



AEROSPACE MATERIAL

Society of Automotive Engineers, Inc.

TWO PENNSYLVANIA PLAZA, NEW YORK, N. Y. 10001

SPECIFICATION

AMS 5763

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Revised

STEEL BARS, FORGINGS, TUBING, AND RINGS, CORROSION RESISTANT

15Cr - 6.5Ni - 0.75Mo - 1.5Cu

Solution Heat Treated

1. SCOPE:

1.1 Form: This specification covers a precipitation-hardenable, 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 resistance approximating that of 18-8 types and high strength exceeding that of 12Cr martensitic types at temperatures up to 700 F (371 C). Material can be used in the solution heat treated condition and is capable of being precipitation heat treated to tensile strengths as high as 180,000 psi (1241 MPa). Although this material is relatively immune to stress corrosion cracking, reference should be made to ARP 1110 for recommended practices to minimize such conditions.

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

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2241 - Tolerances, Corrosion and Heat Resistant Steel Bars and Wire and Titanium and Titanium Alloy Bars and Wire

AMS 2243 - Tolerances, Corrosion and Heat Resistant Steel Tubing

AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys

AMS 2303 - Aircraft Quality Steel Cleanliness, Martensitic Corrosion Resistant Steels, Magnetic Particle Inspection Procedure

AMS 2350 - Standards and Test Methods

AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings

AMS 2375 - Approval and Control of Critical Forgings

AMS 2808 - Identification, Forgings

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

2.1.2 Aerospace Recommended Practices:

ARP 1110 - Minimizing Stress Corrosion Cracking in Heat Treatable Wrought Low Alloy and Martensitic Corrosion Resistant Steels

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

ASTM A370 - Mechanical Testing of Steel Products

ASTM E353 - Chemical Analysis of Stainless, Heat Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

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

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

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 spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Carbon	--	0.05
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.030
Sulfur	--	0.030
Chromium	14.00 - 16.00	
Nickel	6.00 - 7.00	
Molybdenum	0.50 - 1.00	
Columbium + Tantalum	8 x C	--
Copper	1.25 - 1.75	

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, Mechanical Tubing, Flash Welded Rings, and Forgings: Solution heat treated as in 3.3.

3.2.1.1 Bars:

3.2.1.1.1 Rounds: Centerless ground after solution heat treatment.

3.2.1.1.2 Squares, Hexagons, and Flats: Hot finished, solution heat treated, and descaled or cold drawn after solution heat treatment and descaling, as ordered.

3.2.1.2 Wire: Cold drawn after solution heat treatment.

3.2.1.3 Mechanical Tubing: Cold finished and solution heat treated.

3.2.1.4 Flash Welded Rings: Shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, they 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 Heat Treatment: Bars, wire, forgings, mechanical tubing, and flash welded rings shall be solution heat treated by heating to $1900\text{ F} \pm 25$ ($1037.8\text{ C} \pm 14$), holding at heat for not less than 1 hr, and cooling rapidly.

3.4 Properties: The product shall conform to the following requirements; hardness and tensile testing shall be conducted in accordance with ASTM A370:

3.4.1 Bars, Wire, Forgings, Mechanical Tubing, and Flash Welded Rings: Shall conform to the requirements of 3.4.1.1 and shall be capable of meeting the requirements of 3.4.1.2.

3.4.1.1 As Solution Treated:

3.4.1.1.1 Tensile Properties:

3.4.1.1.1.1 Bars, Forgings, Tubing, and Flash Welded Rings:

Tensile Strength, min	125,000 psi (862 MPa)
Yield Strength at 0.2% Offset, min	95,000 psi (655 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	10%
Reduction of Area (round specimens), min	40%

3.4.1.1.1.2 Wire: Shall have tensile strength not higher than 165,000 psi (1138 MPa) or equivalent hardness.

3.4.1.1.2 Hardness:

3.4.1.1.2.1 Bars: Shall be not higher than 311 HB or equivalent, determined midway between surface and center.

3.4.1.1.2.2 Tubing, Flash Welded Rings, and Forgings: Shall be not higher than 311 HB or equivalent.

3.4.1.2 After Precipitation Heat Treatment: The product shall be capable of meeting the following requirements after being precipitation heat treated by heating to $900\text{ F} \pm 15$ ($482.2\text{ C} \pm 5.6$), holding at heat for not less than 4 hr, and cooling in air:

3.4.1.2.1 Tensile Properties:

Tensile Strength, min	180,000 psi (1241 MPa)
Yield Strength at 0.2% Offset, min	170,000 psi (1172 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	10%
Reduction of Area (round specimens), min	40%

3.4.1.2.2 Hardness: Should be not lower than 363 HB or equivalent but the product shall not be rejected on the basis of hardness if the tensile property requirements are met.

3.4.2 Forging Stock: When a sample of stock is forged to a test coupon and heat treated as in 3.3 and 3.4.1.2, specimens taken from the heat treated coupon shall conform to the requirements of 3.4.1.2.1 and 3.4.1.2.2. If specimens taken from the stock after heat treatment as in 3.3 and 3.4.1.2, conform to the requirements of 3.4.1.2.1 and 3.4.1.2.2, the tests shall be accepted as equivalent to tests of a forged coupon.

3.4.3 Stock for Flash Welded Rings: Specimens taken from the stock after heat treatment as in 3.3 and 3.4.1.2 shall conform to the requirements of 3.4.1.2.1 and 3.4.1.2.2.

3.5 Quality: When specified, steel shall conform to AMS 2303. The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

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

3.7 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of the following:

3.7.1 Bars and Wire: AMS 2241.

3.7.2 Mechanical Tubing: AMS 2243.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of the product shall supply all samples 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 perform such confirmatory testing as he deems necessary to assure that the product conforms to the requirements of this specification.
- 4.2 Classification of Tests:
- 4.2.1 Acceptance Tests: Tests of the product to determine conformance to composition (3.1) requirements and of bars, wire, tubing, flash welded rings, and forgings to determine conformance to tensile (3.4.1.1.1) and hardness (3.4.1.1.2) requirements as solution heat treated are classified as acceptance or control tests.
- 4.2.2 Qualification Tests: Tests of bars, wire, tubing, flash welded rings, and forgings to determine conformance to tensile (3.4.1.2.1) and hardness (3.4.1.2.2) requirements after precipitation heat treatment and of stock for forging (3.4.2) and stock for flash welded rings (3.4.3) to demonstrate capability of developing required properties are classified as qualification or periodic control tests.
- 4.3 Sampling: Bars, wire, mechanical tubing, flash welded rings, and stock for flash welded rings shall be sampled in accordance with AMS 2371 and the following. Forgings and forging stock shall be sampled as agreed upon by purchaser and vendor.
- 4.3.1 Specimens, for tensile testing, from flash welded rings shall be cut from parent metal, not including the weld heat affected zone; specimens from forgings shall have the axis approximately parallel to the forging flow lines.
- 4.4 Approval: When specified, approval and control of critical forgings shall be in accordance with AMS 2375.
- 4.5 Reports:
- 4.5.1 The vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment and the results of tests on each size from each heat to determine conformance to the other technical requirements of this specification. This report shall include the purchase order number, heat number, material specification number, size, and quantity from each heat. 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 finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, 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 a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.
- 4.6 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.