

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 5872B

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Superseding AMS 5872A

ALLOY SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT
48Ni - 20Cr - 20Co - 5.9Mo - 2.2Ti - 0.45Al
Solution Heat Treated

UNS N07263

1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant nickel alloy in the form of sheet, strip, and plate.

1.2 Application: Primarily for parts requiring high strength up to 1500°F (815°C) and oxidation resistance up to 2000°F (1095°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 shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

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 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

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

- ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
- ASTM E21 - Elevated Temperature Tension Tests of Metallic Materials
- ASTM E112 - Determining Average Grain Size
- ASTM E139 - Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials
- ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic 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.

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 E354 or by spectrographic or other analytical methods approved by purchaser:

	min	max
Carbon	0.04 -	0.08
Manganese	--	0.60
Silicon	--	0.40
Phosphorus	--	0.015
Sulfur	--	0.007
Chromium	19.00 -	21.00
Cobalt	19.00 -	21.00
Molybdenum	5.60 -	6.10
Titanium	1.90 -	2.40
Aluminum	0.30 -	0.60
Titanium + Aluminum	2.40 -	2.80
Iron	--	0.70
Boron	--	0.005
Copper	--	0.20
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:

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3.2.1 Sheet and Strip: Hot or cold rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to a corrosion-resistant steel No. 1 finish.

3.2.2 Plate: Hot rolled, solution heat treated, and descaled.

3.3 Solution Heat Treatment: The product shall be solution heat treated by heating to a temperature within the range 2050° - 2150°F (1120° - 1180°C), holding at the selected temperature within $\pm 25^\circ\text{F}$ ($\pm 15^\circ\text{C}$) for a time commensurate with thickness, and rapidly cooling.

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

3.4.1 As Solution Heat Treated:

3.4.1.1 Hardness: Shall be not higher than 70 HR15N, determined in accordance with ASTM E18, or equivalent.

3.4.1.2 Bending: Product 0.187 in. (4.75 mm) and under in nominal thickness shall withstand, without cracking, bending at room temperature in accordance with ASTM E290 through an angle of 180 deg around a diameter equal to the bend factor times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

Nominal Thickness		Bend Factor
Inch	Millimetres	
Up to 0.050, incl	Up to 1.25, incl	1
Over 0.050 to 0.187, incl	Over 1.25 to 4.75, incl	2

3.4.1.2.1 Bending requirements for product over 0.187 in. (4.75 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.1.3 Grain Size: Shall be as follows, determined by comparison of a polished and etched specimen with the chart in ASTM E112:

Condition	Grain Size
Cold Rolled	4 or finer with occasional grains as large as 3
Hot Rolled	3 or finer with occasional grains as large as 2

3.4.1.4 Microstructure: Metallographic examination shall disclose no significant alloy depleted layer or other undesirable surface condition. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.4.2 After Precipitation Heat Treatment: The product shall have the following properties after being precipitation heat treated by heating to $1475^\circ\text{F} \pm 25$ ($800^\circ\text{C} \pm 15$), holding at heat for 8 hr ± 0.5 , and cooling in air:

- 3.4.2.1 Tensile Properties at 1435°F (780°C): Shall be as follows, determined in accordance with ASTM E21 on specimens heated to 1435°F ± 10 (780°C ± 5), held at heat for 10 - 20 min. before testing, and tested at 1435°F ± 10 (780°C ± 5).

Tensile Strength, min	78,500 psi (540 MPa)
Yield Strength at 0.2% Offset, min	58,500 psi (405 MPa)
Elongation in 4D, min	9%

- 3.4.2.2 Creep Properties at 1435°F (780°C): A tensile specimen, maintained at 1435°F ± 3 (780°C ± 2) while a load sufficient to produce an initial axial stress of 16,800 psi (115 Mpa) is applied continuously, shall not exceed 0.1% total plastic strain in 50 hours. Test shall be conducted in accordance with ASTM E139.

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 is not performed in vacuum, electrodes which have been produced by vacuum induction melting shall be used for remelting.

- 3.5.2 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.

- 3.6 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 the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. 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 to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each heat or lot as applicable.

- 4.3 Sampling: Shall be in accordance with AMS 2371.

4.4 Reports:

- 4.4.1 The vendor of the product 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 technical requirements of this specification. This report shall include the purchase order number, heat number, AMS 5872B, size, and quantity.