

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-5607

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Submitted for recognition as an American National Standard

Issued 1971-05-15
Revised 1990-07-01

Superseding AMS-5607B

ALLOY SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT

73Ni - 7.0Cr - 16.5Mo

Solution Heat Treated

UNS N10003

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 moderate strength up to 1400°F (760°C) and oxidation resistance up to 1600°F (871°C), particularly where a low coefficient of expansion is desirable.

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 the 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

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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 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 Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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/DP/MS 3/20 methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	0.04	0.08
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.015
Sulfur	--	0.020
Chromium	6.00	8.00
Molybdenum	15.75	17.25
Cobalt	--	0.20
Tungsten	--	0.50
Aluminum + Titanium	--	0.50
Boron	--	0.01
Iron	--	5.00
Copper	--	0.35
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:

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 3.2.1.1 or 3.2.1.2 as applicable (See 8.2).

3.2.1.1 Sheet: No. 2D finish.

3.2.1.2 Strip: No. 1 strip finish.

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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 $2150^{\circ}\text{F} \pm 25$ ($1177^{\circ}\text{C} \pm 14$), holding at heat for a time commensurate with section thickness but not more than 30 minutes, and cooling at a rate equivalent to an air cool or faster.

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

3.4.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E 8 or ASTM E 8M:

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%

3.4.2 Bending: Product under 0.1875 inch (4.762 mm) in nominal thickness shall withstand, without cracking, bending in accordance with ASTM E 290 at room temperature through an angle of 180 degrees 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 1.27, incl	1.5
Over 0.050 to 0.1875, excl	Over 1.27 to 4.762, excl	2

3.4.2.1 Bending requirements for plate 0.1875 inch (4.762 mm) and over in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.3 Stress-Rupture Properties at 1500°F (816°C): A tensile specimen, maintained at $1500^{\circ}\text{F} \pm 3$ ($816^{\circ}\text{C} \pm 2$) 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 8% in 2 inches (50.8 mm) or 4D. Tests shall be conducted in accordance with ASTM E 139.

3.4.3.1 The test of 3.4.3 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 3.4.3.

3.4.3.2 When permitted by purchaser, the test of 3.4.3 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 for 23 hours or to rupture, 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 (14 MPa). Time to rupture and elongation requirements shall be as specified in 3.4.3.

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.

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. 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 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 the product shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for tensile, bending, and stress-rupture properties of each lot. This report shall include the purchase order number, lot number, AMS-5607C, size, and quantity.

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

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet, strip, and plate shall be marked on one face, in the respective location indicated below, with AMS-5607C, lot number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the product or its performance and shall be sufficiently stable to withstand normal handling.

5.1.1 Flat Strip 6 Inches (152 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 feet (914 mm).