SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS5872 | REV. E

Issued 1973-05
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Superseding AMS5872D

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

(Composition similar to UNS N07263)

RATIONALE

AMS5872E has been reaffirmed to comply with the SAE five-year review policy.

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 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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), or www.sae.org.

AMS 2262	Tolerances, 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
AS4194	Sheet and Strip Surface Finish Nomenclature

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5872E

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, or www.astm.org.

ASTM A 480/A 480M	Flat Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
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	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 in accordance with ASTM A 480/A 480M and AS4194 comparable to the following commercial corrosion-resistant steel finishes, as applicable 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 be tested in accordance with ASTM E 290 using a sample prepared nominally 0.75 inch (19.0mm) in width with its axis of bending parallel to the direction of rolling and shall withstand, without cracking, bending at room temperature 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. In case of dispute, the results of tests using the guided bend test of ASTM E 290 shall govern.

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 400 to 600X 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 m) 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.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibllity for Inspection

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.