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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5599D

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Superseding AMS 5599C

ALLOY SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT
62Ni - 21.5Cr - 9.0Mo - 3.7(Cb+Ta)
Annealed

UNS N06625

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. MAM 5599, specified in SI (metric) units, is the equivalent of this AMS.

1.2 Application: Primarily for parts requiring corrosion and oxidation resistance up to 2000°F, particularly where such parts may require welding during fabrication.

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

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

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

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

ASTM E8 - Tension Testing of Metallic Materials
ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E112 - Determining Average Grain Size
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 Alloys

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

2.3.1 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, Ø determined by wet chemical methods in accordance with ASTM E354 or by spectrochemical or other analytical methods approved by purchaser:

	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 + Tantalum	3.15	4.15
Iron	--	5.00
Cobalt (3.1.1)	--	1.00
Titanium (3.1.2)	--	0.40
Aluminum (3.1.2)	--	0.40
Nickel	remainder	

3.1.1 Determination not required for routine acceptance.

3.1.2 Shall be present but not in excess of specified maximum.

3.1.3 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, unless annealing is Ø performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to the following commercial corrosion-resistant steel finishes as applicable:

3.2.1.1 Sheet: No. 2D finish.
Ø

3.2.1.2 Strip: No. 1 strip finish.
Ø

3.2.2 Plate: Hot rolled, annealed, and descaled.

3.3 Heat Treatment: The product shall be annealed by heating to a temperature not lower than 1600°F, holding at the selected temperature within ±25°F for a time commensurate with thickness, and cooling at a rate equivalent to air cool or faster.

3.4 Properties: The product shall conform to the following requirements:

3.4.1 Tensile Properties: Shall be as follows for product up to 1.000 in. in nominal thickness, determined in accordance with ASTM E8:

Tensile Strength, min	120,000 psi
Yield Strength at 0.2% Offset, min	60,000 psi
Elongation in 2 in. or 4D, min	30%

3.4.1.1 Yield strength requirement does not apply to product under 0.020 in. in nominal thickness.

3.4.1.2 Elongation requirement does not apply to product under 0.010 in. in nominal thickness.

3.4.2 Bending: Product 0.250 in. and under in nominal thickness shall withstand, without cracking, bending in accordance with ASTM E290 through an angle of 180 deg around a diameter equal to the bend factor times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

Nominal Thickness Inch	Bend Factor
Up to 0.050, incl	1
Over 0.050 to 0.250, incl	2

3.4.2.1 Bending requirements for plate over 0.250 in. in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.3 Grain Size: Shall be as follows, determined in accordance with ASTM E112:

3.4.3.1 For sheet and strip shall be not larger than the following:

Nominal Thickness Inch	ASTM Grain Size No.
Up to 0.050, incl	5
Over 0.050 to 0.250, incl	4

3.4.3.2 For plate shall be predominantly ASTM No. 3 with occasional grains as large as 2 permitted.

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 performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure 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 tests and shall be performed on each heat or lot as applicable.

4.3 Sampling: Shall be in accordance with AMS 2371.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for tensile properties, bending properties, and grain size requirements of each lot. This report shall include the purchase order number, heat number, AMS 5599D, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 5599D, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification and shall include in the report either a statement that the material conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2371.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet, strip, and plate shall be marked on one face, in the respective location indicated below, with AMS 5599D, heat number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the product or its performance and shall be sufficiently stable to withstand normal handling.