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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5743F

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Superseding AMS 5743E

STEEL BARS AND FORGINGS, CORROSION AND MODERATE HEAT RESISTANT
15.5Cr - 4.5Ni - 2.9Mo - 0.10N
Solution Heat Treated, Sub-Zero Cooled, Equalized, and Over-Tempered
UNS S35500

1. SCOPE:

1.1 Form: This specification covers a corrosion and moderate heat resistant steel in the form of bars, forgings, and forging stock.

1.2 Application: Primarily for parts requiring oxidation resistance and high strength up to 800°F (425°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 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.

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 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

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2.1.1 Aerospace Material Specifications (Cont'd.):

AMS 2375 - Control of Forgings Requiring First Article Approval
AMS 2806 - Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Heat and Corrosion Resistant Steels and Alloys
AMS 2808 - Identification, Forgings

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, Ø determined by wet chemical methods in accordance with ASTM E353 or by spectrographic or other analytical methods approved by purchaser:

	min	max
Carbon	0.10 -	0.15
Manganese	0.50 -	1.25
Silicon	--	0.50
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	15.00 -	16.00
Nickel	4.00 -	5.00
Molybdenum	2.50 -	3.25
Nitrogen	0.07 -	0.13

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: Solution heat treated, sub-zero cooled, equalized, over-tempered, and descaled.

3.2.1.1 Rounds: Ground, turned, or polished after heat treatment.

3.2.1.2 Shapes: Cold finished prior to heat treatment.

3.2.1.3 Flats: Hot finished prior to heat treatment.

3.2.2 Forgings: Solution heat treated, sub-zero cooled, equalized, and over-tempered.

3.2.3 Forging Stock: As ordered by the forging manufacturer.

3.3 Heat Treatment: Bars and forgings shall be solution heat treated by heating to 1900°F ± 25 (1040°C ± 15), holding at heat for 1 - 3 hr, and cooling as rapidly as possible to room temperature; cooled to -100°F (-75°C) or colder, held at that temperature for not less than 3 hr, and warmed in air to room temperature; equalized by heating to 1425°F ± 50 (775°C ± 30), holding at heat for not less than 3 hr, and cooling in air to not higher than 80°F (25°C); and over-tempered by heating to 1075° ± 25 (580°C ± 15), holding at heat for not less than 3 hr, and cooling in air.

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

3.4.1 Bars and Forgings:

3.4.1.1 As Solution Heat Treated, Sub-Zero Cooled, Equalized, and Over-Tempered:

3.4.1.1.1 Hardness: Not higher than 363 HB, or equivalent, except that bars 0.625 in. (15.50 mm) and under in nominal diameter may have hardness as high as 375 HB or equivalent.

3.4.1.2 After Austenite Conditioning, Sub-Zero Cooling, and Tempering: The product shall have the following properties after being austenite conditioned by heating to 1750°F ± 25 (955°C ± 15), holding at heat for 10 - 60 min., and quenching in water; cooling to not higher than -100°F (-75°C), holding at that temperature for not less than 3 hr, and warming in air to room temperature; and tempered by heating to 1000°F ± 25 (540°C ± 15), holding at heat for not less than 3 hr, and cooling in air:

3.4.1.2.1 Tensile Properties:

Tensile Strength, min	170,000 psi (1170 MPa)
Yield Strength at 0.2% Offset, min	155,000 psi (1070 MPa)
Elongation in 4D, min	12%
Reduction of Area, min	25%

3.4.1.2.2 Hardness: Should be 37 - 44 HRC, or equivalent, but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.1.2.1 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.

3.5 Quality:

3.5.1 Steel shall be multiple melted using consumable electrode practice in the remelt cycle.

3.5.2 The product, as received by purchaser, shall be uniform in quality and condition, essentially free of grain boundary carbides, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

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

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

3.6 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight bars will be acceptable in mill lengths of 6 - 20 ft (2 - 6 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 ft (3 m).

3.7 Tolerances: Bars shall conform to all applicable requirements of AMS 2241 or MAM 2241.

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 the following requirements are classified as acceptance tests and shall be performed on each heat or lot as applicable:

4.2.1.1 Composition (3.1) of each heat.

4.2.1.2 Hardness (3.4.1.1.1) of each lot of bars and forgings as solution heat treated, sub-zero cooled, equalized, and over-tempered.

4.2.1.3 Tensile properties (3.4.1.2.1) and hardness (3.4.1.2.2) of each lot of bars and forgings after austenite conditioning, sub-zero cooling, and tempering.

4.2.1.4 Tolerances (3.7) of bars.

4.2.2 Periodic Tests: Tests of forging stock (3.4.2) to demonstrate ability to develop required properties are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: Tests of forgings to determine conformance to all applicable technical requirements of this specification when AMS 2375 is specified 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, processing, or both requires reapproval as in 4.4, and when purchaser deems confirmatory testing to be required.

4.2.3.1 For direct U.S. Military procurement of forgings, substantiating test data and, when requested, preproduction forgings shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with the following: a heat shall be the consumable electrode remelted ingots produced from steel originally melted as a single furnace charge.

4.3.1 Bars: 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 and forgings shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and the results of tests on each lot to determine conformance to the other acceptance test requirements of this specification. This report shall include the purchase order number, heat number, AMS 5743F, 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 Ø The vendor of forging stock 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 5743F, 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 5743F, 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 either a statement that the material conforms or copies of laboratory reports showing the results of tests to determine conformance.