AEROSPACE MATERIAL SPECIFICATION

AMS5930™	REV. C

Issued 1990-10
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Revised 2023-02

Superseding AMS5930B

Steel, Corrosion-Resistant, Bars, Forgings and Forging Stock
13.0Cr - 2.5Ni - 5.5Co - 2.0Mo - 0.60V (0.05 - 0.09C)
Vacuum Induction Plus Vacuum Consumable Electrode Melted
(Composition similar to UNS S42670)

RATIONALE

AMS5930C is the result of a Five-Year Review and update of the specification. The revision prohibits unauthorized exceptions (3.7, 5.2.1, 8.6), updates the composition testing and reporting requirements (3.1, 3.1.1), revises quality (3.5.2, 8.4), removes obsolete references (3.4.2.1), and adds pyrometry controls for response to heat treatment (3.4.4).

1. SCOPE

1.1 Form

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

1.2 Application

These products have been used typically for carburized parts requiring high minimum case hardness and corrosion resistance equivalent to AISI Type 440C, but usage is not limited to such applications. These products are suitable for service up to 675 °F (357 °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.

AMS2241 Tolerances, Corrosion- and Heat-Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Bars and Wire

AMS2248 Chemical Check Analysis Limits, Corrosion- and Heat-Resistant Steels and Alloys, Maraging and Other Highly Alloyed Steels, and Iron Alloys

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/AMS5930C/

AMS2300 Steel Cleanliness, Premium Aircraft-Quality, Magnetic Particle Inspection Procedure

AMS2371 Quality Assurance Sampling and Testing, Corrosion- and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

AMS2374 Quality Assurance Sampling and Testing, Corrosion- and Heat-Resistant Steel and Alloy Forgings

AMS2750 Pyrometry

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 Machining 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 by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	0.05	0.09
Manganese	0.50	1.00
Silicon	0.10	0.70
Phosphorus	--	0.015
Sulfur	--	0.010
Chromium	12.00	14.00
Nickel	2.00	3.00
Cobalt	4.00	7.00
Molybdenum	1.50	2.50
Vanadium	0.40	0.80

3.1.1 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 AMS2248.

3.2 Melting Practice

Steel shall be multiple melted using vacuum induction melting practice followed by vacuum consumable electrode remelting.

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

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 150 ksi (1034 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 302 HBW, or equivalent (see 8.3). Bars ordered annealed and cold finished may have hardness as high as 311 HBW, or equivalent (see 8.3).

3.3.1.3 Bars shall not be cut from plate (see 4.4.1.1).

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:

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 for product 36 square inches (232 cm^2) and under in nominal cross-sectional area 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

3.4.2 Micro-Inclusion Rating

No specimen shall exceed the limits of 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	1
Total Ratable Fields, Frequency, Maximum	b	1	b	1	b	1	c	1

a Combined A+B+C, not more than three fields of No. 2.0 A Type or No. 1.5 B and C Types.
b Combined A+B+C, not more than eight fields.
c Any number of lower ratable fields is permitted.

3.4.2.1 A ratable field is defined as one which has a Type A, B, C, or D inclusion rating of at least No. 1.0 thin or heavy in accordance with ASTM E45.

3.4.3 Average Grain Size

Shall be ASTM No. 5 or finer, determined in accordance with ASTM E112.

3.4.4 Response to Heat Treatment

Product 4.0 inches (102 mm) and under in nominal cross-section and specimens 4.0 inches (102 mm) and under in nominal cross-section extracted from larger product shall have hardness not lower than 38 HRC or equivalent (see 8.3), determined in accordance with ASTM A370, at any location after being heated to 1900 °F ± 25 °F (1038 °C ± 14 °C), held at heat for 15 to 30 minutes, and quenched in oil. Pyrometry shall be in accordance with AMS2750.

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 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 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 AMS2241.

3.7 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.3.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for producer's tests and shall be responsible for the performance of 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), condition (3.3), macrostructure (3.4.1), micro-including rating (3.4.2), average grain size (3.4.3), response to heat treatment (3.4.4), and tolerances (3.6) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Frequency-severity cleanliness rating of each heat 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 purchaser.

4.3 Sampling and Testing

Shall be as follows:

4.3.1 Bars and Forging Stock

In accordance with AMS2371.

4.3.2 Forgings

In accordance with AMS2374.