

AEROSPACE MATERIAL SPECIFICATION



AMS 5869B

Issued OCT 1990
Revised NOV 2002

Superseding AMS 5869A

Nickel Alloy, Corrosion and Heat-Resistant, Sheet, Strip, and Plate
62Ni - 21.5Cr - 9.0Mo - 3.7Cb
Solution Heat Treated

(Composition similar to UNS N06625)

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 resistance to corrosion, oxidation, creep, and rupture 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 forms 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 cancelled 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 or www.sae.org.

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

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SAE WEB ADDRESS:

2.1 (Continued):

- AMS 2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing
- AS4194 Sheet and Strip Surface Finish Nomenclature

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

- ASTM A 480/A 480M Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
- ASTM E 8 Tension Testing of Metallic Materials
- ASTM E 8M Tension Testing of Metallic Materials (Metric)
- ASTM E 112 Determining 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 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	--	0.10
Manganese	--	0.50
Silicon	--	0.50
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	20.00	23.00
Molybdenum	8.00	10.00
Columbium	3.15	4.15
Cobalt	--	1.00
Titanium	--	0.40
Aluminum	--	0.40
Iron	--	5.00
Nickel	remainder	

3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2269.

3.2 Condition:

The product shall be supplied in the following condition:

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 in accordance with ASTM A 480/A 480M and AS4194 comparable to 3.2.1.1 or 3.2.1.2 as applicable.

3.2.1.1 Sheet: No. 2D finish.

3.2.1.2 Strip: No. 1 strip finish.

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

3.3 Heat Treatment:

The product shall be solution heat treated by heating to a temperature not lower than 2000 °F (1093 °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 (See 8.2).

3.3.1 Product may be given a subsequent stabilization treatment at a temperature not lower than 1800 °F (982 °C) to increase resistance to sensitization.

3.4 Properties:

The product shall conform to the following requirements:

3.4.1 Tensile Properties: Shall be as shown in Table 2 for product up to 1.000 inch (25.40 mm) in nominal thickness, determined in accordance with ASTM E 8 or ASTM E 8M.

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	30%

3.4.1.1 Yield strength requirement does not apply to product under 0.020 inch (0.51 mm) in nominal thickness.

3.4.1.2 Elongation requirement does not apply to product under 0.010 inch (0.25 mm) in nominal thickness.

- 3.4.2 Bending: Product 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 3 times the nominal thickness of the product, with axis of bend parallel to the direction of rolling.

TABLE 3 - Bending Parameters

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
0.010 to 0.050, incl	Up to 1.27, incl	1
Over 0.050 to 0.1874, incl	Over 1.27 to 4.760, incl	2

- 3.4.2.1 ASTM E 290 is not applicable to product thicknesses under 0.010 inch (0.25 mm).

- 3.4.3 Average Grain Size: Shall be as follows, determined in accordance with ASTM E 112:

- 3.4.3.1 Sheet and Strip: Shall be not finer than shown in Table 4.

TABLE 4 - Average Grain Size

Nominal Thickness Inch	Nominal Thickness Millimeters	ASTM No.
Up to 0.050, incl	Up to 1.27, incl	7
Over 0.050 to 0.1874, incl	Over 1.27 to 4.760, incl	6

- 3.4.3.2 Plate: Shall be not finer than ASTM No. 6.

- 3.4.3.3 Sheet, Strip, and Plate: Shall be not coarser than ASTM No. 2.

- 3.4.4 Stress-Rupture Properties at 1500 °F (816 °C): A tensile specimen, maintained at 1500 °F $\pm$ 3 (816 °C $\pm$ 2) while a load sufficient to produce an initial axial stress of 19.0 ksi (131 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. Time to rupture and elongation after rupture shall be reported. Test shall be conducted in accordance with ASTM E 139.

- 3.4.4.1 The test of 3.4.4 may be conducted using incremental loading. In such case, the load required to produce an initial axial stress of 19.0 ksi (131 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 requirement shall be as specified in 3.4.4.

- 3.5 Quality:

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.