



<b>AEROSPACE MATERIAL SPECIFICATION</b>	<b>AMS5869™</b>	<b>REV. D</b>
	Issued 1990-10 Reaffirmed 2013-12 Revised 2021-03 Superseding AMS5869C	
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)		

### RATIONALE

AMS5869D updates chemical testing requirements (3.1), adds requirements for heat treatment (3.3), prohibits unauthorized exceptions (1.1, 3.4.1.3, 3.7, 4.4, 5.1.1, 8.6, 8.7), allows prior revisions (8.8), and results from a Five-Year Review and update of this specification.

#### 1. SCOPE

##### 1.1 Form

This specification covers a corrosion and heat-resistant nickel alloy in the form of sheet, strip, and plate up to 1.000 inch (25.40 mm) in nominal thickness (see 8.7).

##### 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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://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

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

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AMS2750	Pyrometry
AMS2807	Identification, Carbon and Low-Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing
ARP1917	Clarification of Terms Used in Aerospace Metals Specifications
AS4194	Sheet and Strip Surface Finish Nomenclature

## 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, [www.astm.org](http://www.astm.org).

ASTM A480/A480M	Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM E8/E8M	Tension Testing of Metallic Materials
ASTM E112	Determining Average Grain Size
ASTM E139	Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials
ASTM E290	Bend Test of Material for Ductility
ASTM E354	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 in accordance with ASTM E354 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 AMS2269.

### 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 A480/A480M 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 heat treated as follows; pyrometry shall be in accordance with AMS2750.

3.3.1 The product shall be solution heat treated by heating in a suitable atmosphere to a temperature not lower than 2000 °F ± 25 °F (1093 °C ± 14 °C), holding at heat for a time commensurate with section thickness, and cooling at a rate equivalent to an air cool or faster (see 8.2).

#### 3.3.2 Continuous Heat Treatment

When continuous heat treating is used 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 requirements of 3.4.

3.3.3 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 E8/E8M.

**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.

3.4.1.3 Mechanical property requirements for product outside of the range covered by 1.1 shall be as agreed upon between purchaser and producer and reported per 4.4.4.

### 3.4.2 Bending

Product 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 and shall withstand without cracking when bending at room temperature 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. In case of dispute, the results of tests using the guided bend test of ASTM E290 shall govern.

**Table 3 - Bending parameters**

Nominal Thickness Inches	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 E290 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 E112:

#### 3.4.3.1 Sheet and Strip

Shall be not finer than shown in Table 4.

**Table 4 - Average grain size**

Nominal Thickness Inches	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 °F (816 °C  $\pm$  2 °C) 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 E139.

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 hours minimum, 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.

### 3.6 Tolerances

Shall conform to all applicable requirements of AMS2262.