

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5639F

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Superseding AMS 5639E

STEEL BARS, WIRE, FORGINGS, TUBING, AND RINGS, CORROSION RESISTANT
19Cr - 10Ni (SAE 30304)
Solution Heat Treated

UNS S30400

1. SCOPE:

- 1.1 Form: This specification covers a corrosion-resistant steel in the form of bars, wire, forgings, mechanical tubing, flash welded rings, and stock for forging or flash welded rings.
- 1.2 Application: Primarily for parts requiring corrosion and heat resistance up to 800°F (427°C). Welding, brazing, or other exposure to temperatures over 800°F (427°C) during fabrication may impair corrosion resistance.

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 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 2350 - Standards and Test Methods

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2.1.1 Aerospace Material Specifications (cont'd):

- 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 7490 - Rings, Flash Welded, Corrosion and Heat Resistant Austenitic Steels and Austenitic-Type Alloys

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

- ASTM A 262 - Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
- 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, 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	--	0.08
Manganese	--	2.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	18.00 - 20.00	
Nickel	8.00 - 12.00	
Molybdenum	--	0.75
Copper	--	0.75

- 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:
- 3.2.1 Bars, Wire, Forgings, Mechanical Tubing, and Flash Welded Rings: Solution heat treated free from continuous carbide network.
- 3.2.1.1 Bars and Wire:
- 3.2.1.1.1 All hexagons, other bars 2.75 inches (69.8 mm) and under in nominal diameter or distance between parallel sides, and wire shall be cold finished.
- 3.2.1.1.2 Bars, other than hexagons, over 2.75 inches (69.8 mm) in nominal diameter or distance between parallel sides shall be hot finished and descaled.
- 3.2.1.2 Mechanical Tubing: Shall be cold finished.
- 3.2.1.3 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 7490.
- 3.2.2 Stock for Forging or Flash Welded Rings: As ordered by the forging or flash welded ring manufacturer.
- 3.3 Properties: The product shall conform to the following requirements; tensile and hardness testing shall be performed in accordance with ASTM A 370.
- 3.3.1 Tensile Properties:
- 3.3.1.1 Bars and Forgings Over 0.50 Inch (12.7 mm) in Nominal Diameter or Least Distance Between Parallel Sides: Shall be as follows:
- | | |
|--|----------------------|
| Tensile Strength, minimum | 75,000 psi (517 MPa) |
| Yield Strength at 0.2% Offset, minimum | 30,000 psi (207 MPa) |
| Elongation in 4D, minimum | 40% |
| Reduction of Area, minimum | 50% |
- 3.3.1.2 Wire: Shall have tensile strength of 85,000 - 125,000 psi (586 - 862 MPa).
- 3.3.2 Hardness:
- 3.3.2.1 Forgings and Flash Welded Rings: Shall be not higher than 187 HB, or equivalent.

- 3.3.2.2 Mechanical Tubing: Shall be not higher than 90 HRB, or equivalent, determined approximately midway between outer and inner surfaces.
- 3.3.3 Susceptibility to Intergranular Attack: The product shall pass the
Ø intergranular corrosion test performed in accordance with ASTM A 262, Practice E.
- 3.4 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.
- 3.4.1 Grain flow of die forgings, except in areas which contain flash-line end
Ø grain, shall follow the general contour of the forgings showing no evidence of re-entrant grain flow.
- 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 4.4. 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
Ø 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
Ø of specimens to be sampled shall be the minimum number of specimens tested:
- 4.3.1 Bars, Wire, Mechanical Tubing, Flash Welded Rings, and Stock for Flash Welded Rings: AMS 2371.
- 4.3.2 Forgings and Forging Stock: AMS 2374.