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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 5610K
Superseding AMS 5610J

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

1. SCOPE:

1.1 Form: This specification covers two types of 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 use of a free-machining grade of steel with oxidation resistance up to 1000°F (540°C), but useful at the higher temperatures only when stresses are low.

1.3 Classification: The steels covered by this specification are classified as follows:

Type I - 12.5Cr - 0.27Se
Type II - 12.5Cr - 0.28S

1.3.1 Unless a specific type is ordered, either type may be supplied.

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 SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2241 - Tolerances, Corrosion and Heat Pesistant 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
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 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, ø 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:

	Type I		Type II	
	min	max	min	max
Carbon	--	0.15	--	0.15
Manganese	--	1.25	--	2.50
Silicon	--	1.00	--	1.00
Phosphorus	--	0.060	--	0.060
Sulfur	--	0.030	0.15 -	0.40
Selenium	0.18 -	0.35	--	--
Chromium	11.50 -	13.50	11.50 -	13.50
Nickel	--	0.75	--	0.75
Molybdenum or Zirconium	--	0.60	--	0.60
Copper	--	0.50	--	0.50

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. (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.

3.2.2 Wire: Cold drawn and annealed, having tensile strength not higher than Ø 125,000 psi (860 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. (9.50 mm) and under in Ø nominal diameter or distance between parallel sides and specimens 0.375 in. ± 0.010 (9.50 mm ± 0.25) thick cut from larger product shall have hardness not lower than 35 HRC, determined in accordance with ASTM A370, after being placed in a furnace which is at 1825°F ± 10 (995°C) ± 5), allowed to heat to 1825°F ± 10 (995°C ± 5), held at heat for 30 min. ± 3, and cooled in still air.

3.4 Quality: The product, as received by purchaser, shall be uniform in Ø 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.

3.5 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 (2 - 6 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 Ø 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 4.4. 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: 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.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 Bars and Wire: AMS 2371.

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 Ø 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 hardness and response to heat treatment requirements. This report shall include the purchase order number, heat number, AMS 5610K, 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..