Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 5860A
Superseding AMS 5860

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UNS S45500

STEEL SHEET, STRIP, AND PLATE, CORROSION AND MODERATE HEAT RESISTANT
12Cr - 8.5Ni - 0.30 (Cb + Ta) - 1.1Ti - 2.0Cu
Consumable Electrode or Vacuum Induction Melted
1525°F (830°C) Solution Heat Treated

1. SCOPE:

1.1 Form: This specification covers a corrosion and moderate heat resistant steel in the form of sheet, strip, and plate.

1.2 Application: Primarily for parts requiring corrosion resistance and high strength in service up to 800°F (425°C).

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specification (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2242 - Tolerances, Corrosion and Heat Resistant Steel and Iron Base Alloy Sheet, Strip, and Plate and Titanium and Titanium Alloy Sheet, Strip, and Plate
AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM A370 - Mechanical Testing of Steel Products
ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Carbon	--	0.05
Manganese	--	0.50
Silicon	--	0.50
Phosphorus	--	0.025
Sulphur	--	0.025
Chromium	11.00	12.50
Nickel	7.50	9.50
Columbium & Tantalum	0.10	0.50
Titanium	0.80	1.40
Copper	1.50	2.50
Molybdenum	--	0.50

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

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Sheet: Cold rolled, solution heat treated, and descaled (No. 2D Finish).

3.2.2 Strip: Cold rolled, solution heat treated, and descaled (No. 1 Strip Finish).

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

3.3 Heat Treatment: The product shall be solution heat treated by heating to 1525°F ± 25 (830°C ± 15), holding at heat for 5 - 30 min., and quenching rapidly. Plate over 1.25 in. (3.8 mm) in nominal thickness shall be water quenched.

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

3.4.1 As Solution Heat Treated:

3.4.1.1 Tensile Properties:

Tensile strength, max	175,000 psi (1207 MPa)
Yield Strength at 0.2% Offset, max	160,000 psi (1103 MPa)
Elongation in 2 in. (50 mm) or 4D, min	3%

3.4.1.2 Hardness: Product 0.010 in. (0.25 mm) and over in nominal thickness should have hardness not higher than 35 HRC or equivalent but shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.1.1 are met.

3.4.1.3 Bending: Product 0.1875 in. (4.762 mm) and under in nominal thickness shall withstand, without cracking, free bending through an angle of 90 deg around a diameter equal to 2-1/2 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

3.4.2 After Precipitation Heat Treatment: The product shall have the following properties after being precipitation heat treated by heating to 950°F ± 10 (510°C ± 5), holding at heat for 4 hr to .25, and cooling in air:

3.4.2.1 Tensile Properties: Shall be as specified in Table I.

TABLE I

Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset, psi, min	Elongation in 2 in. or 4D %, min
Up to 0.020, incl	225,000	210,000	2
Over 0.020 to 0.062, incl	225,000	210,000	3
Over 0.062	225,000	210,000	4

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset, MPa, min	Elongation in 50 mm or 4D %, min
Up to 0.51, incl	1551	1448	2
Over 0.51 to 1.57, incl	1551	1448	3
Over 1.57	1551	1448	4

3.4.2.2 Hardness: Product 0.010 in. (0.25 mm) and over in nominal thickness should have hardness not lower than 44 HRC or equivalent but shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.2.1 are met.

3.4.3 After Other Precipitation Heat Treatment: Properties after precipitation heat treatment at temperatures other than 950°F ± 10 (510°C + 5) shall be as agreed upon by purchaser and vendor.

3.5 Quality:

3.5.1 Steel shall be produced by multiple melting using consumable electrode practice in the remelt cycle or shall be induction melted under vacuum.

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

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2242.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each lot.

4.3 Sampling: Shall be in accordance with AMS 2371 and the following:

4.3.1 Specimens for tensile tests of widths 9 in. (229 mm) and over shall be taken with the axis of the specimen perpendicular to the direction of rolling; for widths less than 9 in. (229 mm), specimens shall be taken with the axis parallel to the direction of rolling.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat and the results of tests on each thickness from each heat to determine conformance to the other technical requirements of this specification. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

Ø 4.5 Resampling and Retesting: Shall be in accordance with AMS 2371.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet, strip, and plate shall be marked on one face, in the respective location indicated below, with AMS 5860A, heat number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the product or its performance and shall be sufficiently stable to withstand normal handling.

5.1.1 Flat Strip 6 In. (152 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm).

5.1.2 Flat Sheet, Flat Strip Over 6 In. (152 mm) in Width, and Plate: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm), the rows being spaced not more than 6 in. (152 mm) apart and alternately staggered.

5.1.3 Coiled Sheet and Strip: Shall be marked near both the outside and inside ends of the coil; the markings shall be applied as in 5.1 or shall appear on a durable tag or label attached to the coil and Ø marked with the information of 5.1. When the inside end of the coil is inaccessible, as when the product is wound on cores, the tag or label may be attached to the core.

5.2 Packaging:

5.2.1 The product shall be prepared for shipment in accordance with commercial practice and in Ø compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.2.2 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-163, Ø Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.2.1 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.