NOTICE OF ADOPTION

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17 September 1993

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Society of Automotive Engineers Inc.
400 Commonwealth Drive
Warrendale, PA 15096–0001

Title of Document: AMS 5598C, Nickel Alloy, Corrosion and Heat Resistant, Sheet, Strip, and Plate 72Ni – 15.5Cr – 0.95(Cb + Ta) – 2.5Ti – 0.70Al – 7.0Fe Consumable Electrode or Vacuum Induction Melted Solution Heat Treated, Precipitation Hardenable.

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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5598C

Issued 1 SEP 1965
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Superseding AMS 5598B

Submitted for recognition as an American National Standard

NICKEL ALLOY, CORROSION AND HEAT RESISTANT, SHEET, STRIP, AND PLATE, 72Ni - 15.5Cr - 0.95(Cb + Ta) - 2.5Ti - 0.70Al - 7.0Fe Consumable Electrode or Vacuum Induction Melted Solution Heat Treated, Precipitation Hardenable

UNS N07750

1. SCOPE:

1.1 Form:

This specification covers a corrosion and heat resistant nickel alloy in the form of sheet, strip, and plate procured in inch/pound units.

1.1.1 MAM 5598 is the metric version of this AMS.

1.2 Application:

These products have been used typically for parts requiring high strength up to 1500 °F and oxidation resistance up to 1800 °F and for bellows and flat springs requiring optimum resistance to relaxation up to 1000 °F with moderate or relatively low stresses, particularly where welding is involved, but usage is not limited to such applications. Parts may be formed, welded if required, and then heat treated to improve strength at elevated temperatures.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-001.

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

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 8 Tension Testing of Metallic Materials
ASTM E 18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E 112 Determining the 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

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

(R)

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	--	0.35
Silicon	--	0.35
Phosphorus	--	0.015
Sulfur	--	0.010
Chromium	14.00	17.00
Nickel + Cobalt	70.00	--
Columbium + Tantalum	0.70	1.20
Titanium	2.25	2.75
Aluminum	0.40	1.00
Iron	5.00	9.00
Cobalt	--	1.00
Copper	--	0.50

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2269.

3.2 Melting Practice:

Alloy shall be multiple melted using consumable electrode practice in the remelt cycle or shall be induction melted under vacuum. If consumable electrode remelting is not performed in vacuum, electrodes which 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 Sheet: Hot rolled or cold rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to a commercial corrosion-resistant steel No. 2D finish (See 8.2).

3.3.2 Strip: Cold rolled and solution heat treated. Strip need not be bright and may have an oxidized surface.

3.3.3 Plate: Hot rolled, solution heat treated, and descaled.

3.4 Solution Heat Treatment:

No specific heat treating instructions are specified but it is recommended that the product be solution heat treated by heating in a suitable protective atmosphere to 1800 °F ± 25, holding at heat for a time commensurate with product thickness, and cooling at a rate equivalent to an air cool or faster.

3.5 Properties:

The product shall conform to the following requirements:

3.5.1 As Solution Heat Treated:

3.5.1.1 Tensile Properties: Shall be as shown in Table 2 and Table 3, determined in accordance with ASTM E 8.

3.5.1.1.1 Strip:
(R)

TABLE 2 - Strip Tensile Properties

Nominal Thickness Inch	Tensile Strength ksi, max	Elongation in 2 Inches or 4D %, min
Up to 0.010, excl	140	--
0.010 to 0.187, incl	135	18

3.5.1.1.2 Sheet:
(R)

TABLE 3 - Sheet Tensile Properties

Nominal Thickness Inch	Tensile Strength ksi, max	Yield Strength at 0.2% Offset ksi, max	Elongation in 2 Inches or 4D %, min
0.010 to 0.024, incl	135	75.0	30
Over 0.024 to 0.187, incl	135	75.0	35

3.5.1.2 (R) Bending: Sheet and strip shall withstand, without cracking, bending in accordance with ASTM E 290 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 with axis of bend parallel to the direction of rolling.

TABLE 4 - Bending Parameters

Nominal Thickness Inch	Bend Factor
Up to 0.050, incl	1
Over 0.050 to 0.187, incl	2

3.5.1.3 (R) Grain Size: Sheet and strip 0.010 to 0.187 inch, inclusive, in nominal thickness shall have an average grain size of ASTM No. 5 or finer, determined in accordance with ASTM E 112.

3.5.2 After Precipitation Heat Treatment: The product shall have the following properties after being precipitation heat treated by heating to 1350 °F ± 15, holding at heat for 8 hours ± 0.5, cooling at a rate of 100 F ± 15 degrees per hour to 1150 °F ± 15, holding at 1150 °F ± 15 for 8 hours ± 0.5, and cooling in air. Instead of the 100 F ± 15 degrees per hour cooling rate to 1150 °F ± 15, product may be furnace cooled at any rate provided the time at 1150 °F ± 15 is adjusted to give a total precipitation heat treatment time of 18 hours.

3.5.2.1 (R) Tensile Properties: Shall be as shown in Table 5, determined in accordance with ASTM E 8.

TABLE 5 - Minimum Tensile Properties

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	155	--	--
	0.010 to 0.187, incl	160	--	12
Sheet	0.010 to 0.187, incl	170	115	18
Plate	Over 0.187 to 4.000, incl	160	105	18

3.5.2.2 (R) Hardness: Should be not lower than shown in Table 6, or equivalent, determined in accordance with ASTM E 18, (See 8.3).

TABLE 6 - Minimum Hardness

Product	Hardness
Strip 0.005 to 0.187 inch, inclusive, in nominal thickness	30 HRC
Sheet	32 HRC
Plate	30 HRC

3.6 Quality:

The product, 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 product.

3.7 Tolerances:

Sheet 44 inches and under in width and 0.010 inch and over in nominal thickness; strip, other than for thickness; and plate shall conform to all applicable requirements of AMS 2262. Thickness tolerances for strip shall be ±10% of the nominal thickness. Tolerances for sheet over 44 inch in width and under 0.010 inch in nominal thickness shall be as agreed upon by purchaser and vendor.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

(R)

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling and Testing:

(R)

Shall be in accordance with AMS 2371.