

AEROSPACE MATERIAL SPECIFICATION



AMS 6325G

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Reaffirmed SEP 2000

Superseding AMS 6325F

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

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 following publications form a part of this specification 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.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2251	Tolerances, Low-Alloy Steel Bars
MAM 2251	Tolerances, Metric, Low-Alloy Steel Bars
AMS 2259	Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS 2301	Aircraft Quality Steel Cleanliness, 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
AMS 2806	Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys

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2.1 (Continued):

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, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 370 Mechanical Testing of Steel Products

ASTM E 112 Determining the 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, Inspection, and Rating Steel Products, Comprising Bars, Billets, Blooms, and Forgings

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

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 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 Distance Between Parallel Sides: Hot finished, or cold finished when so ordered, hardened, and tempered.

3.2.2 Forgings: Hardened and tempered.

3.3 Heat Treatment:

The product shall be austenitized, quenched, and tempered to meet the requirements of 3.4.4 and 3.4.5.

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 or billets, etched in hot hydrochloric acid in accordance with ASTM E 381, shall show no pipes 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-Sectional Area Square Inches	Cross-Sectional 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 (see 8.2).

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 Decarburization, Inch/Pound Units

Nominal Diameter or Distance Between Parallel Sides Inches	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 Decarburization, SI Units

Nominal Diameter or Distance Between Parallel Sides Millimeters	Depth of Decarburization Millimeters
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 microscopic method or by HR30N scale or equivalent hardness testing method on hardened but untempered specimens 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 decarburization thereon.

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 8.3).

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 surfaces.

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 re-entrant grain flow.

3.6 Tolerances:

Bars shall conform to all applicable requirements of AMS 2251 or MAM 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 performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 Bars: In accordance with AMS 2370.

4.3.2 Forgings: In accordance with AMS 2372.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition, macrostructure, grain size, and frequency-severity cleanliness rating of each heat and for tensile properties and hardness of each lot. This report shall include the purchase order number, heat and lot number, AMS 6325G, size, and quantity. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.5 Resampling and Retesting:

Shall be as follows:

4.5.1 Bars: In accordance with AMS 2370.

4.5.2 Forgings: In accordance with AMS 2372.

5. PREPARATION FOR DELIVERY:

5.1 Sizes:

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

5.2 Identification:

Shall be as follows:

5.2.1 Bars: In accordance with AMS 2806.

5.2.2 Forgings: In accordance with AMS 2808.

5.3 Packaging:

5.3.1 Bars ordered ground, turned, or polished shall be coated with a suitable corrosion-preventive compound prior to shipment.

5.3.2 The product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.