SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS6434 REV. G

Issued 1953-06
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Superseding AMS6434F

Steel, Sheet, Strip, and Plate
0.78Cr - 1.8Ni - 0.35Mo - 0.20V (0.33 - 0.38C) (4335 Mod)

(Composition similar to UNS K33517)

RATIONALE

AMS6434G results from a Five Year Review and update of this specification that includes revision to the decarburization requirement.

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 parts, which may be welded during fabrication, requiring through-hardening to tensile strengths not lower than 180 ksi (1241 MPa), 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 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

AMS2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS6434G

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 A 370 Mechanical Testing of Steel Products

ASTM E 112 Determining Average Grain Size

ASTM E 290 Bend Testing of Material for Ductility

ASTM E 350 Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

ASTM E 384 Knoop and Vickers Hardness of Materials

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - COMPOSITION

Element	min	max
Carbon	0.33	0.38
Manganese	0.60	0.80
Silicon	0.15	0.35
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.65	0.90
Nickel	1.65	2.00
Molybdenum	0.30	0.40
Vanadium	0.17	0.23
Copper	--	0.35

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259.

3.2 Condition

The product shall be supplied in the following condition; hardness tests shall be conducted in accordance with ASTM A 370:

3.2.1 Sheet and Strip

Cold finished, bright or atmosphere annealed, and descaled if necessary; or hot rolled, annealed, and descaled; having hardness not higher than 25 HRC, or equivalent (See 8.2).

3.2.2 Plate

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

3.2.2.1 If allowed by the purchaser, cold rolled, annealed if necessary and descaled as 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 testing shall be performed in accordance with ASTM A 370:

3.3.1 Average Grain Size

ASTM No. 5 or finer, determined in accordance with ASTM E 112.

3.3.2 Bending

Product 0.749 inch (19.02 mm) and under in nominal thickness shall be tested in accordance with ASTM E 290 using a sample prepared nominally 0.75 inch (19.0 mm) in width with its axis of bending parallel to the direction of rolling and shall withstand without cracking when bending at room temperature through the angle and bend radius shown in Table 2. In case of dispute, the results of tests using the guided bend test of ASTM E 290 shall govern.

TABLE 2 - Bend Requirements

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Angle Degrees	Bend Radius t = nominal thickness
Up to 0.249, incl	Up to 6.32, incl	180	0.5 t
Over 0.249 to 0.749, incl	Over 6.32 to 19.02, incl	90	1.5 t

3.3.3 Decarburization of Each Lot

Decarburization shall be evaluated by one of the methods of 3.3.3.1, 3.3.3.2, or 3.3.3.3 selected at the discretion of the producer.

3.3.3.1 Metallographic Method

A cross section taken perpendicular to the surface shall be prepared, etched, and visually examined metallographically at a magnification not to exceed 100X. The product shall not show a layer of complete (ferrite) or partial decarburization exceeding the limits of Table 3.

3.3.3.2 Step Method

Specimen shall be full thickness of the product up to 0.250 inch (6.35 mm) or reduced to 0.250 inch (6.35 mm) preserving one original surface for heavier product. Recommended size is 1 inch x 4 inches (25 mm x 102 mm). Specimen shall be hardened by austenitizing and quenching. Tempering is generally not recommended, but if tempered, the tempering temperature shall be not higher than 300 °F (149 °C). During heat treatment, specimens shall be protected by suitable atmosphere or medium or by suitable plating to prevent carburization or further decarburization. The protective plating, if used, shall be removed prior to examination.

For product less than 0.250 inch (6.35 mm), a portion of the specimen shall be ground to a depth of 0.050 inch (1.27 mm) or one-half thickness, whichever is less using sufficient coolant to prevent thermal or mechanical effects. The product shall not show evidence of complete decarburization (ferrite) when examined metallographically at a magnification not exceeding 100X. It shall be free of partial decarburization to the extent that the difference in hardness between the original surface and the surface (depth) generated by grinding shall not be greater than two units on the HRA scale or equivalent (See 8.2).

For product 0.250 inch (6.35 mm) and thicker, the specimens shall be ground to remove 0.010 inch (0.25 mm) of metal and a portion of the specimen shall be further ground to a depth of at least one-third the original thickness of the specimen. The difference in the hardness between the two prepared steps shall be no greater than three units on the HRA scale or equivalent (See 8.2).

3.3.3.3 Hardness Traverse Method

The total depth of decarburization determined by a traverse method using microhardness testing in accordance with ASTM E 384 at a magnification not exceeding 100X, shall be defined as the perpendicular distance from the surface to the depth under the surface below which there is not further increase in hardness. The sample shall be hardened as listed in 3.3.3.2. Acceptance shall be as listed in Table 3.

TABLE 3A - MAXIMUM DECARBURIZATION, INCH/POUND UNITS

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

TABLE 3B - MAXIMUM DECARBURIZATION, SI UNITS

Nominal Thickness Millimeters	Total Depth of Decarburization Millimeter
Up to 12.70, incl	0.38
Over 12.70 to 25.40, incl	0.64
Over 25.40	0.89

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

3.3.3.5 In the case of dispute, the microhardness traverse method shall govern

3.4 Quality

The product, as received by 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

Shall be in accordance with AMS2252.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. 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

All technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling and Testing

Shall be in accordance with AMS2370.