AEROSPACE MATERIAL SPECIFICATION

AMS5867™	REV. C

Issued 1992-04
Reaffirmed 2015-12
Revised 2021-10

Superseding AMS5867B

Steel, Corrosion and Heat Resistant, Forgings
12.5Cr (410)
Enhanced Fracture Toughness, Annealed

(Composition similar to UNS S41000)

RATIONALE

AMS5867C is the result of a Five-Year Review and update of the document. The revision prohibits unauthorized exceptions (3.5, 4.4.3, 8.4), updates composition methods (3.1) and response to heat treatment (3.3.1 and 3.3.2), requires country of origin (4.4), updates forging stock information (4.4.2, 8.6), and allows prior revisions (8.5).

1. SCOPE

1.1 Form

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

1.2 Application

These forgings have been used typically for structural parts requiring oxidation resistance up to 1000 °F (538 °C) and enhanced fracture toughness, 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.

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

AMS2303 Steel Cleanliness, Aircraft-Quality, Martensitic Corrosion-Resistant Steels, Magnetic Particle Inspection Procedure

AMS2315 Determination of Delta Ferrite Content

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/AMS5867C/

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

AMS2808 Identification, Forgings

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 E399 Linear-Elastic Plane-Strain Fracture Toughness (K_{Ic}) of Metallic Materials

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	0.10	0.13
Manganese	--	0.50
Silicon	--	1.00
Phosphorus	--	0.020
Sulfur	--	0.030
Chromium	11.50	13.50
Nickel	--	0.75
Molybdenum	--	0.50
Aluminum	--	0.05
Copper	--	0.50
Vanadium	--	0.04
Tin	--	0.05
Nitrogen	--	0.08

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Forgings

Annealed having hardness not higher than 241 HB, or equivalent (see 8.2); hardness shall be determined in accordance with ASTM A370.

3.2.2 Forging Stock

As ordered by the forging manufacturer.

3.3 Response to Heat Treatment - Properties

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

3.3.1 Forgings

Forgings shall have the following properties, determined on full-section specimens from forgings 0.500 inch (12.70 mm) and under in nominal diameter or distance between parallel sides or on 0.500 inch ± 0.010 inch (12.70 mm ± 0.25 mm) diameter specimens cut from larger forgings after being heat treated as follows: Heat to 1825 °F ± 25 °F (996 °C ± 14 °C), hold at heat for not less than 1 hour, and cool to room temperature. Cooling rate between 1550 and 1000 °F (843 and 538 °C) shall be 50 °F (28 °C) degrees per minute or faster, except liquid quenching is prohibited. Temper at 1015 °F ± 15 °F (546 °C ± 8 °C) for not less than 1 hour and cool.

3.3.1.1 Hardness

Shall be 30 to 38 HRC, or equivalent (see 8.2).

3.3.1.2 Microstructure

When required, shall be in accordance with standards established by purchaser.

3.3.1.3 Ferrite Content

Shall be not more than 2%, determined in accordance with AMS2315.

3.3.1.4 Fracture Toughness

Room temperature fracture toughness (K_{Ic}), determined in accordance with ASTM E399, shall be not less than 40 ksi $\sqrt{\text{inch}}$ (44 MPa $\sqrt{\text{m}}$).

3.3.2 Forging Stock

A sample of forging stock forged to a test coupon shall be annealed to a hardness not exceeding 241 HB, or equivalent (see 8.2), then heat treated as in 3.3.1 Room temperature fracture toughness (K_{Ic}), determined in accordance with ASTM E399, shall be not less than 40 ksi $\sqrt{\text{inch}}$ (44 MPa $\sqrt{\text{m}}$).

3.4 Quality

Forgings, 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 forgings.

3.4.1 Steel shall be aircraft quality conforming to AMS2303.

3.4.2 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.

3.5 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

Hardness (3.3.1.1), microstructure, when required (3.3.1.2), ferrite content (3.3.1.3), fracture toughness (3.3.1.4) of forgings and forging stock (3.3.2) and composition (3.1), frequency/severity rating (3.4.1) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Grain flow of die forgings (3.4.2) is a periodic test 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 in accordance with AMS2374.

4.4 Reports

4.4.1 The producer of forgings shall furnish with each shipment a report showing the producer's name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations)and the results of tests for composition and frequency/severity rating of each heat and for condition, hardness, microstructure (when specified), ferrite content and fracture toughness after heat treatment of each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot numbers, AMS5867C, size, quantity, and melt source of stock used to make the forgings.

4.4.2 The producer of forging stock shall furnish with each shipment a report showing the producer's name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations) and the results of tests for composition and frequency/severity rating of each heat, and for fracture toughness of each lot and the results of any additional property requirements imposed by 8.6. This report shall include the purchase order number, heat number, AMS5867C, size, and quantity.

4.4.3 When material produced to this specification has exceptions taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS5867C(EXC) because of the following exceptions:" and the specific exceptions shall be listed.

4.5 Resampling and Retesting

Shall be in accordance with AMS2374.

5. PREPARATION FOR DELIVERY

5.1 Identification

5.1.1 Forgings

In accordance with AMS2808.

5.1.2 Forging Stock

As agreed upon by purchaser and producer.

5.2 Packaging

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.