

Submitted for recognition as an American National Standard

STEEL BARS, FORGINGS, TUBING, AND RINGS, CORROSION AND HEAT RESISTANT
17Cr - 12Ni - 2.5Mo (SAE 30316L)
Solution Heat Treated

UNS S31603

1. SCOPE:

- 1.1 Form: This specification covers a corrosion and heat 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 both corrosion and heat resistance up to 1600°F (871°C). At comparable elevated temperatures, strength of this steel is slightly higher than, and oxidation resistance is similar to, that of 18-8 type steels.

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.

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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
- 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 2375 - Control of Forgings Requiring First Article Approval
- 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 American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

- ASTM A370 - Mechanical Testing of Steel Products
- ASTM E353 - 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 E353, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	--	0.030
Manganese	1.25 -	2.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	16.00 -	18.00
Nickel	10.00 -	14.00
Molybdenum	2.00 -	3.00
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, Flash Welded Rings, and Mechanical Tubing: 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; hardness and tensile testing shall be performed in accordance with ASTM A370:
- 3.3.1 Tensile Properties: Wire shall have tensile strength not higher than
 Ø 125,000 psi (862 MPa).

3.3.2 Hardness:

3.3.2.1 Bars: Shall be as follows, or equivalent, determined at approximately mid-radius or quarter-thickness:

Nominal Diameter or Distance Between Parallel Sides		Brinell Hardness	
Inches	Millimetres	min	max
Up to 2.000, incl	Up to 50.80, incl	140	255
Over 2.000	Over 50.80	--	255

3.3.2.2 Mechanical Tubing: Shall be not higher than 90 HRB, or equivalent, determined approximately midway between outer and inner surfaces.

3.3.2.3 Forgings and Flash Welded Rings: Shall be not higher than 187 HB, or equivalent.

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 Forgings shall have substantially uniform macrostructure. Standards for
Ø acceptance shall be as agreed upon by purchaser and vendor.

3.4.2 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 mechanical 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:

4.2.1 Acceptance 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.

- 4.2.2 Preproduction Tests: Tests of forgings to determine conformance to all applicable technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the first-article shipment of a forging to a purchaser, when a change in material and/or processing requires reapproval as in 4.4, and when purchaser deems confirmatory testing to be required.
- 4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction forgings shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.
- 4.3 Sampling: Shall be in accordance with the following:
- 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.
- 4.4 Approval: When specified, approval and control of forgings shall be in accordance with AMS 2375.
- 4.5 Reports:
- 4.5.1 The vendor of bars, wire, forgings, mechanical tubing, and flash welded rings shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for tensile properties or hardness, as applicable, of each lot. This report shall include the purchase order number, lot number, AMS 5653C, size, and quantity. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.
- 4.5.2 The vendor of stock for forging or flash welded rings shall furnish with each shipment a report showing the results of tests for chemical composition of each heat. This report shall include the purchase order number, heat number, AMS 5653C, size, and quantity.
- 4.5.3 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 5653C, contractor or other direct supplier of product, part number, and quantity. When product for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of product to determine conformance to the requirements of this specification and shall include in the report either a statement that the product conforms or copies of laboratory reports showing the results of tests to determine conformance.
- 4.6 Resampling and Retesting: Shall be in accordance with the following:
- 4.6.1 Bars, Wire, Mechanical Tubing, Flash Welded Rings, and Stock for Flash Welded Rings: AMS 2371.