SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS5859 | REV. D

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Superseding AMS5859C

Steel, Corrosion Resistant, Sheet, Strip, and Plate 15Cr - 6.5Ni - 0.75Mo - 0.30Cb - 1.5Cu Consumable Electrode Melted, Solution Heat Treated Precipitation Hardenable

(Composition similar to UNS S45000)

RATIONALE

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

1. SCOPE:

1.1 Form:

This specification covers a premium aircraft-quality, corrosion-resistant steel in the form of sheet, strip, and plate.

1.2 Application:

These products have been used typically for parts requiring corrosion resistance approximating that of 18-8 type steels and strength exceeding that of 12Cr martensitic-type steels up to 700 °F (371 °C), but usage is not limited to such applications. This steel can be used in the solution heat treated condition and can be precipitation heat treated to tensile strengths as high as 180 ksi (1241 MPa).

1.2.1 This steel is relatively immune to stress-corrosion cracking; however, reference should be made to ARP1110 for recommended practices to minimize such conditions.

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 canceled 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/AMS5859D

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2242	Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
MAM 2242	Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
AMS 2248	Chemical Check Analysis Limits, Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
AMS 2300	Premium Aircraft-Quality Steel Cleanliness, Magnetic Particle Inspection Procedure
MAM 2300	Premium Aircraft-Quality Steel Cleanliness, Magnetic Particle Inspection Procedure, Metric (SI) Measurement
AMS 2371	Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS 2750	Pyrometry
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
ARP1110	Minimizing Stress Corrosion Cracking in Wrought Forms of Steels and Corrosion Resistant Steels and Alloys

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM A 370	Mechanical Testing of Steel Products
ASTM A 480/A 480M	Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM E 353	Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron 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 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon	–	0.05
Manganese	–	1.00
Silicon	–	1.00
Phosphorus	–	0.020
Sulfur	–	0.015
Chromium	14.00	16.00
Nickel	6.00	7.00
Molybdenum	0.50	1.00
Columbium	8xC	–
Copper	1.25	1.75

3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2248.

3.2 Melting Practice:

Steel shall be multiple melted using consumable electrode practice in the remelt cycle.

3.3 Condition:

The product shall be supplied in the following condition:

3.3.1 Sheet and Strip: Cold rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled having a surface appearance in accordance with ASTM A 480/A 480M and AS4194 comparable to 3.3.1.1 and 3.3.1.2.

3.3.1.1 Sheet: No. 2D finish.

3.3.1.2 Strip: No. 1 strip finish.

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

3.4 Solution Heat Treatment:

The product, except as specified in 3.4.1, shall be solution heat treated by heating to 1900 °F ± 25 (1038 °C ± 14), holding at heat for 5 to 30 minutes, and quenching rapidly, such as in water, oil, or forced air. Pyrometry shall be in accordance with AMS 2750.

3.4.1 For sheet and strip heat treated in a continuous process, the product shall be solution heat treated by heating to 1900 °F ± 25 (1038 °C ± 14), holding at heat for a time commensurate with thickness and the heating equipment and procedure used, and cooling at a rate equivalent to air cooling.

3.5 Properties:

The product shall conform to the following requirements; tensile, hardness, and bend testing shall be performed in accordance with ASTM A 370:

3.5.1 As Solution Heat Treated:

3.5.1.1 Tensile Properties: Shall be as shown in Table 2.

TABLE 2 - Minimum Tensile Properties

Property	Value
Tensile Strength	125 ksi (862 MPa)
Yield Strength at 0.2% Offset	95 ksi (655 MPa)
Elongation in 2 inches (50.8 mm) or 4D	4%

3.5.1.2 Hardness: Product 0.010 inch (0.25 mm) and over in nominal thickness should have hardness not higher than 33 HRC, or equivalent (See 8.2), but shall not be rejected on the basis of hardness if the tensile property requirements of 3.5.1.1 are acceptable, determined on specimens taken from the same sample as that with nonconforming hardness or from another sample with similar nonconforming hardness.

3.5.1.3 Bending: Product under 0.1875 inch (4.762 mm) in nominal thickness shall withstand, without cracking, free bending through an angle of 180 degrees around a diameter equal to six times the nominal thickness of the product, with axis of bend parallel to the direction of rolling.

3.5.2 After Precipitation Heat Treatment: Product shall have the following properties after being precipitation heat treated by heating to 1050 °F ± 15 (566 °C ± 8), holding at heat for 4 to 8 hours, and cooling at a rate equivalent to air cooling.

3.5.2.1 Tensile Properties: Shall be as shown in Table 3.

TABLE 3A - Minimum Tensile Properties, Inch/Pound Units

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 0.020, incl	145	135	5
Over 0.020 to 0.062, incl	145	135	6
Over 0.062	145	135	8

TABLE 3B - Minimum Tensile Properties, SI Units

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 0.51, incl	1000	931	5
Over 0.51 to 1.57, incl	1000	931	6
Over 1.57	1000	931	8

3.5.2.2 Hardness: Product 0.010 inch (0.25 mm) and over in nominal thickness should have hardness not lower than 34 HRC, or equivalent (See 8.2), but shall not be rejected on the basis of hardness if the tensile property requirements of 3.5.2.1 are acceptable, determined on specimens taken from the same sample as that with nonconforming hardness or from another sample with similar nonconforming hardness.

3.5.3 After Other Precipitation Heat Treatment: Properties after precipitation heat treatment at temperatures other than 1050 °F ± 15 (566 °C ± 8) shall be as agreed upon by purchaser and vendor.

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.

3.6.1 Steel shall be premium aircraft-quality conforming to AMS 2300 or MAM 2300.

3.7 Tolerances:

Shall conform to all applicable requirements of AMS 2242 or MAM 2242, except that flatness tolerances shall be as agreed upon by purchaser and vendor.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

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

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.5.1.1 and 3.5.2.1), hardness (3.5.1.2 and 3.5.2.2), and tolerances (3.7) are acceptance tests and shall be performed on each heat or lot as applicable.