



AEROSPACE MATERIAL SPECIFICATION

AMS5223™**REV. H**

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Revised 2025-07

Superseding AMS5223G

(R) Iron-Nickel Alloy, Strip
49Fe - 5.3Cr - 42Ni - 2.5Ti - 0.55Al
Solution Heat Treated, Cold Rolled, 10% Reduction
(Composition similar to UNS N09902)

RATIONALE

AMS5223H is the result of a Five-Year Review and update of the specification. The revision updates and revises composition testing methods, requirements, and reporting (see 3.1 and 3.1.1), modifies finish requirements (see 3.2), adds strain rate limits for tensile tests (see 3.4.2.1.1 and 3.4.3.1.1), updates hardness testing (see 3.4.2.2, 3.4.3.2, and 8.2), adds note on heat treatment (see 8.3), and updates the requirements for exceptions (see 3.4.4, 4.4.4, and 8.6).

1. SCOPE

1.1 Form

This specification covers an iron-nickel alloy in the form of strip 0.020 to 0.1874 inch (0.51 to 4.760 mm), inclusive, in nominal thickness.

1.2 Application

This strip has been used typically for diaphragms, leaf springs, and helical springs requiring a precipitation-hardenable alloy with a thermoelastic coefficient of -20 to $+20 \times 10^{-6}$ per degree Fahrenheit from -50 to $+150$ °F (-36 to $+36 \times 10^{-6}$ per degree Celsius from -46 to $+66$ °C) after suitable heat treatment, 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.

AMS2242 Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium and Titanium Alloy Sheet, Strip, and Plate

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Documents

Standard, visit Sharing Hub

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
AMS2750	Pyrometry
AMS2807	Identification, Carbon and Low-Alloy Steels, Corrosion- and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft 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 A480/A480M	Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM E8/E8M	Tension Testing of Metallic Materials
ASTM E18	Rockwell Hardness of Metallic Materials
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

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	--	0.06
Manganese	--	0.80
Silicon	--	1.00
Phosphorus	--	0.04
Sulfur	--	0.04
Chromium	4.90	5.75
Nickel	41.00	43.50
Titanium	2.20	2.75
Aluminum	0.30	0.80
Chromium + (Titanium - 4x Carbon)	7.10	8.10
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

Solution heat treated, descaled, cold rolled with approximately 10% reduction in thickness, and having a surface appearance comparable to a No. 1 strip finish in accordance with ASTM A480/A480M.

3.3 Solution Heat Treatment

Strip shall be solution heat treated by heating to 1750 °F $\pm$ 25 °F (954 °C $\pm$ 14 °C), holding at heat for a time commensurate with thickness, and cooling as required. Pyrometry shall be in accordance with AMS2750.

3.3.1 Continuous Heat Treating

When continuous heat treating is used, process parameters (e.g., furnace temperature set points, heat input, travel rate, etc.) for continuous heat-treating lines shall be established by the material producer and validated by testing of product to specified requirements.

3.4 Properties

Strip shall conform to the following requirements:

3.4.1 As Solution Heat Treated

3.4.1.1 Average Grain Size

Average grain size shall be ASTM No. 5 or finer, determined in accordance with ASTM E112.

3.4.2 As Solution Heat Treated and Cold Rolled

3.4.2.1 Tensile Properties

Tensile properties shall be as shown in Table 2, determined in accordance with ASTM E8/E8M. These requirements apply to strip 0.020 to 0.1874 inch (0.51 to 4.760 mm), inclusive, in nominal thickness.

Table 2 - Tensile properties - as solution heat treated

Properties	Value
Tensile Strength	90 to 110 ksi (621 to 758 MPa)
Elongation in 2 Inches (50 mm), Minimum	15%

3.4.2.1.1 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). The requirement for compliance becomes effective for material produced 1 year after the publication date of this specification.