SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS5864 | REV. C

Issued 1980-04
Revised 2008-03
Reaffirmed 2012-04

Superseding AMS5864B

Steel, Corrosion-Resistant, Plate
13Cr - 8.0Ni - 2.2Mo - 1.1Al
Vacuum Induction Plus Consumable Electrode Melted
Solution Heat Treated, Precipitation Hardenable
(Composition similar to UNS S13800)

RATIONALE

AMS5864C has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

1.1 Form

This specification covers a corrosion-resistant steel in the form of plate up to 3.00 inches (76.2 mm), inclusive, in nominal thickness.

1.2 Application

This plate has been used typically for parts requiring corrosion resistance, stress-corrosion resistance, high strength up to 600 °F (315 °C), and good ductility and strength in the transverse direction in thick sections, but usage is not limited to such applications.

1.2.1 Certain design and processing procedures may cause this plate to become susceptible to stress-corrosion cracking; ARP1110 recommends 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

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5864C

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.

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
AMS2315	Determination of Delta Ferrite Content
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
ARP1110	Minimizing Stress Corrosion Cracking in Wrought Forms of Steels and Corrosion Resistant Steels and Alloys

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 370	Mechanical Testing of Steel Products
ASTM E 112	Determining Average Grain Size
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 as 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	--	0.10
Silicon	--	0.10
Phosphorus	--	0.010
Sulfur	--	0.008
Chromium	12.25	13.25
Nickel	7.50	8.50
Molybdenum	2.00	2.50
Aluminum	0.90	1.35
Nitrogen	--	0.010

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248, except that variation is not permitted for nitrogen.

3.2 Melting Practice

Steel shall be multiple melted using vacuum induction followed by consumable electrode remelting.

3.3 Condition

Hot rolled, solution heat treated, and descaled.

3.4 Heat Treatment

Plate shall be solution heat treated by heating to 1700 °F ± 25 (927 °C ± 14), holding at heat for not less than 30 minutes, and cooling as required to below 60 °F (16 °C).

3.5 Properties

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

3.5.1 As Solution Heat Treated

3.5.1.1 Tensile Properties

As agreed upon by purchaser and vendor.

3.5.1.2 Hardness

Not higher than 38 HRC, or equivalent (See 8.2).

3.5.1.3 Average Grain Size

Shall be ASTM No. 5 or finer, determined in accordance with ASTM E 112. The sample for grain size estimation may be hardened to any of the conditions of Table 2 to define better grain boundaries.

3.5.2 After Precipitation Heat Treatment

Specimens from the solution heat treated plate, precipitation heat treated to a particular condition in accordance with the times and temperatures shown in Table 2 and cooled in air, shall have the properties shown in Table 3 and Table 4 for that particular condition. Tensile and hardness tests shall be made in only the H1000 precipitation heat treated condition, unless otherwise specified.

TABLE 2 - HEAT TREATMENT

Condition	Temperature	Time, Hours
H950	950 °F ± 10 (510 °C ± 6)	4 ± 0.25
H1000	1000 °F ± 10 (538 °C ± 6)	4 ± 0.25
H1025	1025 °F ± 10 (552 °C ± 6)	4 ± 0.25
H1050	1050 °F ± 10 (566 °C ± 6)	4 ± 0.25
H1100	1100 °F ± 10 (593 °C ± 6)	4 ± 0.25
H1150	1150 °F ± 10 (621 °C ± 6)	4 ± 0.25

3.5.2.1 Tensile Properties

Shall be as shown in Table 3:

TABLE 3A - MINIMUM TENSILE PROPERTIES, INCH/POUND UNITS

Condition	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %	Reduction of Area %
H950	Longitudinal	220	205	10	45
	Long.-Trans.	220	205	10	45
	Short-Trans.	220	205	10	35
H1000	Longitudinal	205	190	10	50
	Long.-Trans.	205	190	10	50
	Short-Trans.	205	190	10	40
H1025	Longitudinal	185	175	11	50
	Long.-Trans.	185	175	11	50
	Short-Trans.	185	175	11	45
H1050	Longitudinal	175	165	12	50
	Long.-Trans.	175	165	12	50
	Short-Trans.	175	165	12	45
H1100	Longitudinal	150	135	14	50
	Long.-Trans.	150	135	14	50
	Short-Trans.	150	135	14	50
H1150	Longitudinal	135	90	14	50
	Long.-Trans.	135	90	14	50
	Short-Trans.	135	90	14	50

TABLE 3B - MINIMUM TENSILE PROPERTIES, SI UNITS

Condition	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 2 Inches or 4D %	Reduction of Area %
H950	Longitudinal	1517	1413	10	45
	Long.-Trans.	1517	1413	10	45
	Short-Trans.	1517	1413	10	35
H1000	Longitudinal	1413	1310	10	50
	Long.-Trans.	1413	1310	10	50
	Short-Trans.	1413	1310	10	40
H1025	Longitudinal	1276	1207	11	50
	Long.-Trans.	1276	1207	11	50
	Short-Trans.	1276	1207	11	45
H1050	Longitudinal	1207	1138	12	50
	Long.-Trans.	1207	1138	12	50
	Short-Trans.	1207	1138	12	45
H1100	Longitudinal	1034	931	14	50
	Long.-Trans.	1034	931	14	50
	Short-Trans.	1034	931	14	50
H1150	Longitudinal	931	621	14	50
	Long.-Trans.	931	621	14	50
	Short-Trans.	931	621	14	50

3.5.2.1.1 Short-transverse tensile property requirements apply only to plate 2.50 inches (63.5 mm) and over in nominal thickness.

3.5.2.1.2 Plate tested in the long- transverse or short-transverse direction need not be tested in the longitudinal direction.

3.5.2.2 Ferrite Determination

The delta ferrite content of plate under 2.50 inches (63.5 mm) in nominal thickness shall be less than 2%, as determined by AMS2315. Additionally, the length/thickness ratio of delta ferrite inclusions shall average less than 4:1, with no single stringer greater than 8:1 in each metallographic sample. Overaging is permissible to highlight the ferrite.

3.5.2.3 Hardness

Shall be not lower than shown in Table 4, or equivalent (See 8.2), for the corresponding precipitation hardened condition.

TABLE 4 - MINIMUM HARDNESS REQUIREMENTS

Condition	Hardness, HRC
H950	45
H1000	43
H1025	41
H1050	40
H1100	34
H1150	30

3.6 Quality

Plate, 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 plate.

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 vendor.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of plate 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 plate conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), hardness (3.5.1.2 and 3.5.2.3), average grain size (3.5.1.3), tensile properties (3.5.2.1), and tolerances (3.7) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Ferrite content (3.5.2.2) and frequency-severity cleanliness rating (3.6.1) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.