AEROSPACE MATERIAL SPECIFICATION

AMS6294™ REV. K

Issued 1939-12
Reaffirmed 2006-02
Revised 2018-08

Superseding AMS6294J

Steel Bars and Forgings, Carburizing
1.8Ni - 0.25Mo (0.17 - 0.22C) (SAE 4620)
(Composition similar to UNS G46200)

RATIONALE

AMS6294K results from a Five-Year Review and update of this specification that revises composition analytical methods (3.1), adds grain refiners (3.1.1), revises grain size determination (3.3.2), adds no unauthorized exceptions (3.6) and revises classification of tests (4.2), reporting (4.4) and identification (5.2.1).

1. SCOPE

1.1 Form

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

1.2 Application

These products have been used typically for carburized parts that require high minimum core hardness and allow wide hardness range in sections 0.375 inch (9.5 mm) and under in nominal thickness, but usage is not limited to such applications. The core may or may not be machinable after hardening.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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

AMS2301 Steel Cleanliness, Aircraft Quality, Magnetic Particle Inspection Procedure

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://standards.sae.org/AMS6294K

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

AMS2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys

AMS2808 Identification, Forgings

AMS6290 Steel, Bars and Forgings, Carburizing, 1.8Ni - 0.25Mo (0.11 - 0.17C) (SAE 4615)

AMS6292 Steel Bars and Forgings, Carburizing, 1.8Ni - 0.25Mo (0.15 - 0.20C) (SAE 4617)

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 A255 Determining Hardenability of Steel

ASTM A370 Mechanical Testing of Steel Products

ASTM A751 Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

ASTM E112 Determining Average Grain Size

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 E381 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 in accordance with ASTM A751or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	0.17	0.22
Manganese	0.45	0.65
Silicon	0.15	0.35
Phosphorus	--	0.025
Sulfur	--	0.025
Nickel	1.65	2.00
Molybdenum	0.20	0.30
Chromium	--	0.20
Copper	--	0.35

3.1.1 Aluminum, vanadium and columbium are optional grain refining elements and need not be determined or reported unless used to satisfy the average grain size requirements of 3.3.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259.

3.2 Condition

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

3.2.1 Bars

3.2.1.1 Bars 0.500 Inch (12.70 mm) and Under in Nominal Diameter or Least Distance Between Parallel Sides

Cold finished having tensile strength not higher than 130 ksi (895 MPa) or equivalent hardness (see 8.2).

3.2.1.2 Bars Over 0.500 Inch (12.70 mm) in Nominal Diameter or Least Distance Between Parallel Sides

Hot finished, unless otherwise ordered, having hardness not higher than 229 HB, or equivalent (see 8.3). Bars ordered cold finished may have hardness as high as 241 HB or equivalent (see 8.3).

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

3.2.2 Forgings

As ordered.

3.2.3 Forging Stock

As ordered by the forging 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 Macrostructure

Visual examination of transverse full cross-sections from bars, billets, and forging stock, etched in hot hydrochloric acid in accordance with ASTM E381, shall show no pipe or cracks. Porosity, segregation, inclusions, and other imperfections shall be no worse than the macrograph ratings of ASTM E381 shown in Table 2.

Table 2 - Macrostructure limits

Section Size Square Inches	Section Size Square Centimeters	Macrographs
Up to 36, incl	Up to 230, incl	S2 - R1 - C2
Over 36 to 133, incl	Over 230 to 858, incl	S2 - R2 - C3
Over 133	Over 858	Note 1

NOTE 1: Limits for larger sizes shall be agreed upon by purchaser and producer. The purchaser shall have written approval of the agreement from the cognizant engineering organization.