AEROSPACE MATERIAL SPECIFICATION

AMS5872™	REV. G

Issued 1973-05
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Revised 2024-12

Superseding AMS5872F

Nickel Alloy, Corrosion- and Heat-Resistant, Sheet, Strip, Plate and Foil
48Ni - 20Cr - 20Co - 5.9Mo - 2.2Ti - 0.45Al (Alloy 263),
Consumable Electrode Remelted or Vacuum Induction Melted, Solution Heat Treated
(Composition similar to UNS N07263)

RATIONALE

AMS5872G is the result of a Five-Year Review and update of the specification. The revision updates the Title to match the Scope, revises composition testing and reporting (see 3.1 and 3.1.1), updates finish requirements (see 3.3.1), adds pyrometry control (see 3.4 and 3.5.2), clarifies bend testing (see 3.5.1.2), adds note on hardness conversions (see 8.2), and updates the exceptions requirements (see 8.5).

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 +1 724-776-4970 (outside USA), or www.sae.org.

AMS2262 Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate

AMS2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys

AMS2283 Composition Testing Methods for Nickel- and Cobalt-Based Alloys

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**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS5872G/

AMS2371 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

AMS2750 Pyrometry

AMS2807 Identification, Carbon and Low-Alloy Steels, Corrosion- and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

AS7766 Terms Used in Aerospace Metals Specifications

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 E3 Preparation of Metallographic Specimens

ASTM E18 Rockwell Hardness of Metallic Materials

ASTM E21 Elevated Temperature Tension Tests of Metallic Materials

ASTM E112 Determining Average Grain Size

ASTM E139 Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials

ASTM E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness

ASTM E290 Bend Testing of Material for Ductility

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Composition shall conform to the following percentages by weight as shown in Table 1, determined in accordance with AMS2283 or by other analytical methods acceptable to the 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 The producer may test for any element not listed in Table 1 and include this analysis in the report of 4.4. Reporting of any element not listed in the composition table is not a basis for rejection unless limits of acceptability are specified by the purchaser.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

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 that have been produced by vacuum induction melting shall be used.

3.3 Condition

The product shall be supplied in the following condition:

3.3.1 Sheet, Strip, and Foil

Sheet, strip, and foil shall be hot or cold rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled producing a uniform finish.

3.3.2 Plate

Plate shall be 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

Except as specified in 3.4.1, 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. Pyrometry shall in be accordance with AMS2750.

3.4.1 Continuous Heat Treating

Process parameters (e.g., furnace temperature set points, heat input, travel rate, etc.) for continuous heat-treating lines shall be established by the material producer and validated by testing of product to the other requirements of this specification.

3.5 Properties

The product shall conform to the following requirements:

3.5.1 As Solution Heat Treated

3.5.1.1 Hardness

As solution heat-treated hardness shall be not higher than 70 HR15N, or equivalent (see 8.3), determined in accordance with ASTM E18.

3.5.1.2 Bending

Product 0.187 inch (4.75 mm) and under in nominal thickness shall be tested in accordance with ASTM E290 using a sample prepared nominally 0.75 inch (19.0 mm) in width with its axis of bending parallel to the direction of rolling. Testing shall be performed at room temperature through an angle of 180 degrees around a diameter equal to the bend factor times the nominal thickness (t) of the product in accordance with Table 2. The specimen shall exhibit no cracking when visually examined. In case of dispute, the results of tests using the guided bend test of ASTM E290 shall govern.

Table 2 - Bending parameters

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

3.5.1.3 Average Grain Size

Average grain size shall be as shown in Table 3, determined in accordance with ASTM E112.

Table 3 - Average grain size

Nominal Thickness	Grain Size No.
Up to 0.187 inch (4.75 mm), incl	4 or finer
Over 0.187 inch (4.75 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 (0.03 mm) for product over 0.060 inch (1.52 mm) in thickness. Each specimen shall be prepared according to ASTM E3 and evaluated at 400 to 600X magnification.

3.5.2 Response to Precipitation Heat Treatment

The product shall have the following properties after being precipitation heat treated by heating to 1475 °F ± 15 °F (802 °C ± 8 °C), holding at heat for 8 hours ± 0.5 hour, and cooling in air; pyrometry shall be in accordance with AMS2750:

3.5.2.1 Tensile Properties at 1435 °F (779 °C)

Response to precipitation heat-treatment tensile properties shall be as shown in Table 4, determined in accordance with ASTM E21 on specimens heated to 1435 °F ± 10 °F (779 °C ± 6 °C), held at heat for 20 to 30 minutes before testing, and tested at 1435 °F ± 10 °F (779 °C ± 6 °C).

Table 4 - Minimum tensile properties - response to heat treatment

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 mm) or 4D	9%

3.5.2.2 Response to Heat-Treatment Creep Properties at 1435 °F (779 °C)

A tensile specimen, maintained at 1435 °F ± 3 °F (779 °C ± 2 °C) 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. The test shall be conducted in accordance with ASTM E139.

3.6 Quality

The product, as received by the 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

Tolerances shall conform to all applicable requirements of AMS2262.

3.8 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

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

4.2 Classification of Tests

All technical requirements are acceptance tests and shall be performed on each lot, with the exception of composition, which shall be performed on each heat.

4.3 Sampling and Testing

Sampling shall be in accordance with AMS2371.