



<b>AEROSPACE MATERIAL SPECIFICATION</b>	<b>AMS5505™</b>	<b>REV. G</b>
	Issued 1961-07 Reaffirmed 2012-04 Revised 2024-09  Superseding AMS5505F	
(R) Steel, Corrosion- and Heat-Resistant, Sheet, Strip, and Plate 12Cr (410 Modified) Ferrite Controlled, Annealed (Composition similar to UNS S41000)		

### RATIONALE

AMS5505G is the result of a Five-Year Review and update of the specification. The revision updates composition testing and reporting (see 3.1 and 3.1.2), revises finish requirements (see 3.2.1), adds continuous heat-treatment requirements (see 3.2.3), updates formatting in Tables 2 and 4 for clarity, adds strain rate control during tensile tests (see 3.3.3.1.1 and 3.3.4.1.1), updates bend testing (see 3.3.2), adds pyrometry control (see 3.3.4), clarifies ferrite testing (see 3.3.4.3 and 4.2.1), and updates the exception requirements (see 3.6, 4.4.1, and 8.5).

#### 1. SCOPE

##### 1.1 Form

This specification covers a corrosion- and heat-resistant steel in the form of sheet, strip, and plate over 0.005 inch (0.13 mm) in nominal thickness.

##### 1.2 Application

These products have been used typically for parts requiring uniformly high room temperature tensile properties, oxidation resistance up to 1000 °F (538 °C), and where control of ferrite content is necessary, but usage is not limited to such applications.

#### 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.

##### 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](http://www.sae.org).

AMS2242 Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium and Titanium Alloy Sheet, Strip, and Plate

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AMS2248	Chemical Check Analysis Limits, Corrosion- and Heat-Resistant Steels and Alloys, Maraging and Other Highly Alloyed Steels, and Iron Alloys
AMS2315	Determination of Delta Ferrite Content
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
AS7766	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](http://www.astm.org).

ASTM A370	Mechanical Testing of Steel Products
ASTM A751	Chemical Analysis of Steel Products
ASTM E112	Determining Average Grain Size
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 Material for Ductility

## 2.3 Definitions

Terms used in AMS are defined in AS7766.

## 3. TECHNICAL REQUIREMENTS

### 3.1 Composition

Composition shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM A751 or by other analytical methods acceptable to the purchaser.

**Table 1 - Composition**

Element	Min	Max
Carbon	0.12	0.15
Manganese	--	0.60
Silicon	--	0.50
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	11.50	12.50
Nickel	--	0.75
Molybdenum	--	0.20
Aluminum	--	0.05
Copper	--	0.50
Tin	--	0.05
Nitrogen	--	0.08

### 3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

3.1.2 The producer may test for any element not listed in Table 1 and include this analysis in the report of 4.4. Reporting of any element not listed in the composition table is not a basis for rejection unless limits of acceptability are specified by the purchaser.

### 3.2 Condition

The product shall be supplied in the following condition:

#### 3.2.1 Sheet and Strip

Sheet and strip shall be hot or cold rolled, annealed, and, unless annealing is performed in an atmosphere yielding a bright finish, descaled producing a uniform finish.

#### 3.2.2 Plate

Plate shall be hot rolled, annealed, and descaled.

#### 3.2.3 Continuous Heat Treatment

When continuous heat treating is used, process 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 3.3.

### 3.3 Properties

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

#### 3.3.1 Annealed Tensile Properties

Tensile properties shall be as shown in Table 2 for product over 0.005 inch (0.13 mm) in nominal thickness.

**Table 2 - Annealed tensile properties**

Nominal Thickness		Tensile Strength Max		Elongation in 2 Inches (50 mm) or 4D
Inch	mm	ksi	MPa	% Min
0.005 to 0.030, excl	0.76	95	655	15
0.030 and over	0.76	95	655	20

3.3.1.1 Unless otherwise specified, the strain rate shall be set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of  $\pm 0.002$  in/in/min ( $\pm 0.002$  mm/mm/min) through 0.2% offset yield strain. After the yield strain, the speed of the testing machine shall be set between 0.05 and 0.5 inch/inch (0.05 and 0.5 mm/mm) of the length of the reduced parallel section (or distance between the grips for specimens not having a reduced section) per minute. Alternatively, an extensometer and strain rate indicator may be used to set the strain rate between 0.05 and 0.5 in/in/min (0.05 and 0.5 mm/mm/min). The requirement for compliance becomes effective for material produced 1 year after the publication date of this specification.

