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

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5613N

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Superseding AMS 5613M

STEEL BARS, WIRE, FORGINGS, TUBING, AND RINGS, CORROSION AND MODERATE HEAT RESISTANT 12.5Cr (SAE 51410) Annealed

UNS S41000

1. SCOPE:

1.1 Form: This specification covers a corrosion and moderate heat resistant steel in the form of bars, wire, forgings, mechanical tubing, flash welded rings, and stock for forging, flash welded rings, or heading.

1.2 Application: Primarily for parts, such as compressor wheels and blades, requiring oxidation resistance up to 1000°F (538°C) but useful at the higher temperature only when stresses are low.

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 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 2241 - Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
MAM 2241 - Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
AMS 2243 - Tolerances, Corrosion and Heat Resistant Steel Tubing
MAM 2243 - Tolerances, Metric, Corrosion and Heat Resistant Steel Tubing
AMS 2248 - Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS 2303 - Aircraft Quality Steel Cleanliness, Martensitic Corrosion-Resistant Steels, Magnetic Particle Inspection Procedure
MAM 2303 - Aircraft Quality Steel Cleanliness, Martensitic Corrosion-Resistant Steels, Magnetic Particle Inspection Procedure, Metric (SI) Measurement
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
AMS 2374 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Forgings and Forging Stock
AMS 2806 - Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys
AMS 2808 - Identification, Forgings
AMS 7493 - Rings, Flash Welded, Non-Austenitic Corrosion Resistant Steels

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

ASTM A 370 - Mechanical Testing of Steel Products
ASTM E 353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron 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 E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	0.10	0.15
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	11.50	13.50
Nickel	--	0.75
Molybdenum	--	0.50
Aluminum	--	0.05
Nitrogen	--	0.08
Copper	--	0.50
Tin	--	0.05

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

3.2 Condition: The product shall be supplied in the following condition; hardness and tensile strength shall be determined in accordance with ASTM A370:

3.2.1 Bars: Annealed having hardness not higher than 241 HB, or equivalent.

3.2.1.1 Bars 2.750 inches (69.85 mm) and under in nominal diameter or distance between parallel sides and all hexagons shall be cold finished.

3.2.1.2 Bars, other than hexagons, over 2.750 inches (69.85 mm) in nominal diameter or distance between parallel sides shall be hot finished.

3.2.2 Wire: Cold drawn and annealed having tensile strength not higher than Ø 115,000 psi (793 MPa).

3.2.3 Forgings and Flash Welded Rings: Annealed having hardness not higher than 241 HB, or equivalent.

3.2.3.1 Flash welded rings shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, rings shall be manufactured in accordance with AMS 7493.

3.2.4 Mechanical Tubing: Annealed and cold finished having hardness not higher than 241 HB, or equivalent.

3.2.5 Stock for Forging, Flash Welded Rings, or Heading: As ordered by the forging, flash welded ring, or heading manufacturer.

3.3 Properties: The product shall conform to the following requirements; hardness testing shall be performed in accordance with ASTM A 370:

3.3.1 Response to Heat Treatment: Product 0.375 inch (9.52 mm) and under in nominal thickness and 0.375 inch ± 0.010 (9.52 mm ± 0.25) thick specimens cut from larger product shall have hardness not lower than 35 HRC, or equivalent, after being heated to 1750°F ± 25 (954°C ± 14), held at heat for 30 - 35 minutes, and cooled in still air.

3.4 Quality:

3.4.1 Steel shall be aircraft quality and, when specified, shall conform to AMS 2303 or MAM 2303.

3.4.2 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.

3.4.3 Grain flow of die forgings, except in areas which contain flash-line end grain, shall follow the general contour of the forgings showing no evidence of re-entrant grain flow. Ø

3.5 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight bars, wire, and tubing will be acceptable in mill lengths of 6 - 20 feet (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).

3.6 Tolerances: Shall conform to all applicable requirements of the following:

3.6.1 Bars and Wire: AMS 2241 or MAM 2241.

3.6.2 Mechanical Tubing: AMS 2243 or MAM 2243.

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 4.5. 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 and Testing: Shall be in accordance with the following; the number of specimens to be sampled shall be the minimum number of specimens tested: Ø

4.3.1 Bars, Wire, Mechanical Tubing, Flash Welded Rings, and Stock for Flash Welded Rings or Heading: AMS 2371.