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Superseding AMS5541F

Nickel Alloy, Corrosion and Heat Resistant, Sheet and Strip
73Ni - 15.5Cr - 2.4Ti - 0.7Al - 7.0Fe
Annealed

(Composition similar to UNS N07722)

RATIONALE

AMS5541G revises bending (3.4.1.2) and is 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 and strip.

1.2 Application

These products have been used typically for parts requiring high strength up to 1500 °F (816 °C) and oxidation resistance up to 1800 °F (982 °C), but usage is not limited to such applications. Parts may be formed and then heat treated to improve strength at elevated temperatures.

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

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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

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-Resisting Steel Plate, Sheet, and Strip

ASTM E 8/E 8M Tension Testing of Metallic Materials

ASTM E 18 Rockwell Hardness 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

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	--	0.08
Manganese	--	1.00
Silicon	--	0.70
Sulfur	--	0.01
Chromium	14.00	17.00
Nickel	70.00	--
Titanium	2.00	2.75
Aluminum	0.40	1.00
Iron	5.00	9.00
Cobalt (3.1.1)	--	1.00
Copper	--	0.50

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2269.

3.2 Condition

Cold rolled, annealed, and, unless annealing is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to the following commercial corrosion resistant steel finishes as described in ASTM A 480/A480M and AS 4194, and the following:

3.2.1 Sheet

No. 2D finish.

3.2.2 Strip

No 1 strip finish.

3.3 Heat Treatment

Product shall be annealed by heating to a temperature within the range 1750 to 1850 °F (954 to 1010 °C), holding at the selected temperature within ± 25 °F (± 14 °C) for a time commensurate with section thickness, and cooling rapidly.

3.4 Properties

The product shall conform to the following requirements:

3.4.1 As Annealed

3.4.1.1 Tensile Properties

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

TABLE 2A - TENSILE PROPERTIES, INCH/POUND UNITS

Nominal Thickness Inch	Tensile Strength ksi, max	Elongation in 2 Inches or 4D %, min
0.010 to 0.024, incl	130.0	30
Over 0.024 to 0.250, incl	125.0	40

TABLE 2B - TENSILE PROPERTIES, SI UNITS

Nominal Thickness Millimeters	Tensile Strength MPa, max	Elongation in 50.8 mm or 4D %, min
0.25 to 0.61, incl	896	30
Over 0.61 to 6.35, incl	862	40

3.4.1.2 Bending

Product 0.250 inch (6.35 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 around the bend diameter shown as a function of the product thickness in Table 3. 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 Diameter
Up to 0.050, incl	Up to 1.27, incl	1T
Over 0.050 to 0.250, incl	Over 1.27 to 6.35, incl	2T

3.4.2 After Precipitation Heat Treatment

The product shall have the following properties after being precipitation heat treated by heating to 1300 °F ± 25 (704 °C ± 14), holding at heat for not less than 16 hours, and cooling in air:

3.4.2.1 Tensile Properties

Shall be as shown in Table 4, determined in accordance with ASTM E 8/E 8M.

TABLE 4A - MINIMUM TENSILE PROPERTIES, INCH/POUND UNITS

Nominal Thickness Inch	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.010 to 0.024, incl	140.0	90.0	15
Over 0.024 to 0.250, incl	140.0	90.0	20

TABLE 4B - 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 %
0.25 to 0.61, incl	965	621	15
Over 0.61 to 6.35, incl	965	621	20

3.4.2.2 Hardness

Should be not lower than 23 HRC, or equivalent (See 8.2), determined in accordance with ASTM E 18, but the product shall not be rejected on the basis of hardness if the tensile properties determined on specimens taken from the same sample as that with nonconforming hardness or another sample with similar nonconforming hardness are acceptable.

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.

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 except cobalt analysis (See 3.1.1) 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.