

AEROSPACE MATERIAL SPECIFICATION



AMS 5872D

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Superseding AMS 5872C

Nickel Alloy, Corrosion and Heat Resistant, Sheet, Strip, and Plate
48Ni - 20Cr - 20Co - 5.9Mo - 2.2Ti - 0.45Al
Consumable Electrode or Vacuum Induction Melted
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:

These products have been used typically for parts requiring high strength up to 1500 °F (816 °C) and oxidation resistance up to 2000 °F (1093 °C), but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order form a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been canceled and no superseding document has been specified, the last published issue of that document shall apply.

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 3	Preparation of Metallographic Specimens
ASTM E 18	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E 21	Elevated Temperature Tension Tests of Metallic Materials
ASTM E 112	Determining the Average Grain Size
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

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the following percentages by weight as 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	0.04	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 applicable requirements of AMS 2269.

3.2 Melt Practice:

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.

3.3 Condition:

The product shall be supplied in the following condition:

3.3.1 Sheet, Strip, and Foil: 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 the following commercial corrosion-resistant steel finishes, as applicable (See 8.2), except that product 0.010 inch (0.25 mm) and under in nominal thickness shall have a surface appearance comparable to a No. 2B finish.

3.3.1.1 Sheet: No. 2D finish.

3.3.1.2 Strip: No. 1 strip finish.

3.3.2 Plate: Hot rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled.

3.4 Solution Heat Treatment:

The product shall be solution heat treated by heating to a temperature within the range 1900 to 2150 °F (1038 to 1177 °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.

3.5 Properties:

The product shall conform to the following requirements:

3.5.1 As Solution Heat Treated:

3.5.1.1 Hardness: Shall be not higher than 70 HR15N, or equivalent (See 8.3), determined in accordance with ASTM E 18.

3.5.1.2 Bending: Product 0.187 inch (4.75 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 the bend factor shown in Table 2 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 2 - Bending Parameters

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
Up to 0.050, incl	Up to 1.27, incl	1
Over 0.050 to 0.187, incl	Over 1.27 to 4.75, incl	2

3.5.1.3 Average Grain Size: Shall be as shown in Table 3, determined in accordance with ASTM E 112:

TABLE 3 - Average Grain Size

Nominal Thickness	Grain Size
Up to 0.187 inch (4.75 mm), incl	4 or finer
Over 0.1875 inch (4.762 mm)	3 or finer

3.5.1.4 Surface Microstructure: Metallographic examination on the unetched and etched specimen cross-section of product 0.125 inch (3.18 mm) and under in thickness, shall disclose no alloy depleted surface layer, intergranular attack, or other detrimental surface conditions greater than 0.0005 inch (0.013 mm) for product 0.060 inch (1.52 mm) and under in thickness, or greater than 0.001 inch (0.025 mm) for product over 0.060 inch (1.52 mm) in thickness. Each specimen shall be prepared according to ASTM E 3 and evaluated at 500X magnification.

3.5.2 After Precipitation Heat Treatment: The product shall have the following properties after being precipitation heat treated by heating to 1475 °F ± 15 (802 °C ± 8), holding at heat for 8 hours ± 0.5, and cooling in air:

3.5.2.1 Tensile Properties at 1435 °F (779 °C): Shall be as shown in Table 4, determined in accordance with ASTM E 21 on specimens heated to 1435 °F ± 10 (779 °C ± 6), held at heat for 20 to 30 minutes before testing, and tested at 1435 °F ± 10 (779 °C ± 6).

TABLE 4 - Minimum Tensile Properties

Property	Value
Tensile Strength	78.5 ksi (541 MPa)
Yield Strength at 0.2% Offset	58.5 ksi (403 MPa)
Elongation in 2 inches (50.8 mm) or 4D	9%

3.5.2.2 Creep Properties at 1435 °F (779 °C): A tensile specimen, maintained at 1435 °F ± 3 (779 °C ± 2) while a load sufficient to produce an initial axial stress of 16.8 ksi (116 MPa) is applied continuously, shall not exceed 0.1% total plastic strain in 50 hours. Test shall be conducted in accordance with ASTM E 139.