SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS5874 | REV. C

Issued 1980-07
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Superseding AMS5874B

Alloy, Corrosion and Heat-Resistant, Sheet, Strip, and Plate
29Fe - 22Cr - 21Ni - 18.5Co - 3.2Mo - 2.8W - 0.78Ta - 0.30Al - 0.05Zr - 0.05La - 0.20N
Solution Heat Treated

(Composition similar to UNS R30556)

RATIONALE

AMS5874C has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

1.1 Form

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

1.2 Application

These products have been used typically for formed, drawn, and welded parts requiring high strength and oxidation resistance up to 2000 °F (1093 °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.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
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Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5874C

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 2242	Tolerances, Corrosion and Heat-Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
AMS 2248	Chemical Check Analysis Limits, Wrought Corrosion and Heat-Resistant Steels and Alloys, Maraging and other Highly-Alloyed Steels, and Iron 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
AS4194	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 A 480/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 139	Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials
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	0.05	0.15
Manganese	0.50	2.00
Silicon	0.20	0.80
Phosphorus	--	0.04
Sulfur	--	0.015
Chromium	21.00	23.00
Nickel	19.00	22.50
Cobalt	16.00	21.00
Molybdenum	2.50	4.00
Tungsten	2.00	3.50
Tantalum	0.30	1.25
Aluminum	0.10	0.50
Zirconium	0.001	0.10
Lanthanum	0.005	0.10
Nitrogen	0.10	0.30
Columbium (Niobium)	--	0.30
Boron	--	0.02

Iron	remainder

3.1.1 Check Analysis

Composition variations shall meet the requirements of AMS 2248; check analysis limits for lanthanum shall be 0.002 under minimum and 0.01 over maximum.

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Sheet and Strip

Hot or cold rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright surface, descaled having a surface appearance in accordance with ASTM A 480/A 480M and AS4194 comparable to 3.2.1.1 and 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, solution heat treated, and descaled.

3.3 Heat Treatment

The product shall be solution heat treated by heating to a temperature within the range 2100 to 2225 °F (1149 to 1218 °C), holding at the selected temperature within ± 25 °F (± 14 °C) for a time commensurate with section thickness but not more than 30 minutes, and cooling rapidly.

3.4 Properties

The product shall conform to the following requirements:

3.4.1 Average Grain Size

Shall be 3 or finer, determined by comparison of a polished and etched specimen with the chart in ASTM E 112.

3.4.2 Tensile Properties

Shall be as shown in Table 2, determined in accordance with ASTM E 8 or ASTM E 8M.

TABLE 2 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	100 ksi (689 MPa)
Yield Strength at 0.2% Offset	47.0 ksi (324 MPa)
Elongation in 2 Inches (50.8 mm) or 4D Nominal Thickness	
Up to 0.020 inch (0.51 mm), incl	35%
Over0.020 inch (0.51 mm)	40%

3.4.3 Hardness

Shall be not higher than 21 HRC, or equivalent (See 8.2), determined in accordance with ASTM E 18.

3.4.4 Bending

Product 0.187 inch (4.75 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 3 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 3 - BENDING PARAMETERS

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
Up to 0.050, incl	Up to 1.27, incl	1.5
Over 0.050 to 0.187, incl	Over 1.27 to 4.75, incl	2.0

3.4.5 Stress-Rupture Properties at 1500 °F (816 °C)

A tensile specimen, maintained at 1500 °F ± 3 (816 °C ± 2) while a load sufficient to produce the initial axial stress specified in Table 4 is applied continuously, shall not rupture in less than 24 hours. The test shall be continued to rupture without change of load. Elongation after rupture, measured at room temperature, shall be as specified in Table 4. Tests shall be conducted in accordance with ASTM E 139.

TABLE 4 - STRESS RUPTURE PARAMETERS

Nominal Thickness Inch	Nominal Thickness Millimeters	Stress ksi	Stress MPa	Elongation in 2 Inches (50.8 mm) or 4D %, min
Up to 0.020, incl	Up to 0.51, incl	18.0	124	20
Over 0.020	Over 0.51	19.0	131	25

3.4.5.1 The test of 3.4.5 may be conducted using a load higher than required to produce the initial axial stress specified in Table 4 but load shall not be changed while test is in progress. Time to rupture and elongation requirements shall be as specified in 3.4.5.

3.4.5.2 When permitted by purchaser, the test of 3.4.5 may be conducted using incremental loading. In such case, a load sufficient to produce the initial axial stress specified in Table 4 shall be used to rupture or for 24 hours, whichever occurs first. After the 24 hours and at intervals of 8 hours minimum, thereafter, the stress shall be increased in increments of 2000 psi (14 MPa). Time to rupture and elongation requirements shall be as specified in 3.4.5.

3.4.6 Oxidation Resistance

Product shall meet the following oxidation requirements, determined in accordance with 4.4.1:

3.4.6.1 Metal converted to oxide scale plus any continuous intergranular oxidation shall not exceed an average of 0.0015 inch (0.038 mm) per side or 0.003 inch (0.08 mm) per specimen.

3.4.6.2 Specimens displaying localized areas greater than 0.062 inch (1.57 mm) in diameter with excessive oxidation attack, unless such attack can be attributed to contact with ceramic supports, shall be considered invalid and the tests repeated. If the condition is duplicated, the product is not acceptable.

3.5 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.

3.6 ToleranceS