



AEROSPACE MATERIAL SPECIFICATION

AMS6517™**REV. B**Issued 2011-03
Revised 2019-10

Superseding AMS6517A

Steel, Bars, and Forgings
3.5Cr - 9.5Ni - 18Co - 1.1Mo (0.13 - 0.17C)
Double Vacuum Melted, Normalized, Annealed
(Composition similar to UNS K93061)

RATIONALE

AMS6517B results from a Five-Year Review and update of this specification that revises analytical methods (3.1), changes room temperature to quantitative values (3.4, 3.5.3.1), revises format to be consistent with AMS6509A (3.5.3), adds tensile testing strain rates (3.5.3.1.3), revises quality (3.6.2), adds AS6279 (3.8), prohibits unauthorized exceptions (3.9), makes forging properties acceptance tests (4.2.1.4) and revises reporting (4.4) and identification (5.2.1).

1. SCOPE

1.1 Form

This specification covers a premium aircraft-quality alloy steel in the form of bars, forgings, and forging stock.

1.2 Application

These products have been used typically for carburized parts requiring high minimum core hardness with a narrow range, reduced distortion and subject to magnetic particle inspection standards, 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 cancelled and no superseding document has been specified, the last published issue of that document shall apply.

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.

AMS2251	Tolerances, Low-Alloy Steel Bars
AMS2259	Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS2300	Steel Cleanliness, Premium Aircraft-Quality Magnetic Particle Inspection Procedure

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Documents
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AMS2370	Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock
AMS2372	Quality Assurance Sampling and Testing Carbon and Low-Alloy Steel Forgings
AMS2750	Pyrometry
AMS2806	Identification Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys
AMS2808	Identification Forgings
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
AS6279	Standard Practice for Production, Distribution, and Procurement of Metal Stock

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 A604	Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billets
ASTM A751	Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
ASTM E45	Determining the Inclusion Content of Steel
ASTM E140	Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness
ASTM E112	Determining Average Grain Size
ASTM E399	Plane-Strain Fracture Toughness of Metallic Materials

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the following 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	0.13	0.17
Manganese	--	0.10
Silicon	--	0.10
Phosphorus	--	0.008
Sulfur	--	0.005
Chromium	3.0	4.0
Nickel	9.2	9.8
Cobalt	17.5	18.5
Molybdenum	0.9	1.3
Titanium	--	0.045
Aluminum	--	0.1
Vanadium	0.04	0.12
Oxygen	--	0.0020 (20 ppm)
Nitrogen	--	0.0015 (15 ppm)

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259.

3.2 Melting Practice

Steel shall be multiple melted using vacuum induction melting followed by vacuum arc remelting.

3.3 Condition

The product shall be supplied in the following condition unless another condition is authorized by purchaser; hardness shall be determined in accordance with ASTM A370:

3.3.1 Bars and Forgings

Normalized and annealed (see 3.4) having hardness not higher than 352 HBW, or equivalent (see 8.2), as descaled. Bar shall not be cut from plate.

3.3.2 Forging Stock

As ordered by the forging manufacturer.

3.4 Heat Treatment

Bars and forgings shall be normalized by heating to 1785 °F ± 25 °F (974 °C ± 14 °C) for a time commensurate with section thickness, 60 minutes minimum, cooling in air to below 120 °F (49 °C) and annealed by heating to 1255 °F ± 25 °F (679 °C ± 14 °C) for not less than 2 hours, and cooling in air. Pyrometry shall be in accordance with AMS2750.

3.5 Properties

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

3.5.1 Macrostructure

Visual examination of transverse full cross-sections from bars, billets, and stock for forging, flash welded rings, or extrusions, etched in hot hydrochloric acid in accordance with ASTM A604, shall not show pipe or cracks. Porosity, segregation, inclusions, and other imperfections shall be no worse than the macrographs of ASTM A604 shown in Table 2.