AEROSPACE MATERIAL SPECIFICATION

AMS5859™	REV. F

Issued 1977-01
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Revised 2021-01

Superseding AMS5859E

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

AMS5859F is the result of a limited scope review to resolve an error in the SI conversion of Table 3.

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 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)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS5859F/

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.

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
AMS2300	Steel Cleanliness, Premium Aircraft-Quality Magnetic Particle Inspection Procedure
AMS2371	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock
AMS2750	Pyrometry
AMS2807	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
ARP1917	Clarification of 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 A480/A480M	Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM A751	Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
ASTM E140	Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness
ASTM E290	Bend Testing of Materials for Ductility

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM A751, 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 AMS2248.

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 A480/A480M 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 as follows. Pyrometry shall be in accordance with AMS2750.

3.4.1 Solution heat treat by heating to 1900 °F ± 25 °F (1038 °C ± 14 °C), holding at heat for 5 to 30 minutes, and quenching rapidly, such as in water, oil, or forced air.

3.4.2 Continuous Heat Treatment of Sheet and Strip

When continuous heat treatment is used, 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 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 0.1874 inch (4.76 mm) and under in nominal thickness 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 when bending at room temperature through an angle of 180 degrees around a diameter equal to six 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 Precipitation Heat Treatment

Product shall have the following properties after being precipitation heat treated by heating to 1050 °F ± 15 °F (566 °C ± 8 °C), 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 0.051, incl	1000	931	5
Over 0.051 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 °F (566 °C ± 8 °C) shall be as agreed upon by purchaser and producer.

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 AMS2300.

3.7 Tolerances

Shall conform to all applicable requirements of AMS2242, except that flatness tolerances shall be as agreed upon by purchaser and producer.

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

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for producer'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.

4.2.2 Periodic Tests

Bending (see 3.5.1.3) and frequency-severity cleanliness (see 3.6.1) are periodic tests and shall be performed at a frequency selected by the producer unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS2371.

4.4 Reports

The producer of the product shall furnish with each shipment a report showing the producer's name and country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations) and the results of tests for chemical composition of each heat and for tensile properties and hardness of each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS5859F, size, and quantity.