



AEROSPACE MATERIAL SPECIFICATION

AMS5940™**REV. E**

Issued 1996-09
Reaffirmed 2019-07
Revised 2024-09

Superseding AMS5940D

Alloy, Corrosion- and Heat-Resistant, Bars, Forgings, and Rings
and Stock for Forging, Flash-Welded Rings and Heading,
34Co - 3.0Cr - 28Ni - 3.0Cb(Nb) - 5.5Al - 0.008B - 25.5Fe
Multiple Melted, High Temperature, Oxidation-Resistant, Low Expansion,
Solution Heat Treated, Precipitation-Hardenable (Alloy 783)
(Composition similar to UNS R30783)

RATIONALE

AMS5940E is the result of a Five-Year Review and update of the specification. The revision prohibits unauthorized exceptions (see 3.8, 4.4.3, 5.2.1, and 8.6), updates the Title to match the Scope, revises composition testing and reporting (see 3.1 and 3.1.1), adds finish information on large bars (see 3.3.1.1.1), adds strain rate control (see 3.5.1.2.1.1.1), adds additional forging stock properties (see 4.4.4 and 8.7), and allows prior revisions (see 8.5).

1. SCOPE

1.1 Form

This specification covers a cobalt-nickel-iron alloy in the form of bars, forgings, flash-welded rings, and stock for forging, flash-welded rings, or heading.

1.2 Application

These products have been used typically for parts requiring a combination of high strength and low expansion properties up to 1300 °F (704 °C), 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.

AMS2261 Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Bars, Rods, and Wire

AMS2269 Chemical Check Analysis Limits, Nickel, Nickel Alloys, and Cobalt Alloys

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Full document details: SAE AMS5940E

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Documents

Standard, visit Sharing Hub

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
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
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 E21	Elevated Temperature Tension Tests of Metallic Materials
ASTM E112	Determining Average Grain Size
ASTM E139	Conducting Creep, Creep-Rupture, and Stress-Rupture Tests 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
ASTM E228	Linear Thermal Expansion of Solid Materials with a Pushrod Dilatometer
ASTM E292	Conducting Time-for-Rupture Notch Tension Tests of Materials
ASTM E1181	Characterizing Duplex Grain Sizes

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	--	0.03
Manganese	--	0.50
Silicon	--	0.50
Phosphorus	--	0.015
Sulfur	--	0.005
Chromium	2.5	3.5
Nickel	26.0	30.0
Columbium (Niobium)	2.5	3.5
Aluminum	5.0	6.0
Boron	0.003	0.012
Iron	24.0	27.0
Titanium	--	0.40
Tantalum	--	0.05
Copper	--	0.50
Cobalt	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 AMS2269.

3.2 Melting Practice

Alloy shall be multiple melted using consumable electrode practice in the remelt cycle. If consumable electrode remelting is not performed in vacuum, electrodes that have been produced by vacuum induction melting shall be used for remelting.

3.3 Condition

The product shall be supplied in the following condition:

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

3.3.1.1 Bars shall be hot finished; round bars shall be ground or turned.

3.3.1.1.1 Bars, other than hexagons, over 2.75 inches (69.8 mm) in nominal diameter or least distance between parallel sides shall be hot finished or cold finished.

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

3.3.1.3 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.

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

3.4 Solution Heat Treatment

Bars, forgings, and flash-welded rings shall be solution heat treated by heating to a temperature within the range 2025 to 2050 °F (1107 to 1121 °C), holding at the selected temperature within ± 25 °F (± 14 °C) for a time commensurate with section thickness, and cooling at a rate equivalent to an air cool or faster (see 8.2).