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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5610M

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Superseding AMS 5610L

Steel, Corrosion and Heat Resistant, Bars, Wire, and Forgings 12.5Cr - Low Carbon (SAE 51416, 51416Se) Free-Machining

UNS S41600
UNS S41623

1. SCOPE:

1.1 Form:

This specification covers two types of free-machining, corrosion and heat resistant steel in the form of bars, wire, forgings, and forging stock.

1.2 Application:

These products have been used typically 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 (538 °C), but usage is not limited to such applications. The product is useful at the higher temperatures only when stresses are low.

1.3 Classification:

The steels covered by this specification are classified as follows:

Type 1 - 12.5Cr - 0.27Se (UNS S41623)
Type 2 - 12.5Cr - 0.28S (UNS S41600)

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

2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been canceled and no superseding document has been specified, the last published issue of that document shall apply.

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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, Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS 2371 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS 2374 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloy Forgings
AMS 2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys
AMS 2808 Identification, Forgings

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM A 370 Mechanical Testing of Steel Products
ASTM E 353 Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-H-6875 Heat Treatment of Steel

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	Type 1 min	Type 1 max	Type 2 min	Type 2 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 applicable 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 A 370:

3.2.1 Bars: Annealed, having hardness not higher than 241 HB, or equivalent (See 8.2).

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

3.2.1.2 Bars, other than hexagons, over 2.750 inches (69.85 mm) in nominal diameter or least distance between parallel sides shall be hot finished.

3.2.2 Wire: Cold drawn and annealed, having tensile strength not higher than 125,000 psi (862 MPa).

3.2.3 Forgings: Annealed in accordance with MIL-H-6875.

3.2.4 Forging Stock: As ordered by the forging manufacturer.

3.3 Properties:

The product shall conform to the following requirements:

3.3.1 Response to Heat Treatment: Product 0.375 inch (9.52 mm) and under in nominal diameter or least distance between parallel sides and specimens 0.375 inch ± 0.010 (9.52 mm ± 0.25) thick cut from larger product shall have hardness not lower than 35 HRC, or equivalent (See 8.2), determined in accordance with ASTM A 370, after being placed in a furnace which is at 1825 °F ± 10 (996 °C ± 6), allowed to heat to 1825 °F ± 10 (996 °C ± 6), held at heat for 30 minutes ± 3, and cooled in still air.

3.4 Quality:

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

3.4.1 Grain flow of die forgings, except in areas which contain flash-line end grain, shall follow the general contour of the forgings showing no evidence of reentrant grain flow.

3.5 Tolerances:

Bars and wire 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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), condition (3.2), response to heat treatment (3.3.1), and tolerances (3.5) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Grain flow of die forgings (3.5.3) is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 Bars, Wire, and Forging Stock: In accordance with AMS 2371.

4.3.2 Forgings: In accordance with AMS 2374.