The Engineering Society For Advancing Mobility Land Sea Air and Space®
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

AMS 5889

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Submitted for recognition as an American National Standard

ALLOY SHEET AND STRIP, CORROSION AND HEAT RESISTANT
54Ni - 22Cr - 12.5Co - 9.0Mo - 1.2Al
Consumable Electrode or Vacuum Induction Melted
Annealed

UNS N06617

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: Primarily for parts requiring a combination of high strength and resistance to oxidation, corrosion, and fatigue up to 2200°F (1204°C) and 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 SAE publications shall apply. The applicable issue of other publications 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
MAM 2262 - Tolerances, Metric, 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

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM E 8 - Tension Testing of Metallic Materials
ASTM E 8M - Tension Testing of Metallic Materials (Metric)
ASTM E 112 - Determining Average Grain Size
ASTM E 290 - Semi-Guided Bend Test for Ductility of Metallic Materials
ASTM E 354 - 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, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	0.05 -	0.15
Manganese	--	0.50
Silicon	--	0.50
Phosphorus	--	0.015
Sulfur	--	0.015
Chromium	20.0 -	24.0
Cobalt	10.0 -	15.0
Molybdenum	8.0 -	10.0
Aluminum	0.8 -	1.5
Titanium	--	0.6
Boron	--	0.006
Iron	--	3.0
Copper	--	0.5
Nickel	remainder	

3.1.1 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 performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to the following commercial corrosion-resistant steel finishes as applicable (See 8.1):

3.2.1.1 Sheet: No. 2D finish.

3.2.1.2 Strip: No. 1 strip finish.

3.3 Heat Treatment: Sheet and strip shall be annealed by heating in the range 2075° - 2175°F (1135° - 1191°C), holding at the selected temperature within ±25°F (±14°C) for a time commensurate with section thickness, and cooling at a rate equivalent to an air cool or faster.

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

3.4.1 Tensile Properties: Shall be as follows, determined at room temperature in accordance with ASTM E 8 or ASTM E 8M:

Tensile Strength, minimum	100,000 psi (689 MPa)
Yield Strength at 0.2% Offset, minimum	40,000 psi (276 MPa)
Elongation in 2 Inches (50.8 mm), minimum	40%

3.4.2 Bending: Product shall withstand, without cracking, bending in accordance with ASTM E 290 through an angle of 180 degrees 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		Bend
Inch	Millimetres	Factor
Up to 0.050, incl	Up to 1.27, incl	1
Over 0.050 to 0.187, incl	Over 1.27 to 4.75, incl	2

3.4.3 Grain Size: Shall be not larger than the following, determined in accordance with ASTM E 112:

Nominal Thickness		ASTM Grain
Inch	Millimetres	Size No.
Up to 0.020, incl	Up to 0.51, incl	4
Over 0.020 to 0.187, incl	Over 0.51 to 4.75, incl	2

3.5 Quality:

3.5.1 Alloy shall be produced by multiple melting using consumable electrode practice in the remelt cycle or shall be induction melted under vacuum. If consumable electrode remelting is not performed in vacuum, electrodes which have been produced by vacuum induction melting shall be used.

3.5.2 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 or MAM 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 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 AMS 2371; the number of specimens to be sampled shall be the minimum number of specimens tested.

4.4 Reports: 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, lot number, AMS 5889, size, and quantity.

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

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet and strip shall be marked on one face, in the respective location indicated below, with AMS 5889, 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.

5.1.1 Flat Strip 6 Inches (152 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 feet (914 mm).

5.1.2 Flat Sheet and Flat Strip Over 6 Inches (152 mm) in Width: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 feet (914 mm), the rows being spaced not more than 6 inches (152 mm) apart and alternately staggered.

5.1.3 Coiled Sheet and Strip: Shall be marked near both the outside and inside ends of the coil; the markings shall be applied as in 5.1 or shall appear on a durable tag or label attached to the coil and marked with the information of 5.1. When the product is wound on cores, the tag or label may be attached to the core.