AEROSPACE MATERIAL SPECIFICATION

AMS6395™	REV. K

Issued 1966-09
Reaffirmed 1994-04
Revised 2025-02

Superseding AMS6395J

Steel Sheet, Strip, and Plate
0.95Cr - 0.20Mo - (0.38 - 0.43C) (SAE 4140)
Aircraft Quality
(Composition similar to UNS G41400)

RATIONALE

AMS6395K is the result of a Five-Year Review and update of the specification. The revision updates the Title to add the material quality, adds a stress-corrosion note (see 1.2.1), adds composition reporting requirements (see 3.1.2), clarifies descaling requirements (see 3.2.2 and 3.2.2.1), standardizes bend test requirements (see 3.3.4), updates decarburization test methods (see 3.3.3), adds pyrometry (see 3.3.2), adds strain rate requirements for tensile testing (see 3.3.2.1), updates wording to acknowledge changes in AMS2301 (see 4.2.1 and 4.4.3), and updates the prohibition on exceptions requirements (see 4.4.2).

1. SCOPE

1.1 Form

This specification covers an aircraft-quality, low-alloy steel in the form of sheet, strip, and plate.

1.2 Application

These products have been used typically for heat-treated parts 0.875 inch (22.22 mm) and under in section thickness at time of heat treatment, requiring through-hardening to a minimum tensile strength of 180 ksi (1241 MPa) and lower strength in heavier thicknesses, but usage is not limited to such applications.

1.2.1 Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking after heat treatment. 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)
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SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS6395K/

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.

AMS2252 Tolerances, Low-Alloy Steel Sheet, Strip, and Plate

AMS2259 Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels

AMS2301 Steel Cleanliness, Aircraft Quality, Magnetic Particle Inspection Procedure

AMS2370 Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel 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

ARP1110 Minimizing Stress Corrosion Cracking in Wrought Forms of Steels and Corrosion Resistant Steels and Alloys

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.

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

ASTM E1077 Estimating the Depth of Decarburization of Steel Specimens

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	0.38	0.43
Manganese	0.75	1.00
Silicon	0.15	0.35
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.80	1.10
Molybdenum	0.15	0.25
Nickel	--	0.25
Copper	--	0.35

3.1.1 Aluminum, vanadium, and columbium (niobium) are optional grain refining elements and need not be determined or reported unless used to satisfy the average grain size requirements of 3.3.1.2.

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.

3.1.3 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259.

3.2 Condition

The product shall be supplied in the following condition; hardness shall be determined in accordance with ASTM A370:

3.2.1 Sheet and Strip

Cold finished, bright or atmosphere annealed, subcritically annealed or normalized, and descaled if necessary, or hot rolled, annealed if necessary, and descaled, having hardness not higher than 98 HRB, or equivalent (see 8.2).

3.2.2 Plate

Hot rolled, annealed, subcritically annealed or normalized, and descaled if necessary, having hardness not higher than 25 HRC, or equivalent (see 8.2).

3.2.2.1 If allowed by the purchaser, cold rolled, annealed, subcritically annealed or normalized, and descaled if necessary, having hardness not higher than 25 HRC, or equivalent (see 8.2).

3.3 Properties

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

3.3.1 Average Grain Size

Average grain size shall be determined by either 3.3.1.1 or 3.3.1.2.

3.3.1.1 Average grain size shall be ASTM No. 5 or finer, determined in accordance with ASTM E112.

3.3.1.2 The product of a heat shall be considered to have an ASTM No. 5 or finer austenitic grain size if one or more of the following are determined by heat analysis (see 8.4):

- A total aluminum content of 0.020 to 0.050%
- An acid soluble aluminum content of 0.015 to 0.050%
- A vanadium content of 0.02 to 0.08%
- A columbium (niobium) content of 0.02 to 0.05%

3.3.2 Response to Heat Treatment

Product 0.875 inch (22.22 mm) and under in nominal thickness and thicker product reduced to 0.875 inch ± 0.010 inch (22.22 mm ± 0.25 mm) in thickness shall have tensile strength not lower than 180 ksi (1241 MPa) or hardness not lower than 40 HRC after being hardened by quenching in oil from 1550 °F ± 10 °F (843 °C ± 6 °C) and tempered for not less than 30 minutes at not lower than 900 °F (482 °C). Pyrometry shall be in accordance with AMS2750.

3.3.2.1 Unless otherwise specified, the strain rate for tensile testing 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 in/in (0.05 and 0.5 mm/mm) of the length of the reduced 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.

3.3.3 Decarburization

Decarburization shall be evaluated by one of the methods of 3.3.3.1 or 3.3.3.2.

3.3.3.1 Metallographic (Microscopic) Method

A cross section taken perpendicular to the surface shall be prepared in accordance with ASTM E1077 and visually examined metallographically at a magnification not to exceed 200X. The sample shall not show a layer of complete (ferrite) or partial decarburization exceeding the limits of Table 2.

3.3.3.2 Hardness Traverse (Microindentation) Method

The total depth of decarburization shall be determined by a traverse method using microindentation hardness testing in accordance with ASTM E1077. Samples shall be hardened and protected during heat treatment to prevent changes in surface carbon content. Tempering is generally not recommended, but if tempered, the tempering temperature shall be not higher than 300 °F (149 °C). Measurements shall be far enough away from any adjacent surface to be uninfluenced by any decarburization on the adjacent surface. Acceptance shall be as listed in Table 2.

Table 2A - Maximum total depth of decarburization, inch/pound units

Nominal Thickness Inches	Total Depth of Decarburization Inches
Up to 0.500, incl	0.015
Over 0.500 to 1.000, incl	0.025
Over 1.000	0.035

Table 2B - Maximum total depth of decarburization, SI units

Nominal Thickness Millimeters	Total Depth of Decarburization Millimeters
Up to 12.70, incl	0.38
Over 12.70 to 25.40, incl	0.62
Over 25.40	0.88

3.3.3.3 When determining the depth of decarburization, it is permissible to disregard local areas provided the decarburization of such areas does not exceed the limits of Table 2 by more than 0.005 inch (0.13 mm) and the width is 0.065 inch (1.65 mm) or less.

3.3.3.4 In the case of dispute, the total depth of decarburization determined using the microindentation hardness traverse method shall govern.

3.3.4 Bending

Product 0.749 inch (19.02 mm) and under in nominal thickness shall be transverse bend tested in accordance with ASTM E290. 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 govern.

Table 3 - Bend angle requirements

Nominal Thickness Inches	Nominal Thickness Millimeters	Angle of Bend Degrees	Radius of Bend Max(1, 2)
Up to 0.249, incl	Up to 6.32, incl	180	1/2t
Over 0.249 to 0.749, incl	Over 6.32 to 19.02, incl	90 min	1/2t

(1) Radius of bend is defined as a bend factor multiplied by the nominal thickness (t).
(2) Prior versions of this specification may have specified a bend factor and a bend diameter in lieu of radius of bend.

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.

3.4.1 Steel shall be aircraft-quality conforming to AMS2301.

3.5 Tolerances

Tolerances shall be in accordance with AMS2252.

3.6 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.2.

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.