



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.

400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS 5638A

Superseding AMS 5638

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STEEL BARS AND FORGINGS, CORROSION RESISTANT

18Cr - 9.5Ni - 0.50Mo - 0.80Al

Free-Machining; Swaging or Upsetting

1. SCOPE:

- 1.1 Form: This specification covers one type of free-machining, corrosion-resistant steel in the form of bars, forgings, and forging stock.
- 1.2 Application: Primarily for parts on which the amount of machining warrants use of a free-machining grade of steel requiring corrosion resistance similar to the 18-8 type of steel but not subjected to temperatures exceeding 700° F (370° C) during fabrication or in service.

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) 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., 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
- AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys
- AMS 2350 - Standards and Test Methods
- AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings
- 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 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 E10 - Brinell Hardness of Metallic Materials
- ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

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

2.3.1 Federal Standards:

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

2.3.2 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

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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 analytical methods approved by purchaser:

	min	max
Ø Carbon	--	0.15
Manganese	--	2.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	0.11 -	0.16
Chromium	17.00 -	19.00
Nickel	8.50 -	10.50
Molybdenum	0.40 -	0.60
Aluminum	0.60 -	1.00
Copper	--	0.50

- 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 and Forgings: Solution heat treated free from continuous carbide network.

- 3.2.1.1 All hexagons and other bars 2.750 in. (70 mm) and under in nominal diameter or distance between parallel sides shall be cold finished.

- 3.2.1.2 Bars, other than hexagons, over 2.750 in. (70 mm) in nominal diameter or distance between parallel sides shall be hot finished.

- 3.2.1.3 Forgings: Shall be descaled.

- 3.2.2 Forging Stock: As ordered by the forging manufacturer.

- 3.3 Heat Treatment: Bars and forgings shall be solution heat treated by heating to a temperature not lower than 1900° F (1040° C), holding at the selected temperature within + 25° F (+15° C) for not less than 15 min., and quenching in oil or water.

- 3.4 Properties: The product shall conform to the following requirements; hardness testing shall be performed in accordance with ASTM E10:

- 3.4.1 Hardness:

- 3.4.1.1 Bars: Shall have hardness as follows, or equivalent, determined approximately midway between surface and center:

Nominal Diameter or Distance Between Parallel Sides		Hardness, HB
Inches	(Millimetres)	
Up to 0.75, incl	(Up to 19.0, incl)	170 - 255
Over 0.75	(Over 19.0)	140 - 241

3.4.1.2 Forgings: Shall have hardness not higher than 187 HB or equivalent.

3.5 Quality: The product, as received by purchaser, shall be uniform in quality and condition, sound, and, consistent with the type of steel involved, free from foreign materials and from internal and external imperfections detrimental to usage of the product.

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 (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 for bars shall conform to all applicable requirements of AMS 2241.

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 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems 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 lot.

4.3 Sampling: Shall be in accordance with the following:

Ø 4.3.1 Bars: AMS 2371.

Ø 4.3.2 Forgings and Forging Stock: AMS 2374.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests for chemical composition of each heat and for hardness of each size or part number from each heat. This report shall include the purchase order number, heat number, material specification number and its revision letter, 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.

4.4.2 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 and its revision letter, 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.

4.5 Resampling and Retesting: Shall be in accordance with the following:

Ø 4.5.1 Bars: AMS 2371.

Ø 4.5.2 Forgings and Forging Stock: AMS 2374.

5. PREPARATION FOR DELIVERY:

5.1 Identification: The product shall be identified as follows:

Ø 5.1.1 Bars: In accordance with AMS 2806.

5.1.2 Forgings: In accordance with AMS 2808.

5.1.3 Forging Stock: As agreed upon by purchaser and vendor.