SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS5610 | REV. N

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Superseding AMS5610M

Steel, Corrosion and Heat-Resistant, Bars, Wire, and Forgings 12.5Cr - Low Carbon (SAE 51416, 51416Se) Free-Machining (Composition similar to UNS S41600 and UNS S41623)

RATIONALE

AMS5610N has been reaffirmed to comply with the SAE five-year review policy.

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 cancelled and no superseding document has been specified, the last published issue of that document shall apply.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5610N

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS 2241	Tolerances, 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
AMS-H-6875	Heat Treatment of Steel Raw Materials

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A 370	Mechanical Testing of Steel Products
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM E 353	Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

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

3.1.1 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 AMS-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.

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 (3.4.1) 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.

4.4 Reports

The vendor of the product shall furnish with each shipment a report showing the results of tests for composition of each heat and for condition and response to heat treatment requirement for each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS 5610N, size, and quantity. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.

4.5 Resampling and Retesting

Shall be as follows:

4.5.1 Bars, Wire, and Forging Stock

In accordance with AMS 2371.

4.5.2 Forgings

In accordance with AMS 2374.

5. PREPARATION FOR DELIVERY

5.1 Sizes

Except when exact lengths or multiples of exact lengths are ordered, straight bars and wire will be acceptable in mill lengths of 6 to 20 feet (1.8 to 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).