



AEROSPACE MATERIAL SPECIFICATION	AMS5613™	REV. S
	Issued 1948-03 Reaffirmed 2013-08 Revised 2021-04	
Superseding AMS5613R		
Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Forging and Ring Stock, Mechanical Tubing, and Rings 12.5Cr (SAE 51410) Annealed (Composition similar to UNS S41000)		

RATIONALE

AMS5613S prohibits unauthorized exception (3.6, 4.4.3, 5.2.1.2, 8.7), updates composition testing (3.1) controls bars being cut from plate (3.2.1.3, 4.4.2). adds stock allowance information (3.4.3, 8.5), adds time tolerance to response to heat treatment (3.3.1), adds country of origin requirements (4.4.1), allows the use of a prior revision (8.6), and is the result of a Five-Year Review and update of the specification.

1. SCOPE

1.1 Form

This specification covers a corrosion and heat resistant steel in the form of bars, wire, forgings, mechanical tubing, flash welded rings, and stock for forging or flash welded rings.

1.2 Application

These products have been used typically for parts requiring strength and oxidation resistance up to 1000 °F (538 °C), but usage is not limited to such applications.

1.2.1 Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking; ARP1110 recommends practices to minimize such conditions.

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.

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<https://www.sae.org/standards/content/AMS5613S>

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2241	Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire
AMS2243	Tolerances, Corrosion and Heat-Resistant Steel Tubing
AMS2248	Chemical Check Analysis Limits, Corrosion and Heat-Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS2303	Steel Cleanliness, Aircraft Quality, Martensitic Corrosion-Resistant Steels, Magnetic Particle Inspection Procedure
AMS2371	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS2374	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steel and Alloy Forgings
AMS2806	Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys
AMS2808	Identification Forgings
AMS7493	Rings, Flash Welded, Ferritic and Martensitic Corrosion-Resistant Steels
ARP1110	Minimizing Stress Corrosion Cracking in Wrought Forms of Steels and Corrosion Resistant Steels and Alloys
ARP1917	Clarification of Terms Used in Aerospace Metals Specifications
AS1182	Standard Stock Removal Allowance, Aircraft-Quality and Premium Aircraft-Quality Steel, Bars and Mechanical Tubing

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 A370	Mechanical Testing of Steel Products
ASTM A751	Chemical Analysis of Steel Products
ASTM E140	Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM A751, or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	0.10	0.15
Manganese	--	1.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	11.50	13.50
Nickel	--	0.75
Molybdenum	--	0.50
Aluminum	--	0.05
Copper	--	0.50
Tin	--	0.05
Nitrogen	--	0.08

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

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 (see 8.2).

3.2.1.1 All hexagons regardless of size, and 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 or cold finished.

3.2.1.3 Bars shall not be cut from plate (see 4.4.2).

3.2.2 Wire

Cold drawn and annealed having tensile strength not higher than 115 ksi (793 MPa).

3.2.3 Forgings and Flash Welded Rings

Annealed having hardness not higher than 241 HB, or equivalent (see 8.2).

3.2.3.1 Flash welded rings shall not be supplied unless specified or permitted on purchaser's part drawing. When supplied, rings shall be manufactured in accordance with AMS7493.

3.2.4 Mechanical Tubing

Annealed and cold finished having hardness not higher than 241 HB, or equivalent (see 8.2).

3.2.5 Stock for Forging, Flash Welded Rings, or Heading

As ordered by the forging, flash welded ring, or heading manufacturer.

3.3 Properties

The product shall conform to the following requirements; hardness testing shall be performed in accordance with ASTM A370:

3.3.1 Response to Heat Treatment

Product 0.375 inch (9.52 mm) and under in nominal thickness, and 0.375 inch \pm 0.010 inch (9.52 mm \pm 0.25 mm) thick specimens cut from larger product, shall have hardness not lower than 35 HRC, or equivalent (see 8.2), after being heated to 1750 °F \pm 25 °F (954 °C \pm 14 °C), held at heat for 30 minutes \pm 5 minutes, and cooled at a rate equivalent to a still air cool.

3.4 Quality

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

3.4.1 Steel shall be aircraft quality and, when specified, shall conform to AMS2303.

3.4.2 Grain flow of die forgings, except in areas which contain flashline end grain, shall follow the general contour of the forgings showing no evidence of reentrant grain flow.

3.4.3 Bars and mechanical tubing shall be free from seams, laps, tears, and cracks after removal of the standard stock removal allowance in accordance with AS1182.

3.5 Tolerances

Shall be as follows:

3.5.1 Bars and Wire

In accordance with AMS2241.

3.5.2 Mechanical Tubing

In accordance with AMS2243.

3.6 Exceptions

Any exceptions shall be authorized by the purchaser and reported in 4.4.3.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for producer'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

Tests for the following requirements are acceptance tests and shall be performed on each heat or lot as applicable:

4.2.1.1 Composition (3.1), response to heat treatment (3.3.1), and cleanliness (3.4.1) when specified, of each heat.

4.2.1.2 Condition (3.2) and tolerances (3.5) on each lot.

4.2.2 Periodic Tests

Grain flow of die forgings (see 3.4.2) is a periodic test and shall be performed at a frequency selected by the producer unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be as follows:

4.3.1 Bars, Wire, Mechanical Tubing, Flash Welded Rings, and Stock for Forging, Flash Welded Rings, or Heading

In accordance with AMS2371.

4.3.2 Forgings

In accordance with AMS2374.

4.4 Reports

4.4.1 The producer shall furnish with each shipment a report showing the producer's name and the country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations) and the results of tests for chemical composition and frequency-severity cleanliness rating, when specified, of each heat and for response to heat treatment 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, AMS5613S, size, and quantity. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.

4.4.2 For bar, report the nominal metallurgically worked cross sectional size and the cut size, if different (see 3.2.1.3).

4.4.3 When material produced to this specification has exceptions taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS5613S(EXC) because of the following exceptions:" and the specific exceptions shall be listed (also see 5.2.1.2).

4.5 Resampling and Retesting

Shall be as follows:

4.5.1 Bars, Wire, Mechanical Tubing, Flash Welded Rings, and Stock for Forging, Flash Welded Rings, or Heading

In accordance with AMS2371.

4.5.2 Forgings

In accordance with AMS2374.

5. PREPARATION FOR DELIVERY

5.1 Sizes

Except when exact lengths or multiples of exact lengths are ordered, straight bars, wire, and tubing 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).