AEROSPACE MATERIAL SPECIFICATION

AMS5744™	REV. G

Issued 1965-02
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Revised 2024-09

Superseding AMS5744F

Steel, Corrosion and Heat-Resistant, Bars and Forgings and Forging Stock 15.5Cr - 4.5Ni - 2.9Mo - 0.10N (AM 355®) Consumable Electrode Remelted Heat Treated, 170 ksi (1172 MPa) Tensile Strength (Composition similar to UNS S35500)

RATIONALE

AMS5744G is the result of a Five-Year Review and update of the specification. The revision updates the Title to match the Scope, updates composition reporting (see 3.1.1), adds bar quality requirements (see 3.6.2 and 8.5), addresses forging stock properties (see 4.4.4 and 8.7), updates the exceptions requirements (see 8.6), and acknowledges the registered trademark for the alloy (see 8.8).

1. SCOPE

1.1 Form

This specification covers a corrosion- and heat-resistant steel in the form of bars, forgings, and forging stock.

1.2 Application

These products have been used typically for parts requiring oxidation resistance and high strength up to 800 °F (427 °C) and where such parts can be machined from fully heat-treated product, 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 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/AMS5744G/

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 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 A751 Chemical Analysis of Steel Products

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

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 the purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	0.10	0.15
Manganese	0.50	1.25
Silicon	--	0.50
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	15.00	16.00
Nickel	4.00	5.00
Molybdenum	2.50	3.25
Nitrogen	0.07	0.13

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 AMS2248.

3.2 Melting Practice

Steel shall be multiple melted using consumable electrode practice in the remelt cycle.

3.3 Condition

The product shall be supplied in the following condition:

3.3.1 Bars and Forgings

Bars and forgings shall be solution heat treated, subzero cooled, austenite conditioned, subzero cooled, tempered (see 3.4), and descaled.

3.3.1.1 Bars shall not be cut from plate (see 4.4.2).

3.3.2 Forging Stock

Forging stock shall be as ordered by the forging manufacturer.

3.4 Heat Treatment

Bars and forgings shall be heat treated as follows:

a. Solution heat treated by heating to 1900 °F ± 25 °F (1038 °C ± 14 °C), holding at heat for 1 to 3 hours, and cooling as rapidly as possible to room temperature.

b. Subzero cooled by cooling to -100 °F (-73 °C) or colder, holding at that temperature for not less than 3 hours, and warming in air to room temperature.

c. Austenite conditioned by heating to 1750 °F ± 25 °F (954 °C ± 14 °C), holding at heat for 10 to 60 minutes, and cooling as rapidly as possible to room temperature; cooling to -100 °F (-73 °C) or colder, holding at that temperature for not less than 3 hours, and warming in air to room temperature.

d. Tempered by heating to 1000 °F ± 25 °F (538 °C ± 14 °C), holding at heat for not less than 3 hours, and cooling in air.

3.4.1 Pyrometry shall be in accordance with AMS2750.

3.5 Properties

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

3.5.1 Bars and Forgings

3.5.1.1 Tensile Properties

Tensile properties shall be as shown in Table 2.

Table 2 - Minimum tensile properties

Property	Value
Tensile Strength	170 ksi (1172 MPa)
Yield Strength at 0.2% Offset	155 ksi (1069 MPa)
Elongation in 4D	12%
Reduction of Area	25%

3.5.1.1.1 Unless otherwise specified, the strain rate shall be set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of ±0.002 in/in/min (±0.002 mm/mm/min) through 0.2% offset yield strain. After the yield strain, the speed of the testing machine shall be set between 0.05 and 0.5 in/in (0.05 and 0.5 mm/mm) of the length of the reduced parallel section (or distance between the grips for specimens not having a reduced section) per minute. Alternatively, an extensometer and strain rate indicator may be used to set the strain rate between 0.05 and 0.5 in/in/min (0.05 and 0.5 mm/mm/min).

3.5.1.2 Hardness

Hardness shall be 37 to 44 HRC, or equivalent (see 8.2).

3.5.2 Forging Stock

When a sample of stock is forged to a test coupon and heat treated as in 3.4, specimens taken from the heat-treated coupon shall conform to the requirements of 3.5.1.1 and 3.5.1.2. If specimens taken from the stock after heat treatment as in 3.4 conform to the requirements of 3.5.1.1 and 3.5.1.2, the tests shall be accepted as equivalent to tests of a forged coupon.

3.6 Quality

The product, as received by the purchaser, shall be uniform in quality and condition, essentially free of grain boundary carbides, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

3.6.1 Grain flow of die forgings, except in areas having flash-line end grain, shall follow the general contour of the forgings showing no evidence of reentrant grain flow.

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

3.7 Tolerances

Tolerances for bars shall conform to all applicable requirements of AMS2241.

3.8 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 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

The following requirements are acceptance tests and shall be performed on each heat or lot as applicable:

- Composition (see 3.1) of each heat.
- Tensile properties (see 3.5.1.1) and hardness (see 3.5.1.2) of each lot of bars and forgings.
- Tolerances (see 3.7) of bars.

4.2.2 Periodic Tests

Tests of forging stock (see 3.5.2) to demonstrate the ability to develop required properties and tests for grain flow of die forgings (see 3.6.1) 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

Sampling and testing shall be as follows:

4.3.1 Bars and Forging Stock

Bars and forging stock shall be sampled and tested in accordance with AMS2371.

4.3.2 Forgings

Forgings shall be sampled and tested in accordance with AMS2374.

4.4 Reports

4.4.1 The producer of bars and forgings shall furnish with each shipment a report showing: the producer's name; the country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations); the results of tests for composition of each heat; and the results of tests for the tensile properties and hardness of each lot. The report shall state that the product conforms to the other technical requirements and shall include the purchase order number, heat and lot numbers, AMS5744G, size, and quantity. If forgings are supplied, the size and melt source of stock used to make the forgings shall also be included.

4.4.2 Report the nominal metallurgically worked cross-sectional size and the cut size, if different (see 3.3.1.1).

4.4.3 When material produced to this specification has exceptions taken to the technical requirements listed in Section 3 (see 5.2.1.1), the report shall contain a statement "This material is certified as AMS5744G(EXC) because of the following exceptions:" and the specific exceptions shall be listed.

4.4.4 The producer of forging stock shall furnish with each shipment a report showing the producer's name, the country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), the results of tests for composition of each heat, and the results of any additional property requirements imposed by the purchase order (see 8.7). This report shall include the purchase order number, heat number, AMS5744G, size, and quantity.

4.5 Resampling and Retesting

4.5.1 Bars and Forging Stock

Bars and forging stock shall be resampled and retested in accordance with AMS2371.