



AEROSPACE MATERIAL SPECIFICATION

AMS6415™

REV. V

Issued 1940-01
Revised 2022-11

Superseding AMS6415U

Steel, Bars, Forgings, Mechanical Tubing, and Forging Stock
0.80Cr - 1.8Ni - 0.25Mo (0.38 - 0.43C) (SAE 4340)
(Composition similar to UNS G43406)

RATIONALE

AMS6415V is the result of a Five-Year Review and update of the specification. The revision updates the Title to match the scope, prohibits unauthorized exceptions (3.6, 4.4.5, 5.2.1.1, 8.7), updates composition testing and reporting (3.1, 3.1.2), updates heat treatment specification (3.2.2), modifies Jominy requirements (3.3.3), updates macrostructure (Table 2, 3.3.1, 8.8), updates decarburization test methods (3.3.4.5), acknowledges changes to AMS2301 (4.2.1, 4.4.4), adds note on stock removal (8.5), and allows prior revisions (8.6).

1. SCOPE

1.1 Form

This specification covers an aircraft-quality, low-alloy steel in the form of bars, forgings, mechanical tubing, and forging stock.

1.2 Application

These products have been used typically for parts, 3.5 inches (89 mm) and under in nominal thickness at time of heat treatment, requiring a through-hardening steel capable of developing a minimum hardness of 40 HRC when properly hardened and tempered and also for parts of greater thickness, but requiring proportionately lower hardness. 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 after heat treatment; 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/AMS6415V/>

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
AMS2253	Tolerances, Carbon and Alloy Steel Tubing
AMS2259	Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS2301	Steel Cleanliness, Aircraft Quality, Magnetic Particle Inspection Procedure
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
AMS2761	Heat Treatment of Steel Raw Materials
AMS2806	Identification Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys
AMS2808	Identification, Forgings
ARP1110	Minimizing Stress Corrosion Cracking in Wrought Forms of Steels and Corrosion Resistant Steels and Alloys
AS1182	Standard Stock Removal Allowance, Aircraft-Quality and Premium Aircraft-Quality Steel Bars and Mechanical Tubing
AS7766	Terms Used in Aerospace Metals Specifications

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 A255	Determining Hardenability of Steel
ASTM A370	Mechanical Testing of Steel Products
ASTM A751	Chemical Analysis of Steel Products
ASTM E112	Determining Average Grain Size
ASTM E140	Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness
ASTM E381	Macroetch Testing Steel, Bars, Billets, Blooms, and Forgings
ASTM E1077	Estimating the Depth of Decarburization of Steel Specimens

2.3 Definitions

Terms used in AMS are defined in AS7766.

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	0.38	0.43
Manganese	0.65	0.85
Silicon	0.15	0.35
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.70	0.90
Nickel	1.65	2.00
Molybdenum	0.20	0.30
Copper	--	0.35

3.1.1 Aluminum, vanadium, and columbium (niobium) are optional grain refining elements and need not be determined or reported unless used to satisfy the average grain size requirements of 3.3.2.2.

3.1.2 Producer may test for any element not listed in Table 1 and include this analysis in the report of 4.4. Reporting of any element not listed in the composition table is not a basis for rejection, unless limits of acceptability are specified by the purchaser.

3.1.3 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259.

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

Bar shall not be cut from plate (also see 4.4.2).

3.2.1.1 Bars 0.500 Inch and Under in Nominal Diameter, or Least Distance Between Parallel Sides

Cold finished having tensile strength not higher than 125 ksi or hardness not higher than 27 HRC, or equivalent (see 8.2).

3.2.1.2 Bars Over 0.500 Inch in Nominal Diameter, or Least Distance Between Parallel Sides

Hot finished and annealed, unless otherwise ordered, having hardness not higher than 235 HBW, or equivalent (see 8.2). Bars ordered cold finished may have hardness as high as 255 HBW, or equivalent (see 8.2).

3.2.2 Forgings

Normalized and tempered in accordance with AMS2761 to a hardness not higher than 269 HBW, or equivalent, unless otherwise ordered (see 8.2).