

# AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5633C

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Superseding AMS 5633B

ALLOY BARS AND FORGINGS, CORROSION AND HEAT RESISTANT  
38Fe - 13.2Cr - 38Ni - 5.5Mo - 0.85Cb - 2.5Ti - 1.6Al - 0.009B  
Consumable Electrode Melted, Solution Heat Treated, Precipitation Hardenable  
UNS N09027

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of 15 October 1986. It is recommended that this specification not be specified for new designs.

This cover sheet should be attached to the "C" revision of the subject specification.

"Noncurrent" refers to those materials which have previously been widely used and which may be required on some existing designs in the future. The Aerospace Materials Division, SAE, does not recommend these as standard materials for future use in new designs. Each of these "Noncurrent" specifications is available on request from SAE.

This specification is under the jurisdiction of AMS Committee "F".

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**ALLOY BARS AND FORGINGS, CORROSION AND HEAT RESISTANT**

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Consumable Electrode Melted, Solution Heat Treated

**1. SCOPE:**

1.1 **Form:** This specification covers a corrosion and heat resistant iron-nickel alloy in the form of bars, wire, forgings, and forging stock.

1.2 **Application:** Primarily for parts, such as turbine discs, shafts, spacers, dowels, and fittings requiring high strength up to 1400°F (760°C) and oxidation resistance up to 1600°F (870°C).

2. **APPLICABLE DOCUMENTS:** The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 **SAE Publications:** Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 **Aerospace Material Specifications:**

AMS 2241 - Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire

AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys

AMS 2350 - Standards and Test Methods

AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Wrought Products Except Forgings and Forging Stock

AMS 2374 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Forgings and Forging Stock

AMS 2375 - Control of Forgings Requiring First Article Approval

AMS 2806 - Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Heat and Corrosion Resistant Steels and Alloys

AMS 2808 - Identification, Forgings

2.2 **ASTM Publications:** Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E8 - Tension Testing of Metallic Materials

ASTM E10 - Brinell Hardness of Metallic Materials

ASTM E21 - Elevated Temperature Tension Tests of Metallic Materials

ASTM E112 - Estimating the Average Grain Size of Metals

ASTM E139 - Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials

ASTM E292 - Conducting Time-for-Rupture Notch Tension Tests of Materials

ASTM E354 - Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

2.3 **U.S. Government Publications:** Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

**Documents**

Document Sharing Hub

### 2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

### 2.3.2 Military Standards:

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

## 3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E354, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

|            | min       | max   |
|------------|-----------|-------|
| Carbon     | 0.02      | 0.08  |
| Manganese  | --        | 0.25  |
| Silicon    | --        | 0.25  |
| Phosphorus | --        | 0.015 |
| Sulfur     | --        | 0.015 |
| Chromium   | 12.50     | 14.00 |
| Nickel     | 36.50     | 39.50 |
| Molybdenum | 5.00      | 6.00  |
| Columbium  | 0.60      | 1.10  |
| Titanium   | 2.30      | 2.70  |
| Aluminum   | 1.45      | 1.75  |
| Boron      | 0.003     | 0.015 |
| 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, Wire, and Forgings: Solution heat treated.

3.2.1.1 Bars and wire 2.75 in. (70.0 mm) and under in nominal diameter or distance between parallel sides shall be cold finished. Larger size bars shall be hot finished and descaled.

3.2.1.2 Forgings: Shall be descaled.

3.2.2 Forging Stock: As ordered by the forging manufacturer.

3.3 Heat Treatment: Bars, wire, and forgings shall be solution heat treated by heating to  $1875^{\circ}\text{F} \pm 25$  ( $1025^{\circ}\text{C} \pm 15$ ), holding at heat for 60 min.  $\pm 5$ , and quenching in oil or water.

3.4 Properties: The product shall conform to the following requirements:

3.4.1 Bars, Wire, and Forgings:

3.4.1.1 As Solution Heat Treated:

3.4.1.1.1 Hardness: Not higher than 275 HB or equivalent, determined in accordance with ASTM E10.

3.4.1.1.2 Grain Size: Predominantly 4 or finer with no grains larger than 2, determined by comparison of a polished and etched specimen with the chart in ASTM E112 or, in case of disagreement, by the intercept (Heyn) method.