



AEROSPACE MATERIAL SPECIFICATION

AMS5540™**REV. R**

Issued 1940-01
Reaffirmed 2000-08
Revised 2023-05

Superseding AMS5540P

Nickel Alloy, Corrosion- and Heat-Resistant,
Sheet, Strip, and Plate
74Ni - 15.5Cr - 8.0Fe
Annealed

(Composition similar to UNS N06600)

RATIONALE

AMS5540R is the result of a Five-Year Review and update of the specification. The revision updates the composition method and reporting (3.1, 3.1.1), clarifies condition (3.2.1), adds strain rate control (3.3.2.3), prohibits unauthorized exceptions (1.1, 3.3.5, 3.6, 4.4.2, 5.1.1, and 8.3), and allows prior revisions (8.4).

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 2.000 inches (50.80 mm), inclusive, in nominal thickness.

1.2 Application

These products have been used typically for parts requiring oxidation resistance up to 2000 °F (1093 °C), but useful at the higher temperatures only when stresses are low, and where such parts may require welding during fabrication, but usage is not limited to such applications. Strength at elevated temperatures is similar to that of 18-8 type steels.

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.

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

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

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AMS2283	Composition Testing Methods for Nickel- and Cobalt-Based Alloys
AMS2371	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS2807	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
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, 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 E290 Bend Testing of Material for Ductility

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight 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	--	0.15
Manganese	--	1.00
Silicon	--	0.50
Phosphorus	--	0.040
Sulfur	--	0.015
Chromium	14.00	17.00
Nickel	72.00	--
Iron	6.00	10.00
Cobalt	--	1.00
Columbium (Niobium)	--	1.00
Titanium	--	0.50
Tantalum	--	0.05
Aluminum	--	0.35
Copper	--	0.50

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 Condition

The product shall be supplied in the following condition:

3.2.1 Sheet and Strip

Hot-rolled or cold-rolled, annealed, and, unless annealing is performed in an atmosphere yielding a bright finish, descaled having a surface appearance as described in ASTM A480/A480M and AS4194 and 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 or cold rolled, annealed, and descaled.

3.3 Properties

3.3.1 The product shall conform to the following requirements:

3.3.2 Tensile Properties

Shall be as specified in Table 2, determined in accordance with ASTM E8/E8M on product 2.000 inches (50.80 mm) and under in nominal thickness.

Table 2 - Minimum tensile properties

Property	Value
Tensile Strength	80 ksi (552 MPa)
Yield Strength at 0.2% Offset	35.0 ksi (241 MPa)
Elongation in 2 Inches (50 mm) or 4D	30%

3.3.2.1 Yield strength requirement does not apply to product under 0.020 inch (0.51 mm) in nominal thickness.

3.3.2.2 Elongation requirement does not apply to product under 0.010 inch (0.25 mm) in nominal thickness.

3.3.2.3 Unless otherwise specified, the strain rate shall be set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of ± 0.002 in/in/min (0.002 mm/mm/min) through 0.2% offset yield strain. After the yield strain, the speed of the testing machine shall be set between 0.05 in/in and 0.5 in/in (0.05 mm/mm and 0.5 mm/mm) of the length of the reduced parallel section (or distance between the grips for specimens not having a reduced section) per minute. Alternatively, an extensometer and strain rate indicator may be used to set the strain rate between 0.05 in/in/min and 0.5 in/in/min (0.05 mm/mm/min and 0.5 mm/mm/min). The requirement for compliance becomes effective for material produced 1 year after the publication date of this document.

3.3.3 Bending

Product 0.010 to 0.1875 inch (0.25 to 4.762 mm), exclusive, 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 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	0.25 to 1.27, incl	1
Over 0.050 to 0.1875, excl	Over 1.27 to 4.762, excl	2

3.3.4 Average Grain Size

Shall be as shown in Table 4, determined in accordance with ASTM E112.

Table 4 - Grain size parameters

Form	Nominal Thickness Inches	Nominal Thickness Millimeters	ASTM Grain Size No.
Sheet	Up to 0.050, incl	Up to 1.27, incl	4.5 or finer
	Over 0.050 to 0.250, incl	Over 1.27 to 6.35, incl	3.5 or finer
Strip	Up to 0.125, incl	Up to 3.18, incl	4.5 or finer

3.3.5 Property requirements for product outside of the range covered by 1.1 shall be agreed upon between the purchaser and producer and reported per 4.4.2.

3.4 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.

3.5 Tolerances

Shall conform to all applicable requirements of AMS2262.

3.6 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.2.

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

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

4.3 Sampling and Testing

Shall be in accordance with AMS2371.