



# AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.  
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

## AMS 5861

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Revised

STEEL SHEET, STRIP, AND PLATE, CORROSION RESISTANT  
22Cr - 13Ni - 5.0Mn - 2.25Mo

### 1. SCOPE:

- 1.1 **Form:** This specification covers a corrosion-resistant steel in the form of sheet, strip, and plate.
- 1.2 **Application:** Primarily for parts requiring excellent corrosion resistance and high strength. Can also be used for welded parts without subsequent heat treatment.

### 2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (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., Two Pennsylvania Plaza, New York, New York 10001.

#### 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, Pennsylvania 19103.

- ASTM A370 - Mechanical Testing of Steel Products
- ASTM A262 - Detecting Susceptibility to Intergranular Attack in Stainless Steels
- ASTM E112 - Estimating Average Grain Size of Metals
- 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, Pennsylvania 19120.

#### 2.3.1 Federal Standards:

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

### 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:

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	min	max
Carbon	--	0.06
Manganese	4.00 -	6.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	20.50 -	23.50
Nickel	11.50 -	13.50
Molybdenum	1.50 -	3.00
Columbium	0.10 -	0.30
Nitrogen	0.20 -	0.40
Vanadium	0.10 -	0.30
Titanium (3.1.1)	--	0.02
Aluminum (3.1.1)	--	0.02
Zirconium (3.1.1)	--	0.02

3.1.1 Determination not required for routine acceptance.

3.1.2 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, annealed as in 3.3.1, and descaled (No. 2D Finish).

3.2.2 Strip: Cold rolled, annealed as in 3.3.1 and descaled (No. 1 Strip Finish).

3.2.3 Plate: Hot rolled, annealed as in 3.3.2, and descaled.

3.3 Heat Treatment:

3.3.1 Sheet and Strip: Shall be annealed by heating to 1950 F  $\pm$  25 (1065.6 C  $\pm$  14), holding at heat for a time commensurate with section thickness, and cooling at a rate equivalent to air cool or faster.

3.3.2 Plate: Shall be annealed by heating to 2050 F  $\pm$  25 (1121.1 C  $\pm$  14), holding at heat for a time commensurate with section thickness, and cooling at a rate equivalent to air cool or faster.

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 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 0.1875, excl 0.1875 and over	120,000 100,000	75,000 55,000	30 35

TABLE I (SI)

Nominal Thickness Millimeters	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D, %, min
Up to 4.762, excl 4.762 and over	827 690	517 379	30 35

3.4.2 **Hardness:** Shall be not higher than 30 HRC or equivalent.

3.4.3 **Bending:** The product shall withstand, without cracking, bending at room temperature through the angle indicated in Table II around a diameter equal to the bend factor times the nominal thickness of the product with axis of bend parallel to the direction of rolling:

TABLE II

Nominal Thickness Inch	Type of Bend	Angle deg, min	Bend Factor
Up to 0.249, incl	Free Bend	180	1
Up to 0.249, incl	V-Block	135	1
Over 0.249 to 0.749, incl	Free Bend	90	1
Over 0.249 to 0.749, incl	V-Block	135	2

TABLE II (SI)

Nominal Thickness Millimeters	Type of Bend	Angle rad, min	Bend Factor
Up to 6.32, incl	Free Bend	3.14	1
Up to 6.32, incl	V-Block	2.36	1
Over 6.32 to 19.02, incl	Free Bend	1.57	1
Over 6.32 to 19.02, incl	V-Block	2.36	2

3.4.4 **Grain Size:** Shall be predominantly 5 or finer, determined by comparison of a polished and etched specimen with the chart in ASTM E112.

3.4.5 **Embrittlement:** The product, after sensitizing treatment, shall be capable of being exposed to the copper-copper sulfate-sulfuric acid test in accordance with Practice E of ASTM A262 without evidence of intergranular surface attack. After exposure, specimens from product 0.749 in (19.02 mm) and under in nominal thickness shall withstand free bending as in 3.4.3. Requirements for product over 0.749 in (19.02 mm) shall be as agreed upon by purchaser and supplier.

3.5 **Quality:** The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

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 assure that the product conforms to the requirements of this specification.

4.2 **Classification of Tests:**

4.2.1 **Acceptance Tests:** Tests to determine conformance to composition (3.1), tensile property (3.4.1), hardness (3.4.2), bending (3.4.3), grain size (3.4.4) and tolerance (3.6) requirements are classified as acceptance or routine control tests.

4.2.2 **Qualification Tests:** Tests to determine conformance to embrittlement (3.4.5) requirements are classified as qualification or periodic control tests.

4.3 **Sampling:** Shall be in accordance with AMS 2371.