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# AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

**SAE**

**AMS 5888A**

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Revised DEC 1995

Superseding AMS 5888

NICKEL ALLOY, CORROSION AND HEAT RESISTANT, PLATE  
54Ni - 22Cr - 12.5Co - 9.0Mo - 1.2Al  
Annealed

UNS N06617

## 1. SCOPE:

### 1.1 Form:

This specification covers a corrosion and heat resistant nickel alloy in the form of plate.

### 1.2 Application:

This plate has been used typically for parts requiring a combination of 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 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 purchase order.

### 2.1 SAE Publications:

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

AMS 2262 Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate  
MAM 2262 Tolerances, Metric Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate  
AMS 2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys  
AMS 2371 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock  
AMS 2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

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## 2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

- ASTM E 8 Tension Testing of Metallic Materials
- ASTM E 8M Tension Testing of Metallic Materials (Metric)
- ASTM E 21 Elevated Temperature Tension Tests of Metallic Materials
- ASTM E 139 Conducting Creep, Creep Rupture, and Stress Rupture Tests of Metallic Materials
- ASTM E 290 Semi-Guided Bend Test for Ductility 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 DODSSP, Subscription Services 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:

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	0.05	0.15
Manganese	--	0.50
Silicon	--	0.50
Phosphorous	--	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 requirements of AMS 2269.

### 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:

Hot rolled, annealed, and descaled.

### 3.4 Heat Treatment:

Plate shall be annealed by heating in the range 2075 to 2200 °F (1135 to 1204 °C), holding at the selected temperature within  $\pm 25$  °F ( $\pm 14$  °C) for a time commensurate with cross-sectional thickness, and cooling at a rate equivalent to an air cool or faster.

### 3.5 Properties:

Plate 2.00 inches (50.8 mm) and under in nominal thickness shall conform to the following requirements:

#### 3.5.1 Tensile Properties:

3.5.1.1 At Room Temperature: Shall be as follows, determined in accordance with ASTM E 8 or ASTM E 8M:

3.5.1.1.1 Plate 1.00 Inch (25.4 mm) and Under in Nominal Thickness: Shall be as shown in Table 2.

TABLE 2 - Minimum Tensile Properties

Property	Value
Tensile Strength	100 ksi (689 MPa)
Yield Strength at 0.2% Offset	40.0 ksi (276 MPa)
Elongation in 2 Inches (50.8 mm) or 4D	40%

3.5.1.1.2 Plate Over 1.00 to 2.00 Inches (25.4 to 50.8 mm), Inclusive, in Nominal Thickness: Shall be as shown in Table 3.

TABLE 3 - Minimum Tensile Properties

Property	Value
Tensile Strength	95.0 ksi (655 MPa)
Yield Strength at 0.2% Offset	35.0 ksi (241 MPa)
Elongation in 2 Inches (50.8 mm) or 4D	35%

- 3.5.1.2 At 1000 °F (538 °C): Shall be as shown in Table 4, determined in accordance with  
(R) ASTM E 21 on specimens heated to 1000 °F  $\pm$  5 (538 °C  $\pm$  3), held at heat for not less than 20 minutes before testing, and tested at 1000 °F  $\pm$  5 (538 °C  $\pm$  3).

TABLE 4 - Minimum Tensile Properties

Property	Value
Tensile Strength	66.0 ksi (455 MPa)
Yield Strength at 0.2% Offset	23.0 ksi (159 MPa)
Elongation in 2 Inches (50.8 mm) or 4D	45%

- 3.5.2 Stress-Rupture Properties at 1600 °F (871 °C): A tensile specimen, maintained at 1600 °F  $\pm$  3 (871 °C  $\pm$  2) 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. Test shall be conducted in accordance with ASTM E 139.

- 3.5.2.1 The test of 3.5.2 may be conducted using incremental loading. In such case, the load  
(R) required to produce an initial axial stress of 13.0 ksi (90 MPa) or higher shall be used to rupture or for 23 hours, whichever occurs first. After the 23 hours and at intervals of 8 to 16 hours, preferably 8 to 10 hours, 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 3.5.2.

- 3.5.3 Bending: Plate, 0.250 inch (6.35 mm) and under in nominal thickness, shall withstand, without cracking, bending at room temperature in accordance with ASTM E 290 through an angle of 180 degrees around a diameter equal to two times the nominal thickness of the plate with axis of bend parallel to the direction of rolling.

### 3.6 Quality:

Plate, 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 plate.