SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5872C

Issued 15 MAY 1973
Revised 1 JUL 1992

Superseding AMS 5872B

Submitted for recognition as an American National Standard

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

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 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.

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 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

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

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 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

2.3 U.S. Government Publications:

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

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition:
(R)

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 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 (R) 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 3.3.1.1 or 3.3.1.2 as applicable (See 8.2).

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 descaled.

3.4 (R) 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, determined in accordance with ASTM E 18 (See 8.3).

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

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

3.5.1.3 (R) Grain Size: Shall be as shown in Table 3, determined by comparison of a polished and etched specimen with the chart in ASTM E 112:

TABLE 3 - 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 (R) 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. Other standards for acceptance or limits for product over 0.125 inch (3.18 mm) in thickness may be established by purchaser. Each specimen shall be prepared according to ASTM E 3 and evaluated at 500X magnification.

3.5.2 (R) 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 eight 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.

3.6 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.

3.7 Tolerances:

Shall conform to all applicable requirements of AMS 2262 or MAM 2262.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:
(R)

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:
(R)

Shall be in accordance with AMS 2371.

4.4 Reports:
(R)

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. This report shall include the purchase order number, lot number, AMS 5872C, size, and quantity.