### 3.3.2 Bending

Product 0.500 inch (12.70 mm) and under in nominal thickness shall be tested in accordance with ASTM E290. Transverse testing shall be performed at room temperature. Bend requirements shall be in accordance with Table 3. When visually examined, the specimen shall exhibit no cracking. In case of dispute, the results of tests using the guided bend test of ASTM E290 shall apply.

**Table 3 - Bending parameters**

Nominal Thickness Inch	Nominal Thickness Millimeters	Type of Bend	Angle Degree	Bend Radius <sup>(1, 2)</sup>
Up to 0.375, incl	Up to 9.52, incl	Free Bend	180	0.5 t
Over 0.375 to 0.500, incl	Over 9.52 to 12.70, incl	Free Bend	180	1 t

<sup>(1)</sup> Bend radius is defined as a bend factor multiplied by the nominal thickness (t).

<sup>(2)</sup> Prior versions of this specification may have specified a bend factor and a bend diameter in lieu of bend radius.

### 3.3.3 Average Grain Size

Sheet and strip shall have average grain size of ASTM No. 5 or finer, determined in accordance with ASTM E112.

### 3.3.4 Response to Heat Treatment

Samples of product 0.375 inch (9.52 mm) and under in nominal thickness and specimens not less than 0.375 inch (9.52 mm) thick in any dimension cut from heavier product shall have the following properties after being heat treated by heating to 1700 °F ± 10 °F (927 °C ± 6 °C), holding at heat for 1 hour ± 0.25 hour, cooling at a rate equivalent to cooling in still air, and tempering twice at 600 °F ± 10 °F (316 °C ± 6 °C) for 2 hours ± 0.25 hour; pyrometry shall be in accordance with AMS2750:

#### 3.3.4.1 Tensile Properties

Response to heat-treatment tensile properties shall be as shown in Table 4.

**Table 4 - Minimum tensile properties, hardened and tempered**

Nominal Thickness		Tensile Strength		Yield Strength at 0.2% Offset		Elongation in 2 Inches (50 mm) or 4D
Inch	mm	ksi	MPa	ksi	MPa	%
Up to 0.035, incl	Up to 0.88, incl	180	1241	147	1014	4
Over 0.035 to 0.070, incl	Over 0.88 to 1.75, incl.	180	1241	147	1014	5
Over 0.070 to 0.110, incl	Over 1.75 to 2.75, incl	180	1241	147	1014	7
Over 0.110 to 0.150, incl	Over 2.75 to 3.75, incl	180	1241	147	1014	9
Over 0.150	Over 3.75	180	1241	147	1014	11

3.3.4.1.1 Unless otherwise specified, the strain rate shall be set at 0.005 in/in/min (0.005 mm/mm/min) and maintained within a tolerance of ±0.002 in/in/min (±0.002 mm/mm/min) through 0.2% offset yield strain. After the yield strain, the speed of the testing machine shall be set between 0.05 and 0.5 inch/inch (0.05 and 0.5 mm/mm) of the length of the reduced parallel section (or distance between the grips for specimens not having a reduced section) per minute. Alternatively, an extensometer and strain rate indicator may be used to set the strain rate between 0.05 and 0.5 in/in/min (0.05 and 0.5 mm/mm/min). The requirement for compliance becomes effective for material produced 1 year after the publication date of this specification.

#### 3.3.4.2 Hardness

Shall be 39 to 46 HRC, or equivalent (see 8.2).

### 3.3.4.3 Ferrite Content

Product, heat treated in accordance with 3.3.4, shall contain not more than 5% ferrite, determined by a method specified in AMS2315.

3.3.5 Mechanical property requirements for product outside the thickness range of 1.1 shall be as agreed upon by the purchaser and producer.

## 3.4 Quality

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

## 3.5 Tolerances

Tolerances shall conform to all applicable requirements of AMS2242.

## 3.6 Exceptions

Any exceptions shall be authorized by the 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 the producer's tests and shall be responsible for the performance of all required tests. The 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 (see 3.1), tensile properties (see 3.3.1), average grain size (see 3.3.3), response to heat treatment - tensile, hardness, and ferrite content (see 3.3.4), and tolerances (see 3.5) are acceptance tests and shall be performed on each heat or lot as applicable.

### 4.2.2 Periodic Tests

Bending (see 3.3.2) is a periodic test and shall be performed at a frequency selected by the producer unless frequency of testing is specified by the purchaser.

## 4.3 Sampling and Testing

Sampling 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; country where the metal was melted (e.g., final melt in the case of metal processed by multiple melting operations); results of tests for chemical composition of each heat; and results of tests for tensile properties and average grain size annealed and for tensile properties, hardness, and ferrite content hardened and tempered on each lot. The report shall state that the product conforms to the other technical requirements and shall include the purchase order number, heat and lot numbers, AMS5505G, size, and quantity.