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

# AEROSPACE MATERIAL SPECIFICATION

AMS 5510K
Superseding AMS 5510J

Issued 12-4-39
Revised 1-15-76

UNS S32100

## STEEL SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT
## 18Cr - 10.5Ni - 0.40Ti (SAE 30321)

1. SCOPE:

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

1.2 Application: Primarily for parts and assemblies requiring both corrosion and heat resistance, especially when such parts and assemblies require welding during fabrication. Parts and assemblies requiring oxidation resistance up to approximately 1500° F (816°C) but useful at that temperature only when stresses are low.

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., 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 A262 - Detecting Susceptibility to Intergranular Attack in Stainless Steels
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 | -- | 0.08 |
| Manganese | -- | 2.00 |
| Silicon | 0.40 | 1.00 |
| Phosphorus | -- | 0.040 |
| Sulfur | -- | 0.030 |
| Chromium | 17.00 | 19.00 |
| Nickel | 9.00 | 12.00 |
| Titanium | 6xC | 0.70 |
| Molybdenum | -- | 0.75 |
| Copper | -- | 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 unless solution heat treatment is performed in an atmosphere yielding a bright finish (No. 1 Strip Finish).

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

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

3.3.1 Tensile Properties: Shall be as specified in Table I:

TABLE I

| Nominal Thickness Inches | Tensile Strength psi, max | Elongation in 2 in. or 4D %, min |
|---|---|---|
| Over 0.002 to 0.003 incl | 110,000 | 20 |
| Over 0.003 to 0.004, incl | 105,000 | 30 |
| Over 0.004 | 100,000 | 40 |

TABLE I (SI)

| Nominal Thickness Millimetres | Tensile Strength MPa, max | Elongation in 50.8 mm or 4D %, min |
|---|---|---|
| Over 0.051 to 0.076, incl | 758 | 20 |
| Over 0.076 to 0.102, incl | 724 | 30 |
| Over 0.102 | 690 | 40 |

3.3.2 Bending: Product 0.749 in. (19.02 mm) and under in nominal thickness shall withstand, without Ø cracking, bending 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. Bend requirements for product over 0.749 in. (19.02 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

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 Millimetres | 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 |

3.3.3 Embrittlement: The product, after sensitizing treatment, shall meet the copper/copper sulfate/ Ø sulfuric acid test performed in accordance with ASTM A262, Practice E, without evidence of intercrystalline surface attack, and, after exposure, shall withstand bending as in 3.3.2.

3.4 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.

3.5 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:

4.2.1 Acceptance Tests: Tests to determine conformance to composition (3.1), tensile property (3.3.1), bending (3.3.2), and tolerance (3.5) requirements are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to embrittlement (3.3.3) requirements are classified as qualification or periodic control tests.

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

4.3.1 Tensile test specimens from 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 in the shipment and for tensile and bending properties of each size from each heat and stating that the product conforms 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 5510K, 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 material 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 Ø shall be applied as in 5.1 or shall appear on a durable tag or label attached to the coil and 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 to ensure carrier acceptance and safe transportation to the point of 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, Level A Ø 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.