

AEROSPACE MATERIAL SPECIFICATION

SAE AMS5916A

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Superseding AMS5916

Alloy, Corrosion and Heat-Resistant, Sheet, Strip, and Plate
35Fe - 24Cr - 37Ni - 0.65Cb(Nb) - 0.2N
Annealed

(Composition similar to N08120)

RATIONALE

AMS5916A revises 3.4.2 for bending, 3.4.3.2 for stress rupture and is a Five Year Review and update of this specification,

1. SCOPE

1.1 Form

This specification covers a corrosion and heat-resistant alloy in the form of sheet, strip, and plate.

1.2 Application

These products have been used typically for parts requiring corrosion and oxidation resistance up to 1800 °F (982 °C), and relatively high strength up to 1500 °F (816 °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), 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
AMS2750	Pyrometry
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

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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 E 8/E 8M Tension Testing 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 Testing of Material for Ductility

ASTM E 354 Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

ASTM A 480/A 480M Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

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	0.02	0.10
Manganese	--	1.50
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	23.00	27.00
Nitrogen	0.15	0.30
Nickel	35.0	39.0
Columbium (Niobium)	0.40	0.90
Cobalt	--	3.0
Molybdenum	--	1.0
Tungsten	--	0.5
Aluminum	--	0.40
Titanium	--	0.20
Boron	--	0.010
Copper	--	0.50
Iron	Balance	

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 A 480/A 480M and AS4194, comparable to 3.2.1.1 or 3.2.1.2 as applicable.

3.2.1.1 Sheet

Shall be No. 2D finish.

3.2.1.2 Strip

Shall be No. 1 strip finish.

3.2.2 Plate

Hot rolled, solution heat treated, and descaled.

3.3 Heat Treatment

The product shall be solution heat treated by heating in a suitable atmosphere within the range 2150 to 2250 °F (1177 to 1232 °C) holding at the selected temperature within ± 25 °F (± 14 °C) for a time commensurate with product thickness, and rapidly cooling. Pyrometry shall be in accordance with AMS2750.

3.4 Properties

The product shall conform to the following requirements:

3.4.1 Tensile Properties

Shall be shown in Table 2, determined in accordance with ASTM E 8/E 8M.

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

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Over 0.015 to 2.00, incl	90	40.0	30

TABLE 2B - MINIMUM TENSILE PROPERTIES, SI UNITS

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Over 0.38 to 50.8	620	275	30

3.4.2 Bending

Product 0.1874 inch (4.756 mm) and under in nominal thickness shall be tested in accordance with ASTM E 290 using a specimen prepared nominally 0.75 inch (19.0 mm) in width with its axis parallel to the rolling direction, 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 3 times the nominal thickness of the product. In case of dispute, results of tests using the guided bend test of ASTM E 290 shall govern.

TABLE 3 - BENDING PARAMETERS

Nominal Thickness Inch (mm)	Bend Factor
Up to 0.050 (1.27), incl	1.0
Over 0.050 (1.27) to 0.1874 (4.760), incl	2.0

3.4.3 Stress-Rupture Properties at 1500 °F (816 °C)

A tensile specimen, maintained at 1500 °F $\pm$ 3 (816 °C $\pm$ 2) while a load sufficient to produce an initial axial stress of 16.0 ksi (110 MPa) is applied continuously, shall not rupture in less than the time indicated in Table 4. The test shall be continued to rupture without change of load. Elongation after rupture, measured at room temperature, shall be not less than shown in Table 4. Tests shall be conducted in accordance with ASTM E 139.

TABLE 4 - STRESS RUPTURE PARAMETERS

Nominal Thickness Inches (mm)	Time to Rupture Hours, Minimum	Elongation in % in 4D
Over 0.015 (0.381) to 2.00 (50.8)	24	10

3.4.3.1 The test of 3.4.3 may be conducted using a load higher than required to produce an initial axial stress of 16.0 ksi (110 MPa) but load shall not be changed while test is in progress. Time to rupture and elongation requirements shall be as shown in Table 4.

3.4.3.2 The test of 3.4.3 may be conducted on product 0.020 inch (0.51 mm) and over in nominal thickness using incremental loading. In such case, the load required to produce an initial axial stress of 16.0 ksi (110 MPa) shall be used to rupture or for 24 hours, whichever occurs first. After the 24 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 and elongation requirements shall be as shown in Table 4.

3.4.4 Average Grain Size

Shall be an average grain size of ASTM No. 5 or coarser, determined in accordance with ASTM E 112.

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 AMS2262.

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

4.2.1 Acceptance Tests

Composition (3.1), tensile properties (3.4.1), bending (3.4.2), average grain size (3.4.4), and tolerances (3.6) are acceptance tests and shall be performed on each heat or lot as applicable.