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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 5666D

Issued 1 NOV 1967
Revised 1 APR 1992
Superseding AMS 5666C

Submitted for recognition as an American National Standard

NICKEL ALLOY, CORROSION AND HEAT RESISTANT, BARS, FORGINGS, EXTRUSIONS, AND RINGS
62Ni - 21.5Cr - 9.0Mo - 3.65 (Cb+Ta)
Annealed

UNS N06625

1. SCOPE:

1.1 Form:

This specification covers a corrosion and heat resistant nickel alloy in the form of bars, forgings, extrusions, flash welded rings, and stock for forging, extruding, or flash welded rings.

1.2 Application:

These products have been used typically for parts requiring both corrosion and oxidation resistance up to 2000 °F (1093 °C) and where such parts may require welding during fabrication, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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, Wrought Nickel Alloys and Cobalt Alloys

AMS 2371 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock

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AMS 5666D

SAE

AMS 5666D

2.1 SAE Publications (Continued):

- AMS 2374 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steel and Alloy Forgings
- 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 and Austenitic-Type Alloys or Precipitation-Hardenable Alloys

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

- ASTM E 8 Tension Testing of Metallic Materials
- ASTM E 8M Tension Testing of Metallic Materials (Metric)
- ASTM E 10 Brinell Hardness of Metallic Materials
- ASTM E 112 Determining Average Grain Size
- ASTM E 354 Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

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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.

AMS 5666D

SAE

AMS 5666D

TABLE 1 - Composition

Element	min	max
Carbon	--	0.10
Manganese	--	0.50
Silicon	--	0.50
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	20.00	23.00
Molybdenum	8.00	10.00
Columbium + Tantalum	3.15	4.15
Cobalt	--	1.00
Titanium	--	0.40
Aluminum	--	0.40
Iron	--	5.00
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: Hot finished and annealed; round bars shall be ground or turned.

3.2.2 Forgings, Extrusions, 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 AMS 7490.

3.2.3 Stock for Forging, Extruding, or Flash Welded Rings: As ordered by the forging, extrusion, 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 or ASTM E 8M on specimens taken from product under 4 inches (101.6 mm) in least cross-sectional dimension:

AMS 5666D

SAE

AMS 5666D

TABLE 2 - Minimum, Tensile Properties

Property	Value
Tensile Strength	120.0 ksi (827 MPa)
Yield Strength at 0.2% Offset	60.0 ksi (414 MPa)
Elongation in 4D	30%

3.3.1.1.1 Tensile property requirements for product 4 inches (101.6 mm) and over in least cross-sectional dimension shall be as agreed upon by purchaser and vendor.

3.3.1.2 Hardness: Shall be not higher than 287 HB, or equivalent, determined in accordance with ASTM E 10 (See 8.2).

3.3.1.3 Grain Size: Predominantly ASTM No. 5 or finer, determined in accordance with ASTM E 112, for product with a least cross-section dimension under 2-1/2 inches (63.5 mm). For product with a least cross-section dimension 2-1/2 inches (63.5 mm) and over, grain size shall be as agreed upon by purchaser and vendor.

3.3.2 Extrusions and Stock for Forging, Extruding, and 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 AMS 2261 or MAM 2261.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

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The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing 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 requirements of this specification.

AMS 5666D

SAE

AMS 5666D

4.2 Classification of Tests:

Tests for the following requirements are acceptance tests and shall be performed on each heat or lot as applicable:

4.2.1 Composition (3.1) of each heat.

4.2.2 Tensile properties (3.3.1.1), hardness (3.3.1.2), and grain size (3.3.1.3) of each lot of bars, forgings, and flash welded rings.

4.2.3 Tolerances (3.5) of bars.

4.3 Sampling and Testing:

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Shall be in accordance with the following:

4.3.1 Bars, Flash Welded Rings, Extrusions, and Stock for Forging, Extruding, or Flash Welded Rings: AMS 2371.

4.3.2 Forgings: AMS 2374.

4.4 Reports:

4.4.1 The vendor of bars, forgings, flash welded rings, and extrusions shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and the results of tests on each lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, lot number, AMS 5666D, size, and quantity. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.4.2 The vendor of stock for forging, extruding, or flash welded rings shall furnish with each shipment a report showing the results of tests for chemical composition of each heat. This report shall include the purchase order number, heat number, AMS 5666D, size, and quantity.

4.5 Resampling and Retesting:

Shall be in accordance with the following:

4.5.1 Bars, Flash Welded Rings, Extrusions, and Stock for Forging, Extruding, or Flash Welded Rings: AMS 2371.

4.5.2 Forgings: AMS 2374.

5. PREPARATION FOR DELIVERY:

5.1 Sizes:

Except when exact lengths or multiples of exact lengths are ordered, straight bars will be acceptable in mill lengths of 6 to 24 feet (1.8 to 7.3 m) but not more than 25% of any shipment shall be supplied in lengths of 6 to 9 feet (1.8 to 2.7 m) except that for bars weighing over 25 pounds per foot (37 kg/m), short lengths down to 2 feet (610 m) may be supplied.