SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

AMS 5542M

Issued SEP 1947
Reaffirmed AUG 2000
Revised OCT 2006

Superseding AMS 5542L

Nickel Alloy, Corrosion and Heat-Resistant, Sheet, Strip, and Plate
72Ni - 15.5Cr - 0.95Cb(Nb) - 2.5Ti - 0.70Al - 7.0Fe
Annealed

(Composition similar to UNS N07750)

RATIONALE

AMS 5542M is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a corrosion and heat-resistant nickel alloy in the form of sheet, strip, and plate.

1.2 Application

These products have been used typically for parts requiring high strength up to approximately 1500 °F (816 °C) and oxidation resistance up to approximately 1800 °F (980 °C), and for bellows and flat springs requiring optimum resistance to relaxation up to approximately 1000 °F (538 °C) with moderate or relatively low stresses, but usage is not limited to such applications.

1.2.1 Parts may be formed and then heat treated to improve strength at elevated temperatures.

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 724-776-4970 (outside USA), www.sae.org.

AMS 2262	Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate
AMS 2269	Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt Alloys
AMS 2371	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

SAENORM.COM : Click to view the full PDF of ams5542m

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2006 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

AMS 2807	Identification, Carbon and Low-Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing
AS4197	Sheet and Strip Surface Finish Nomenclature

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/A 480M	Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM E 8	Tension Testing of Metallic Materials
ASTM E 8M	Tension Testing of Metallic Materials (Metric)
ASTM E 18	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E 112	Determining Average Grain Size
ASTM E 290	Semi-Guided Bend Test for Ductility of Metallic Materials
ASTM E 354	Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon	--	0.08
Manganese	--	1.00
Silicon	--	0.50
Sulfur	--	0.01
Chromium	14.00	17.00
Columbium (Niobium)	0.70	1.20
Titanium	2.25	2.75
Aluminum	0.40	1.00
Iron	5.00	9.00
Cobalt (3.1.1)	--	1.00
Tantalum (3.1.1)	--	0.05
Copper	--	0.50
Nickel + Cobalt	70.00	--

SAENORM.COM : Click to view the full PDF of ams5542m

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS 2269.

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Sheet and Strip

Cold rolled, annealed, and, unless annealing is performed in an atmosphere yielding a bright finish, descaled, if required, having a surface appearance in accordance with ASTM A480/A 480M and AS4194 comparable to 3.2.1.1 or 3.2.1.2 as applicable.

3.2.1.1 Sheet

No. 2D finish

3.2.1.2 Strip

No. 1 strip finish

3.2.2 Plate

Hot rolled and annealed; when so ordered, plate shall be descaled.

3.3 Properties

The product shall conform to the following requirements:

3.3.1 As Annealed

3.3.1.1 Tensile Properties

Shall be as specified in 3.3.1.1.1 and 3.3.1.1.2, determined in accordance with ASTM E 8 or ASTM E 8M.

3.3.1.1.1 Strip

Shall be as shown in Table 2.

TABLE 2A - Tensile Properties, Inch/Pound Units

Nominal Thickness Inch	Tensile Strength ksi, max	Elongation in 2 Inches %, min
Up to 0.010, excl	140	--
0.010 to 0.025, excl	130	20

TABLE 2B - Tensile Properties, SI Units

Nominal Thickness Millimeter	Tensile Strength MPa, max	Elongation in 50.8 mm %, min
Up to 0.25, excl	965	--
0.25 to 0.64, excl	896	20

SAENORM.COM : Click to view the full PDF of ams5542m

3.3.1.1.2 Sheet

Shall be as shown in Table 3.

TABLE 3A - Tensile Properties, Inch/Pound Units

Nominal Thickness Inch	Tensile Strength ksi, max	Yield Strength at 0.2% Offset ksi, max	Elongation in 2 Inches %, min
0.010 to 0.024, incl	140	--	30
Over 0.024 to 0.125, incl	130	60.0	40
Over 0.125 to 0.1874, incl	130	65.0	40

TABLE 3B - Tensile Properties, SI Units

Nominal Thickness Millimeters	Tensile Strength MPa, max	Yield Strength at 0.2% Offset MPa, max	Elongation in 50.8 mm %, min
0.25 to 0.61, incl	965	--	30
Over 0.61 to 3.18, incl	896	414	40
Over 3.18 to 4.76, incl	896	448	40

3.3.1.2 Bending

Product 0.1874 inch (4.76 mm) and under in nominal thickness shall be tested in accordance with ASTM E 290 using a sample prepared nominally 0.75 inch (19.0 mm) in width with its axis of bending parallel to the direction of rolling and shall withstand without cracking when bending at room temperature through an angle of 180 degrees around a diameter equal to the bend factor shown in Table 4 times the nominal thickness of the product. In case of dispute, the results of tests using the guided bend test of ASTM E 290 shall govern.

TABLE 4 - Bending Parameters

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
Up to 0.050, incl	Up to 1.27, incl	1
Over 0.050 to 0.1874, incl	Over 1.27 to 4.76, incl	2

3.3.1.3 Average Grain Size

Sheet and strip 0.010 to 0.1874 inch (0.25 to 4.76 mm) in nominal thickness shall have an average grain size not over 0.0060 inch (0.152 mm) in diameter (ASTM Grain Size No. 2.5), determined in accordance with ASTM E 112.

3.3.1.3.1 Grain size requirements for sheet and strip under 0.010 inch (0.25 mm) in nominal thickness and for plate shall be as agreed upon by purchaser and vendor.

3.3.2 After Precipitation Heat Treatment

The product shall conform to the following requirements after being precipitation heat treated by heating to 1300 °F ± 25 (704 °C ± 14), holding at heat for 20 hours ± 1, and cooling in air:

3.3.2.1 Tensile Properties

Shall be as specified in Table 5, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 5A - Minimum Tensile Properties, Inch/Pound Units

Product	Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Strip	Up to 0.010, excl	150	--	--
	0.010 to 0.025, excl	155	--	15
	0.025 to 0.1874, incl	155	--	15
Sheet	0.010 to 0.1874, incl	165	105	20
Plate	0.1875 to 4.000, incl	155	100	20

SAENORM.COM : Click to view the full PDF of ams5542m