SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 6325H

Issued SEP 1942
Reaffirmed SEP 2000
Revised OCT 2004

Superseding AMS 6325G

Steel, Bars and Forgings
0.50Cr - 0.55Ni - 0.25Mo (0.38 - 0.43C) (SAE 8740)
Heat Treated, 105 ksi (724 MPa) Tensile Strength

(Composition similar to UNS G87400)

1. SCOPE:

1.1 Form:

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

1.2 Application:

These products have been used typically for parts, such as nuts, bolts, and screws, 1.750 inches (44.45 mm) and under in section thickness requiring a minimum tensile strength of 105 ksi (724 MPa), 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, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2251	Tolerances, Low-Alloy Steel Bars
AMS 2259	Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS 2301	Steel Cleanliness, Aircraft Quality, Magnetic Particle Inspection Procedure
AMS 2370	Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock
AMS 2372	Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Forgings

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

2.1 (Continued):

AMS 2750	Pyrometry
AMS 2759/1	Heat Treatment of Carbon and Low-Alloy Steel Parts Minimum Tensile Strength Below 220 ksi (1517 MPa)
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
AS1182	Standard Machining Allowance, Aircraft-Quality and Premium Aircraft-Quality Steel Bars and Mechanical Tubing

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 112	Determining Average Grain Size
ASTM E 350	Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron
ASTM E 381	Macroetch Testing Steel Bars, Billets, Blooms, and Forgings
ASTM E 384	Microindentation Hardness of Materials

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 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon	0.38	0.43
Manganese	0.75	1.00
Silicon	0.15	0.35
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.40	0.60
Nickel	0.40	0.70
Molybdenum	0.20	0.30
Copper	--	0.35

3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2259.

3.2 Condition:

The product shall be supplied in the following condition:

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, hardened, and tempered.

3.2.1.2 Bars Over 0.500 Inch (12.70 mm) in Nominal Diameter or Least Distance Between Parallel Sides: Hot finished, or cold finished when so ordered, hardened, and tempered.

3.2.2 Forgings: Hardened and tempered in accordance with AMS 2759/1.

3.3 Heat Treatment:

The product shall be austenitized and hardened by quenching from 1550 °F ±25 (843 °C ±14) and tempered as required to meet the requirements of 3.4.4 and 3.4.5. Pyrometry shall be in accordance with AMS 2750.

3.4 Properties:

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

3.4.1 Macrostructure: Visual examination of transverse full cross-sections from bars 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 shown in Table 2.

TABLE 2 - Macrostructure Limits

Cross-Section Area Square Inches	Cross-Section Area Square Centimeters	Macrographs
Up to 36, incl	Up to 232, incl	S2 - R1 - C2
Over 36 to 100, incl	Over 232 to 645, incl	S2 - R2 - C3

3.4.2 Average Grain Size: Shall be ASTM No. 5 or finer, determined in accordance with ASTM E 112.

3.4.3 Decarburization:

3.4.3.1 Bars ordered ground, turned, or polished shall be free from decarburization on the ground, turned, or polished surfaces.

3.4.3.2 Decarburization of bars to which 3.4.3.1 is not applicable shall be not greater than shown in Table 3.

TABLE 3A - Maximum Depth of Decarburization, Inch/Pound Units

Nominal Diameter or Distance Between Parallel Sides Inches				Total Depth of Decarburization Inch
	Up	to	0.375, incl	0.010
Over	0.375	to	0.500, incl	0.012
Over	0.500	to	0.625, incl	0.014
Over	0.625	to	1.000, incl	0.017
Over	1.000	to	1.500, incl	0.020
Over	1.500	to	1.750, incl	0.025

TABLE 3B - Maximum Depth of Decarburization, SI Units

Nominal Diameter or Distance Between Parallel Sides Millimeters				Total Depth of Decarburization Millimeter
	Up	to	9.52, incl	0.25
Over	9.52	to	12.70, incl	0.30
Over	12.70	to	15.88, incl	0.36
Over	15.88	to	25.40, incl	0.43
Over	25.40	to	38.10, incl	0.51
Over	38.10	to	44.45, incl	0.64

3.4.3.3 Decarburization shall be measured by the metallographic method, by the HR30N scale hardness testing method, or by a traverse method using microhardness testing in accordance with ASTM E 384. The hardness method(s) shall be conducted on a hardened but untempered specimen protected during heat treatment to prevent changes in surface carbon content. Depth of decarburization, when measured by a hardness method, is defined as the perpendicular distance from the surface to the depth under that surface below which there is no further increase in hardness. Such measurements shall be far enough away from any adjacent surface to be uninfluenced by any decarburization on the adjacent surface. In case of dispute, the depth of decarburization determined using the microhardness traverse method shall govern.

3.4.3.3.1 When determining the depth of decarburization, it is permissible to disregard local areas provided the decarburization of such areas does not exceed the above limits by more than 0.005 inch (0.13 mm) and the width is 0.065 inch (1.65 mm) or less.

3.4.4 Tensile Properties: Specimens, cut from bars 1.750 inches (44.45 mm) and under in nominal diameter or distance between parallel sides and from forgings 1.750 inches (44.45 mm) and under in nominal cross section, shall conform to the properties shown in Table 4.

TABLE 4 - Minimum Tensile Properties

Property	Value
Tensile Strength	105 ksi (724 MPa)
Yield Strength at 0.2% Offset	85 ksi (586 MPa)
Elongation in 4D	17%
Reduction of Area	55%

3.4.5 Hardness: Shall be 233 to 262 HB, or equivalent (See 8.2).

3.5 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.

3.5.1 Steel shall be aircraft quality conforming to AMS 2301.

3.5.2 Bars ordered hot rolled or cold drawn, or ground, turned, or polished shall, after removal of the standard machining allowance in accordance with AS1182, be free from seams, laps, tears, and cracks open to the ground, turned, or polished surface.

3.5.3 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.

3.6 Tolerances:

Bars shall conform to all applicable requirements of AMS 2251.

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 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), macrostructure (3.4.1), average grain size (3.4.2), decarburization (3.4.3), tensile properties (3.4.4), hardness (3.4.5), frequency-severity cleanliness (3.5.1), and tolerances (3.6) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Grain flow of die forgings (3.5.3) is a periodic test and shall be performed at a frequency selected by the vendor unless a frequency of testing is specified by purchaser.