over 1.00 to 2.50, incl	Over 25.4 to 63.5, incl	207 – 285 HB
Hot Finished	Up to 0.50, incl	Up to 12.7, incl	134 – 241 HB
	Over 0.50	Over 12.7	134 – 217 HB

3.3.1.2.2 Forgings: Not higher than 187 HB, or equivalent (See 8.2).

3.3.1.2.3 Flash Welded Rings: Not higher than 217 HB, or equivalent (See 8.2).

3.3.2 Stock for Forging or Flash Welded Rings: Shall have properties as agreed upon by purchaser and vendor.

3.4 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.

3.4.1 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 re-entrant grain flow.

3.5 Tolerances

Bars shall conform to all applicable requirements of AMS2261.

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: Composition (3.1), tensile properties (3.3.1.1), hardness (3.3.1.2) and tolerances (3.5) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Grain flow of die forgings (3.4.1) is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.