Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 5610J
Superseding AMS 5610H
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UNS S41623

STEEL BARS AND FORGINGS, CORROSION AND MODERATE HEAT RESISTANT
12.5Cr Low Carbon (SAE 51416F)
Free-Machining

1. SCOPE:

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

1.2 Application: Primarily for parts requiring hardness up to 35 HRC on which the amount of machining warrants the use of a free-machining grade of steel with oxidation resistance up to 1000° F (538° C), but useful at the higher temperatures only when stresses are low.

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 Bars and Wire and 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 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 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

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	--	0.15
Manganese (3.1.1)	--	1.25
Silicon	--	1.00
Phosphorus	--	0.060
Sulfur (3.1.1)	--	0.030
Selenium (3.1.1)	0.18	0.35
Chromium	11.50	13.50
Nickel	--	0.75
Molybdenum or Zirconium	--	0.60
Copper	--	0.50

3.1.1 Selenium may be absent, but in such case sulfur shall be present in the range of 0.15 - 0.40% and manganese may be as high as 2.5% maximum.

3.1.2 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

3.2 Condition: The product shall be supplied in the following condition; hardness and tensile strength shall be determined in accordance with ASTM A370:

3.2.1 Bars: Annealed, having hardness not higher than 241 HB or equivalent.

3.2.1.1 All hexagons and other bars 2.750 in. (69.85 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. (69.85 mm) in nominal diameter or distance between parallel sides shall be hot finished.

3.2.2 Wire: Cold drawn and annealed, having tensile strength not higher than 115,000 psi (793 MPa) or equivalent hardness.

3.2.3 Forgings: As ordered.

3.2.4 Forging Stock: As ordered by the forging manufacturer.

3.3 Properties:

3.3.1 Response to Heat Treatment: Product, 0.375 in. (9.52 mm) and under in nominal thickness and 0.375 in. ± 0.010 (9.52 mm ± 0.25) thick specimens cut from larger bars and forgings, shall have hardness not lower than 35 HRC, determined in accordance with ASTM A370, when placed in a furnace which is at 1825°F ± 10 (996.1°C ± 5.6), allowed to heat to 1825°F ± 10 (996.1°C ± 5.6), held at heat for 30 min. +3, and cooled in still air.

3.4 Quality: The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and, consistent with the type of steel involved, from internal and external imperfections, detrimental to fabrication or to performance of parts.

3.5 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight bars and 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).

3.6 Tolerances: Unless otherwise specified, tolerances for bars and wire 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 or routine control tests.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 Bars and Wire: AMS 2371.

4.3.2 Forgings and Forging Stock: As agreed upon by purchaser and vendor.

4.4 Reports:

4.4.1 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 hardness and response to heat treatment requirements. 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: 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.

5. PREPARATION FOR DELIVERY:

5.1 Identification: The product shall be identified as follows:

5.1.1 Bars:

5.1.1.1 Each straight bar over 0.500 in. (12.70 mm) in nominal diameter or least width of flat surface shall be marked in a row of characters recurring at intervals not greater than 3 ft (914 mm) with AMS 5610J, heat number, and manufacturer's identification. The characters shall be of such size
Ø as to be clearly legible, shall be applied using a suitable marking fluid, and shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the material or its performance and shall be sufficiently stable to withstand normal handling.

5.1.1.2 Straight bars and wire 0.500 in. (12.70 mm) and under in nominal diameter or least width of flat
Ø surface shall be securely bundled and identified by a durable tag marked with the purchase order number, AMS 5610J, heat number, nominal size, and manufacturer's identification and attached to each bundle or shall be boxed and the box marked with the same information.