

**AEROSPACE
MATERIAL
SPECIFICATION**

SAE AMS5599

REV. G

Issued 1967-11
Revised 2007-06
Reaffirmed 2012-10

Superseding AMS5599F

Nickel Alloy, Corrosion and Heat-Resistant, Sheet, Strip, and Plate
62Ni - 21.5Cr - 9.0Mo - 3.7 Cb (Nb)
Solution Heat Treated

(Composition similar to UNS N06625)

RATIONALE

AMS5599G 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 procured in inch/pound units.

1.2 Application

These products have been used typically for parts requiring corrosion and oxidation resistance up to 2000°F (1095° C), particularly where such parts may require welding during fabrication, 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 & Canada) or 724-776-4970 (outside USA) , 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

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on this Technical Report, please visit
<http://www.sae.org/technical/standards/AMS5599G>**

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.

ASTM A 480/A 480M	Flat-Rolled Stainless and Heat-Resistant Steel Plate, Sheet and Strip
ASTM E 8	Tension Testing of Metallic Materials
ASTM E 112	Determining Average Grain Size
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 percentages by weight 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	--	0.10
Manganese	--	0.50
Silicon	--	0.50
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	20.00	23.00
Molybdenum	8.00	10.00
Columbium (Niobium)	3.15	4.15
Iron	--	5.00
Cobalt (3.1.1)	--	1.00
Titanium	--	0.40
Aluminum	--	0.40
Nickel	remainder	

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis

Composition variations shall meet the applicable 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 in accordance with ASTM A 480/A 480M and AS4194 comparable to 3.2.1.1 and 3.2.1.2, 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.

3.2.1.1 Sheet

No. 2D finish.

3.2.1.2 Strip

No. 1 strip finish.

3.2.2 Plate

Hot rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled.

3.3 Heat Treatment

The product shall be solution heat treated by heating to a temperature not lower than 1600 °F(870° C), holding at the selected temperature within ± 25 °F (± 15 ° C) for a time commensurate with section thickness, 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 shown in Table 2 for product up to 1.000 inch (25.4 mm) in nominal thickness, determined in accordance with ASTM E 8.

TABLE 2A - MINIMUM TENSILE PROPERTIES, INCH/POUND UNITS

Property	Value
Tensile Strength	120.0 ksi
Yield Strength at 0.2% Offset	60.0 ksi
Elongation in 2 Inches or 4D	30%

TABLE 2B - MINIMUM TENSILE PROPERTIES, SI UNITS

Property	Value
Tensile Strength	827 MPa
Yield Strength at 0.2% Offset	414 MPa
Elongation in 50 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.

3.4.2 Bending

Product 0.1874 inch (4.76 mm) and under in nominal thickness shall, be tested in accordance with ASTM E 290 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 with axis of bend parallel to the direction of rolling. In case of dispute, the results of tests using the guided bend test of ASTM E 290 shall govern.

TABLE 3 - BENDING PARAMETERS

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
Up to 0.050, incl	Up to 1.25, incl	1
Over 0.050 to 0.1874, incl	Over 1.25 to 4.75, incl	2

3.4.3 Average Grain Size

Shall be as follows, determined in accordance with ASTM E 112:

3.4.3.1 Sheet and Strip

Shall be as shown in Table 4 or finer.

TABLE 4 - MAXIMUM AVERAGE GRAIN SIZE

Nominal Thickness Inch	Nominal Thickness Millimeters	ASTM Grain Size No.
Up to 0.050, incl	Up to 1.25, incl	5
Over 0.050 to 0.1874, incl	Over 1.25 to 4.75, incl	4

3.4.3.2 Plate

Shall be ASTM No. 3 or finer.

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.

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 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.

4.2 Classification of Tests

All technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling and Testing

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 composition (See 3.1.1) of each heat and for tensile properties, bending properties, and average grain size requirements of each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS 5599G, size, product form and quantity.

4.5 Resampling and Retesting

In accordance with AMS 2371.

5. PREPARATION FOR DELIVERY

5.1 Identification

In accordance with AMS 2807.

5.2 Packaging

The product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS

Product not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES

8.1 A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this specification. An (R) symbol to the left of the document title indicates a complete revision of the specification, including technical revisions. Change bars and (R) are not used in original publications, nor in specifications that contain editorial changes only.

8.2 Terms used in AMS are clarified in ARP1917.

8.3 Dimensions and properties in inch/pound units and the Fahrenheit temperatures are primary; dimensions and properties in SI units and the Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.4 Purchase documents should specify not less than the following:

AMS 5599G

Form and size of product desired

Quantity of product desired.

PREPARED BY AMS COMMITTEE "F"