AEROSPACE MATERIAL SPECIFICATION

AMS5614	REV. E

Issued 1952-06
Revised 2001-11
Reaffirmed 2013-08

Superseding AMS5614D

Steel, Corrosion and Heat Resistant, Bars, Wire, and Forgings
12Cr - 0.50Mo
Annealed
(Composition similar to UNS S41025)

RATIONALE

AMS5614E has been reaffirmed to comply with the SAE 5-year Review policy.

1. SCOPE

1.1 Form

This specification covers a 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, such as compressor blades and vanes, requiring oxidation resistance up to 1000 °F (538 °C), useful at the higher temperatures only when stresses are low, but usage is not limited to such applications.

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.

2.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

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

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/AMS5614E

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 Steel 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 or www.astm.org.

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

ASTM E 381 Macroetch Testing Steel Bars, Billets, Blooms, and Forgings

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	min	max
Carbon	0.07	0.12
Manganese	0.30	0.60
Silicon	--	0.35
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	11.50	12.50
Molybdenum	0.40	0.60
Nickel	--	0.60
Copper	--	0.50
Aluminum	--	0.05
Tin	--	0.05
Nitrogen	--	0.08

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

Hot rolled, annealed, and either descaled or ground, having hardness not higher than 223 HB, or equivalent (See 8.2).

3.2.2 Wire

Cold drawn and annealed having tensile strength not higher then 115 ksi (793 MPa), or equivalent hardness (See 8.3).

3.2.3 Forgings

As ordered.

3.2.4 Forging Stock

As ordered by the forging manufacturer.

3.3 Properties

The product shall conform to the following requirements; tensile and hardness testing shall be performed in accordance with ASTM A 370:

3.3.1 Macrostructure

Visual examination of transverse full cross sections from bars, wire, billets, and forging stock, etched in hot hydrochloric acid in accordance with ASTM E 381 shall show no pipe or cracks. Porosity, segregation, inclusions, and other imperfections shall be no worse than the macrographs of ASTM E 381 acceptable to purchaser.

3.3.2 Response to Heat Treatment

Product 7.0 inches (178 mm) and under in nominal diameter or least distance between parallel sides shall have the following properties after being hardened by heating to 1750 °F ± 10 (954 °C ± 5), holding at heat for 25 to 30 minutes, and cooling in air and tempered by heating to a temperature not lower than 1100 °F (593 °C), holding at heat for 60 minutes ± 5, and cooling in air:

3.3.2.1 Tensile Properties

Shall be as shown in Table 2; requirements apply in both the longitudinal and transverse directions but tests in the transverse direction need be made only on product from which a specimen not less than 2.50 inches (63.5 mm) in length can be taken midway between the surface and the center. Tests in the longitudinal direction are not required on product tested in the transverse direction.

TABLE 2 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	100 ksi (689 MPa)
Yield Strength at 0.2% Offset	80 ksi (552 MPa)
Elongation in 4D	21%
Reduction of Area	60%

3.3.2.2 Hardness

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 of 207 to 248 HB, or equivalent (See 8.2).

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), macrostructure (3.3.1), tensile properties (3.3.2.1), hardness (3.3.2.2), 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 a 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 chemical composition and macrostructure of each heat and for tensile properties and hardness of 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 5614E, size, and quantity. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.