AEROSPACE MATERIAL SPECIFICATION

AMS5547™	REV. J

Issued 1957-09
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Superseding AMS5547H

(R) Steel, Corrosion- and Heat-Resistant, Sheet and Strip
15.5Cr - 4.5Ni - 2.9Mo - 0.10N
Solution Heat Treated
(Composition similar to UNS S35500)

RATIONALE

AMS5547J is the result of a Five-Year Review and update of the specification. The revision adds a maximum thickness and addresses exceptions to this and other requirements (see 1.1, 3.5.3, 3.8, 4.4.1, 5.1.1, and 8.5), updates composition methods and reporting (see 3.1 and 3.1.1), revises acceptable conditions (see 3.3), updates heat treatment (see 3.4 and 3.4.1), addresses thickness limits for hardness and conversion methods (see 3.5.1.1, 3.5.2.2, and 8.2), updates formatting for heat-treatment parameters (see 3.5.2), adds strain rate control (see 3.5.2.1.1), and allows prior revisions (see 8.4).

1. SCOPE

1.1 Form

This specification covers a corrosion- and heat-resistant steel in the form of sheet and strip less than 0.1875 inch (4.762 mm) thick.

1.2 Application

These products have been used typically for parts requiring oxidation resistance and high strength up to 800 °F (427 °C) and where such parts may require welding during fabrication, 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.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
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SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS5547J

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

AMS2248 Chemical Check Analysis Limits, Corrosion- and Heat-Resistant Steels and Alloys, Maraging and Other Highly Alloyed Steels, and Iron Alloys

AMS2371 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

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 A370 Mechanical Testing of Steel Products

ASTM A751 Chemical Analysis of Steel Products

ASTM E290 Bend Testing of Material for Ductility

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 ASTM A751 or by other analytical methods acceptable to the purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	0.10	0.15
Manganese	0.50	1.25
Silicon	--	0.50
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	15.00	16.00
Nickel	4.00	5.00
Molybdenum	2.50	3.25
Nitrogen	0.07	0.13

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 Melting Practice

Steel shall be multiple melted using consumable electrode practice in the remelt cycle and using only one electrode to produce a single ingot.

3.3 Condition

Hot or cold rolled, solution heat treated, and, unless solution heat treating is performed in an atmosphere yielding a bright finish, descaled producing a uniform finish.

3.4 Solution Heat Treatment

The product shall be solution heat treated by heating to 1900 °F ± 25 °F (1038 °C ± 14 °C), holding at the selected temperature for not less than 45 minutes per inch (25 mm) of nominal thickness, and quenching in water or otherwise cooling as rapidly as possible to room temperature.

3.4.1 Continuous Heat Treatment

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 the requirements of 3.5.

3.5 Properties

The product shall conform to the following requirements; tensile, hardness, and bend testing shall be performed in accordance with ASTM A370:

3.5.1 As Solution Heat Treated

3.5.1.1 Hardness

Hardness for product 0.005 inch (0.13 mm) and over shall be not higher than 35 HRC, or equivalent (see 8.2).

3.5.1.2 Bending

The product shall be tested in accordance with ASTM E290 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, bending at room temperature through an angle of 180 degrees around a diameter equal to three times the nominal thickness of the product. In case of dispute, the results of tests using the guided bend test of ASTM E290 shall govern.

3.5.2 Response to Heat Treatment, Sub-Zero Cooled, Austenite Conditioned, Sub-Zero Cooled, and Tempered

Samples from product shall have the following properties after being heat treated as follows (all three steps in order):

1. Heat Treat
   a. Heat to 1900 °F ± 25 °F(1038 °C ± 14 °C), hold at heat for not less than 45 minutes per inch (25 mm) of nominal thickness
   b. Quench in water
   c. Cool to -100 °F (-73 °C) or colder, hold at this temperature for not less than 3 hours
   d. Warm in air to room temperature

2. Austenite Condition
   a. Heat to 1750 °F ± 10 °F (954 °C ± 6 °C), hold at heat for 10 to 60 minutes
   b. Quench in water
   c. Cool to -100 °F (-73 °C) or colder, hold at this temperature for not less than 3 hours
   d. Warm in air to room temperature

3. Temper
   a. Heat to 1000 °F ± 25 °F (538 °C ± 14 °C), hold at heat for not less than 3 hours
   b. Cool in air

3.5.2.1 Tensile Properties - Response to Heat Treatment

Response to heat-treat properties shall be as specified in Tables 2A and 2B.

Table 2A - Minimum tensile properties - response to heat treatment, inch/pound units

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 0.010, incl	165.0	140.0	As agreed upon
Over 0.010 to 0.1875, excl	165.0	140.0	10

Table 2B - Minimum tensile properties - response to heat treatment, SI units

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50 mm or 4D %
Up to 0.25, incl	1138	965	As agreed upon
Over 0.25 to 4.762, excl	1138	965	10

3.5.2.1.1 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 in/in and 0.5 in/in (0.05 mm/mm 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 in/in/min and 0.5 in/in/min (0.05 mm/mm/min and 0.5 mm/mm/min). The requirement for compliance becomes effective for material produced 1 year after the publication date of this specification.

3.5.2.2 Hardness - Response to Heat Treatment

Hardness for product 0.005 inch (0.13 mm) and over shall be 37 to 44 HRC, or equivalent (see 8.2). Product shall not be rejected on the basis of hardness if the tensile properties determined on specimens taken from the same sample as that with nonconforming hardness or another sample with similar nonconforming hardness are acceptable.

3.5.3 Mechanical property requirements for product outside the size range covered by 1.1 shall be agreed upon between purchaser and producer and reported per 4.4.1.

3.6 Quality

The product, as received by the purchaser, shall be uniform in quality and condition, free of grain boundary carbides, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

3.7 Tolerances

Tolerances shall conform to all applicable requirements of AMS2242.

3.8 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1.