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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-5888

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Submitted for recognition as an American National Standard

ALLOY PLATE, CORROSION AND HEAT RESISTANT
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: Primarily 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.

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.

2.1.1 Aerospace Material Specifications:

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

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 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 Naval Publications and Forms Center, Attn: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

2.3.1 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 E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	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 Condition: Hot rolled, annealed, and descaled.

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

3.4 Properties: Plate 2.00 inches (50.8 mm) and under in nominal thickness shall conform to the following requirements; properties for plate over 2.00 inches (50.8 mm) in nominal thickness shall be as agreed upon by purchaser and vendor:

3.4.1 Tensile Properties:

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

3.4.1.1.1 Plate 1.00 Inch (25.4 mm) and Under in Nominal Thickness:

Tensile Strength, minimum	100,000 psi (689 MPa)
Yield Strength at 0.2% Offset, minimum	40,000 psi (276 MPa)
Elongation in 2 Inches (50.8 mm) or 4D, minimum	40%

3.4.1.1.2 Plate Over 1.00 to 2.00 Inches, Inclusive, in Nominal Thickness:

Tensile Strength, minimum	95,000 psi (655 MPa)
Yield Strength at 0.2% Offset, minimum	35,000 psi (241 MPa)
Elongation in 2 Inches (50.8 mm) or 4D, minimum	35%

3.4.1.2 At 1000°F (538°C): Shall be as follows, determined in accordance with ASTM E 21 on specimens heated to 1000°F ± 5 (538°C ± 3), held at heat for 20 - 30 minutes before testing, and tested at 1000°F ± 5 (538°C ± 3):

Tensile Strength, minimum	66,000 psi (455 MPa)
Yield Strength at 0.2% Offset, minimum	23,000 psi (159 MPa)
Elongation in 2 Inches (50.8 mm) or 4D, minimum	45%

3.4.2 Stress-Rupture Properties at 1600°F (871°C): A tensile specimen maintained at 1600°F ± 3 (871°C ± 2) while a load sufficient to produce an initial axial stress of 13,000 psi (90 MPa) 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.

3.4.2.1 The test of 3.4.2 may be conducted using a load higher than required to produce an initial axial stress of 13,000 psi (90 MPa) but load shall not be changed while test is in progress. Time to rupture and elongation requirements shall be as specified in 3.4.2.

3.4.2.2 When permitted by purchaser, the test of 3.4.2 may be conducted using incremental loading. In such case, the load required to produce an initial axial stress of 13,000 psi (90 MPa) shall be used to rupture or for 23 hours, whichever occurs first. After the 23 hours and at intervals of 8 - 16 hours, preferably 8 - 10 hours, thereafter, the stress shall be increased in increments of 2000 psi (13.8 MPa). Time to rupture and elongation requirements shall be as specified in 3.4.2.

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

3.4.3.1 Bending requirements for plate over 0.250 inch (6.35 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.5 Quality:

3.5.1 Alloy shall be produced by multiple melting using consumable electrode practice in the remelt cycle or shall be induction melted under vacuum. If consumable electrode remelting in not performed in vacuum, electrodes which have been produced by vacuum induction melting shall be used.

3.5.2 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.

3.6 Tolerances: Shall conform to all applicable requirements of AMS-2262 or MAM-2262.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of plate 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 plate 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: Shall be in accordance with AMS-2371.

4.4 Reports: The vendor of plate shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for tensile, stress-rupture, and bending properties of each lot. This report shall include the purchase order number, lot number, AMS-5888, size, and quantity.

4.5 Resampling and Retesting: Shall be in accordance with AMS-2371.