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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 5717F

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Superseding AMS 5717E

Submitted for recognition as an American National Standard

NICKEL ALLOY, CORROSION AND HEAT RESISTANT, BARS, FORGINGS, AND RINGS
45.5Ni - 25.5Cr - 3.2Co - 3.2Mo - 3.2W - 18.5Fe
Solution Heat Treated

UNS N06333

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 heat and oxidation resistance up to 2150 °F (1177 °C), particularly 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 2241 Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire

MAM 2241 Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire

AMS 2248 Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys

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2.1 SAE Publications: (Continued)

- 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 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 18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
- 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: (R)

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 | -- | 0.08 |
| Manganese | -- | 2.00 |
| Silicon | 0.75 | 1.50 |
| Phosphorus | -- | 0.030 |
| Sulfur | -- | 0.030 |
| Chromium | 24.00 | 27.00 |
| Nickel | 44.00 | 47.00 |
| Cobalt | 2.50 | 4.00 |
| Molybdenum | 2.50 | 4.00 |
| Tungsten | 2.50 | 4.00 |
| Copper | -- | 0.50 |
| Tin | -- | 0.025 |
| Lead | -- | 0.025 |
| Iron | remainder | |

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 Bars, Forgings, and Flash Welded Rings: Solution heat treated.

3.2.1.1 Bars shall be hot finished except that bars under 0.250 inch (6.35 mm) in nominal diameter or distance between parallel sides may be cold finished.

3.2.1.2 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.

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

3.3 Heat Treatment:

No specific heat treating instructions are specified but bars, forgings, and flash welded rings shall be solution heat treated to produce the properties specified in 3.4.1.1 and 3.4.1.2. Recommended solution heat treatment is presented in 3.3.1.

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3.3.1 Bars, forgings, and flash welded rings should be solution heat treated by (R) heating to a temperature not lower than 1950 °F (1066 °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 shown in Table 2, determined in accordance with ASTM E 8 or ASTM E 8M:

TABLE 2 - Tensile Properties

| Property | Value |
|--|--------------------|
| Tensile Strength, maximum | 120 ksi (827 MPa) |
| Yield Strength at 0.2% Offset, minimum | 35.0 ksi (241 MPa) |
| Elongation in 4D, minimum | 30% |

3.4.1.2 Hardness: Shall be not higher than 95 HRB, or equivalent, determined in (R) accordance with ASTM E 18.

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 (R) grain, shall follow the general contour of the forgings showing no evidence of re-entrant grain flow.

3.6 Tolerances:

Bars shall conform to all applicable requirements of AMS 2241 or MAM 2241.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

(R)

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.

4.2 Classification of Tests:

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

4.3 Sampling and Testing:

(R)

Shall be in accordance with the following:

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

4.3.2 Forgings: AMS 2374.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for tensile properties and hardness requirements of each lot. This report shall include the purchase order number, heat and lot number, AMS 5717F, specific heat treating cycles used to obtain reported properties, 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.

4.5 Resampling and Retesting:

Shall be in accordance with the following:

4.5.1 Bars, Flash Welded Rings, and Stock for Forging 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 mm) may be supplied.