AEROSPACE MATERIAL SPECIFICATION

AMS6308™	REV. G

Issued 1986-04
Reaffirmed 1992-04
Revised 2023-05

Superseding AMS6308F

Steel, Bars, and Forgings and Forging Stock
0.90Si - 1.0Cr - 2.0Ni - 3.2Mo - 2.0Cu - 0.10V (0.07 - 0.13C)
Vacuum Arc or Electroslag Remelted
(Composition similar to UNS K71040)

RATIONALE

AMS6308G is the result of a Five-Year Review and update of the specification. The revision updates the title to match the scope, adds information on composition (3.1.1), clarifies macrostructure requirements (3.4.1.1, 8.8), prohibits unauthorized exceptions (3.7, 4.4.4, 8.4), adds a note on stock removal (8.7), and permits the use of the prior revision (8.6).

1. SCOPE

1.1 Form

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

1.2 Application

These products have been used typically for highly-stressed carburized parts requiring high minimum case hardness and subject to very rigid magnetic particle inspection standards, but usage is not limited to such applications. These products are suitable for service up to 450 °F (232 °C).

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

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**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS6308G/

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

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 A370 Mechanical Testing of Steel Products

ASTM A604 Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billets

ASTM A751 Chemical Analysis of Steel Products

ASTM E45 Determining the Inclusion Content of Steel

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

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 other analytical methods acceptable to the purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	0.07	0.13
Manganese	0.25	0.50
Silicon	0.60	1.20
Phosphorus	--	0.015
Sulfur	--	0.010
Chromium	0.75	1.25
Nickel	1.60	2.40
Molybdenum	3.00	3.50
Copper	1.80	2.30
Vanadium	0.05	0.15

3.1.1 The 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.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259.

3.2 Melting Practice

Steel shall be multiple melted using either vacuum arc or electroslag practice in the remelt cycle.

3.3 Condition

The product shall be supplied in the following condition; hardness and tensile strength shall be determined in accordance with ASTM A370:

3.3.1 Bars

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

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

Annealed and cold-finished having tensile strength not higher than 135 ksi (931 MPa) or equivalent hardness (see 8.2).

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

Hot finished and annealed, unless otherwise ordered, having hardness not higher than 277 HBW, or equivalent (see 8.3). Bars ordered annealed and cold finished may have hardness as high as 285 HBW, or equivalent (see 8.3).

3.3.2 Forgings

Annealed.

3.3.3 Forging Stock

As ordered by the forging manufacturer.

3.4 Properties

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

3.4.1 Macrostructure

Visual examination of transverse full cross sections from bars, billets, and forging stock, etched in hot hydrochloric acid in accordance with ASTM A604, shall show no pipe or cracks. Porosity, segregation, inclusions, and other imperfections shall be no worse than the macrographs of ASTM A604 shown in Table 2.

Table 2 - Macrostructure limits

Class	Condition	Severity
1	Freckles	A
2	White Spots	A
3	Radial Segregation	B
4	Ring Pattern	B

3.4.1.1 Macrostructure examination is not required for bored/hollow forgings (including ring forgings) that are produced directly from ingots or large blooms unless otherwise agreed upon by the purchaser and producer (see 8.8).

3.4.2 Micro-Inclusion Rating of Each Heat

No specimen shall exceed the limits shown in Table 3, determined in accordance with ASTM E45, Method D.

Table 3 - Micro-inclusion rating limits

	A Thin	A Heavy	B Thin	B Heavy	C Thin	C Heavy	D Thin	D Heavy
Worst Field Severity	2.0	1.0	1.5	1.0	1.5	1.0	1.5	1.0
Worst Field Frequency, Maximum	a	1	a	1	a	1	5	3
Total Ratable Fields, Frequency, Maximum	b	1	b	1	b	1	c	3

a - Combined A+B+C, not more than three fields.
b - Combined A+B+C, not more than eight fields.
c - Any number of lower ratable D-type thin fields per specimen is permissible.

3.4.2.1 Thickness of D-Type heavy shall not exceed 0.0005 inch (12.7 µm).

3.4.2.2 A ratable field is defined as one that has a type A, B, C, or D inclusion rating of at least 1.0 thin or heavy in accordance with ASTM E45.

3.4.3 Average Grain Size of Bars and Forgings

Shall be ASTM No. 6 or finer, determined in accordance with ASTM E112.

3.4.4 Response to Heat Treatment of Bars and Forgings

Samples from product, 4.0 inches (102 mm) and under in nominal cross section, shall have hardness not lower than 34 HRC at any location after being heated to 1675 °F ± 25 °F (913 °C ± 14 °C), held at heat for 15 to 30 minutes, and quenched in oil.

3.5 Quality

The product, as received by the 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 premium aircraft-quality conforming to AMS2300.

3.5.2 Bars shall be free from seams, laps, tears, and cracks after removal of the standard stock removal allowance in accordance with AS1182.

3.5.3 Grain flow of die forgings, except in areas that 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 AMS2251.

3.7 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.4.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for the producer's tests and shall be responsible for the performance of all required tests. The 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), condition (3.3), macrostructure (3.4.1), micro-inclusion rating (3.4.2), average grain size (3.4.3), and tolerances (3.6) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Response to heat treatment (3.4.4), frequency-severity cleanliness rating (3.5.1), and grain flow of die forgings (3.5.3) are periodic tests and shall be performed at a frequency selected by the producer unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing

4.3.1 Bars and Forging Stock

In accordance with AMS2370.

4.3.2 Forgings

In accordance with AMS2372.

4.4 Reports

4.4.1 The producer of bars and forgings shall furnish with each shipment a report showing the producer's identity, country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), results of tests for composition, macrostructure, and micro-inclusion rating of each heat for condition and average grain size of each lot and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS6308G, product form, size, and quantity. If forgings are supplied, the size and melt source of the stock used to make the forgings shall also be included.

4.4.2 If the ship size/shape is cut from a larger cross section, report the nominal metallurgically worked size (see 3.3.1).

4.4.3 The producer of forging stock shall furnish with each shipment a report showing the producer's identity, country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), results of tests for composition, macrostructure, micro-inclusion rating of each heat and the results of any additional property requirements imposed by 8.8. This report shall include the purchase order number, heat number, AMS6308G, size, and quantity.

4.4.4 When material produced to this specification has the purchaser's approved exceptions taken to the technical requirements listed in Section 3 (see 5.2.1), the report shall contain a statement "This material is certified as AMS6308G(EXC) because of the following exceptions:" and the specific exceptions shall be listed.

4.5 Resampling and Retesting

4.5.1 Bars and Forging Stock

In accordance with AMS2370.

4.5.2 Forgings

In accordance with AMS2372.