Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

AEROSPACE MATERIAL SPECIFICATION

AMS 5542H
Superseding AMS 5542G
Issued 9-1-49
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ALLOY SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT
Nickel Base - 15.5Cr - 0.95(Cb+Ta) - 2.5Ti - 0.70Al - 7.0Fe

1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant nickel-base alloy in the form of sheet, strip, and plate.

1.2 Application: Primarily for parts requiring high strength up to 1500° F (816° C) and oxidation resistance up to 1800° F (982° C), and for bellows and flat springs requiring optimum resistance to relaxation up to 1000° F (538° C) with moderate or relatively low stresses. Parts may be formed and then heat treated to improve strength at elevated temperatures.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2262 - Tolerances, Nickel, Nickel-Base, and Cobalt-Base Alloy Sheet, Strip, and Plate
AMS 2269 - Chemical Check Analysis Limits, Wrought Nickel and Nickel-Base Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

ASTM E8 - Tension Testing of Metallic Materials
ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E112 - Estimating the Average Grain Size of Metals
ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials
ASTM E354 - Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt-Base Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

Printed in U.S.A.

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E354, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Carbon	--	0.08
Manganese	--	1.00
Silicon	--	0.50
Sulfur	--	0.01
Chromium	14.00	17.00
Columbium + Tantalum	0.70	1.20
Titanium	2.25	2.75
Aluminum	0.40	1.00
Iron	5.00	9.00
Cobalt (3.1.1)	--	1.00
Copper	--	0.50
Nickel + Cobalt	70.00	--

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis: Composition variations shall meet the requirements of AMS 2269.

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Sheet and Strip: Cold rolled, annealed, and descaled unless annealing is performed in an atmosphere yielding a bright finish, having a surface appearance as close as possible to a commercial corrosion resistant steel No. 2D finish; standards for acceptance shall be as agreed upon by purchaser and vendor.

3.2.2 Plate: Hot rolled and annealed; when so ordered, plate shall be descaled.

3.3 Properties:

3.3.1 As Annealed: The product shall conform to the following requirements:

3.3.1.1 Tensile Properties: Shall be as specified in Tables I and II, determined in accordance with ASTM E8:

3.3.1.1.1 Strip:

TABLE I

Nominal Thickness Inch	Tensile Strength psi, max	Elongation in 2 in. or 4D %, min
Up to 0.010, excl	140,000	--
0.010 to 0.025, excl	130,000	20
0.025 and over	As agreed upon	As agreed upon

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, max	Elongation in 50.8 mm or 4D %, min
Up to 0.25, excl	965	--
0.25 to 0.64, excl	896	20
0.64 and over	As agreed upon	As agreed upon

3.3.1.1.2 Sheet:

TABLE II

Nominal Thickness Inch	Tensile Strength psi, max	Yield Strength at 0.2% Offset psi, max	Elongation in 2 in. or 4D %, min
0.010 to 0.024, incl	140,000	--	30
Over 0.024 to 0.125, incl	130,000	60,000	40
Over 0.125 to 0.250, incl	130,000	65,000	40

TABLE II (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, max	Yield Strength at 0.2% Offset MPa, max	Elongation in 50.8 mm or 4D %, min
0.25 to 0.61, incl	965	--	30
Over 0.61 to 3.18, incl	896	414	40
Over 3.18 to 6.35, incl	896	448	40

3.3.1.1.3 Plate: As agreed upon by purchaser and vendor.

3.3.1.2 Bending: The product shall withstand, without cracking, bending in accordance with ASTM E290 through an angle of 180 deg (3.14 rad) around a diameter equal to the bend factor times the nominal thickness of the material with axis of bend parallel to the direction of rolling.

Nominal Thickness Inch	Nominal Thickness (Millimetres)	Bend Factor
Up to 0.050, incl	(Up to 1.27, incl)	1
Over 0.050 to 0.250, incl	(Over 1.27 to 6.35, incl)	2

3.3.1.3 Grain Size: Grain size of sheet and strip 0.010 in. (0.25 mm) and over in nominal thickness shall average not over 0.0060 in. (0.152 mm) in diameter (ASTM Grain Size No. 2.5), determined in accordance with ASTM E112.

3.3.2 After Precipitation Heat Treatment: The product shall conform to the following requirements after being precipitation heat treated by heating to 1300° F ± 25 (704.4° C ± 14), holding at heat for 20 hr ± 1, and cooling in air:

3.3.2.1 Tensile Properties: Shall be as specified in Table III.

TABLE III

Product	Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Strip	Up to 0.010, excl	150,000	--	--
	0.010 to 0.025, excl	155,000	--	15
	0.025 and over	155,000	--	15
Sheet	0.010 to 0.250, incl	165,000	105,000	20
Plate	0.187 to 4.000, incl	155,000	100,000	20

TABLE III (SI)

Product	Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Strip	Up to 0.25, excl	1034	--	--
	0.25 to 0.64, excl	1069	--	15
	0.64 and over	1069	--	15
Sheet	0.25 to 6.35, incl	1138	724	20
Plate	4.75 to 101.60, incl	1069	690	20

3.3.2.1.1 Elongation requirements do not apply to strip under 0.020 in. (0.51 mm) in thickness.

3.3.2.2 Hardness: Strip 0.005 in. (0.13 mm) and over in thickness and plate should have hardness not lower than 30 HRC or equivalent and sheet should have hardness not lower than 32 HRC or equivalent but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.3.2.1 are met.

3.4 Quality: The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

3.5 Tolerances: Unless otherwise specified, 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 and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to assure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance or routine control tests.

4.3 Sampling: Shall be in accordance with AMS 2371 and the following:

4.3.1 Tensile test specimens from widths 9 in. (229 mm) and over shall be taken with axis perpendicular to the direction of rolling; for widths less than 9 in. (229 mm), tensile test specimens shall be taken with axis parallel to the direction of rolling.