AEROSPACE MATERIAL SPECIFICATION

AMS5717™	REV. K

Issued 1964-01
Reaffirmed 2014-10
Revised 2025-02

Superseding AMS5717J

Nickel Alloy, Corrosion and Heat-Resistant, Bars, Forgings, Rings and Stock for Rings and Forging
45.5Ni - 25.5Cr - 3.2Mo - 3.2W - 18.5Fe (Alloy 333)
Solution Heat Treated
(Composition similar to UNS N06333)

RATIONALE

AMS5717K is the result of a Five-Year Review and update of the specification. The revision updates the Title to match the Scope and adds the common name, revises composition testing and reporting (see 3.1 and 3.1.1), adds hardness caveat (see 3.4.1.2.1), updates bar size reporting (see 4.4.2), provides for additional forging properties (see 4.4.3 and 8.7), updates the exceptions requirements (see 8.5), and adds a disclaimer on the use of trademarks (see 8.6).

1. SCOPE

1.1 Form

This specification covers a corrosion- and heat-resistant nickel alloy in the form of bars, forgings, flash-welded rings, and stock for forging or flash-welded rings.

1.2 Application

These products have been used typically for parts requiring heat and oxidation resistance up to 2150 °F (1177 °C), particularly where such parts may require welding during fabrication, 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

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/AMS5717K/

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

AMS2283 Composition Testing Methods for Nickel- and Cobalt-Based Alloys

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

AMS2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels, and Corrosion and Heat-Resistant Steels and Alloys

AMS2808 Identification, Forgings

AMS7490 Rings, Flash Welded, Corrosion and Heat-Resistant Austenitic Steels, Austenitic-Type Iron, Nickel or Cobalt Alloys, or Precipitation-Hardenable Alloys

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 E8/E8M Tension Testing of Metallic Materials

ASTM E18 Rockwell Hardness of Metallic Materials

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 AMS2283, or by other analytical methods acceptable to the purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	--	0.08
Manganese	--	2.00
Silicon	0.75	1.50
Phosphorus	--	0.030
Sulfur	--	0.030
Chromium	24.00	27.00
Nickel	44.00	47.00
Cobalt	2.50	4.00
Molybdenum	2.50	4.00
Tungsten	2.50	4.00
Copper	--	0.50
Tin	--	0.025
Lead	--	0.025
Iron	remainder	

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 Condition

The product shall be supplied in the following condition:

3.2.1 Bars, Forgings, and Flash-Welded Rings

Bars, forgings, and flash-welded rings shall be solution heat treated.

3.2.1.1 Bars shall be hot finished, except that bars under 0.250 inch (6.35 mm) in nominal diameter or distance between parallel sides may be cold finished.

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

3.2.1.2 Flash-welded rings shall not be supplied unless specified or permitted on the purchaser's part drawing. When supplied, rings shall be manufactured in accordance with AMS7490.

3.2.2 Stock for Forging or Flash-Welded Rings

Stock for forging or flash-welded rings shall be as ordered by the forging or flash-welded ring manufacturer.

3.3 Heat Treatment

No specific heat-treating instructions are specified, but bars, forgings, and flash-welded rings shall be solution heat treated to produce the properties specified in 3.4.1.1 and 3.4.1.2. Recommended solution heat treatment is presented in 3.3.1.

3.3.1 Bars, forgings, and flash-welded rings should be solution heat treated by heating to a temperature not lower than 1950 °F (1066 °C), holding at the selected temperature within ±25 °F (±14 °C) for a time commensurate with cross-sectional thickness, and cooling at a rate equivalent to an air cool or faster.

3.4 Properties

The product shall conform to the following requirements:

3.4.1 Bars, Forgings, and Flash-Welded Rings

3.4.1.1 Tensile Properties

Tensile properties shall be as shown in Table 2, determined in accordance with ASTM E8/E8M.

Table 2 - Tensile properties

Property	Value
Tensile Strength, maximum	120 ksi (827 MPa)
Yield Strength at 0.2% Offset, minimum	35.0 ksi (241 MPa)
Elongation in 4D, minimum	30%

3.4.1.2 Hardness

Hardness shall be not higher than 95 HRB, or equivalent (see 8.2), determined in accordance with ASTM E18, or equivalent (see 8.2).

3.4.1.2.1 Product shall not be rejected on the basis of hardness if tensile properties of 3.4.1.1 are acceptable, determined on a specimen taken from the same sample as that with nonconforming hardness or from another sample with similar nonconforming hardness.

3.4.2 Stock for Forging or Flash-Welded Rings

Stock for forging or flash-welded rings shall be as agreed upon by the purchaser and producer.

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 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 tolerances shall conform to all applicable requirements of AMS2241.

3.7 Exceptions

Any exception shall be authorized by the purchaser and reported as in 4.4.1.

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 (see 3.1), tensile properties (see 3.4.1.1), hardness (see 3.4.1.2), and tolerances (see 3.6) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Grain flow of die forgings (see 3.5.1) is a periodic test 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, flash-welded rings, and stock for forging or flash-welded rings shall be sampled and tested in accordance with AMS2371.

4.3.2 Forgings shall be sampled and tested in accordance with AMS2374.

4.4 Reports

The producer of the product 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 tensile properties and hardness requirements 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, AMS5717K, specific heat-treating cycles used to obtain reported properties, 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.

4.4.1 When material produced to this specification has exceptions authorized by the purchaser 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 AMS5717K(EXC) because of the following exceptions:" and the specific exceptions shall be listed.

4.4.2 Report the nominal metallurgically worked cross-sectional size and the cut size, if different (see 3.2.1.1.1).

4.4.2.1 This reporting requirement is limited to bars only.

4.4.3 The producer of stock for forgings or flash-welded rings shall furnish with each shipment a report showing the producer's name, country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations), and the composition and the results of any additional property requirements imposed by 8.7. This report shall include the purchase order number, heat and lot numbers, AMS5717K, product form, size or part number, and quantity.

4.5 Resampling and Retesting

4.5.1 Bars, flash-welded rings, and stock for forging or flash-welded rings shall be resampled and retested in accordance with AMS2371.

4.5.2 Forgings shall be resampled and retested in accordance with AMS2374.

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 24 feet (1.8 to 7.3 m) but not more than 25% of any shipment shall be supplied in lengths of 6 to 9 feet (1.8 to 2.7 m), except that for bars weighing over 25 pounds per foot (37 kg/m), short lengths down to 2 feet (610 mm) may be supplied.