AEROSPACE MATERIAL SPECIFICATION

AMS5085™	REV. K

Issued 1954-05
Revised 2022-04

Superseding AMS5085J

Steel Sheet, Strip, and Plate
0.48 - 0.55C (SAE 1050)
(Composition similar to UNS G10500)

RATIONALE

AMS5085K is the result of a Five-Year Review and update of the specification. The revision prohibits unauthorized exceptions (3.6, 4.4.2, 5.1.1, 8.5), updates composition testing requirements (3.1, 3.1.2), updates grain size testing requirements (3.1.1, 3.3.3, 4.2.1, 4.4.1), removes producing bar from plate requirements (3.2.2, 4.4.2), updates bending test method (3.3.1), updates decarburization requirements (3.3.2), updates definitions (8.3), and allows prior revisions (8.6).

1. SCOPE

1.1 Form

This specification covers a carbon steel in the form of sheet, strip, and plate.

1.2 Application

These products have been used typically for stamped or formed parts that may subsequently be heat treated, 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.

AMS2232 Tolerances, Carbon Steel, Sheet, Strip, and Plate

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

AMS2370 Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock

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

For more information on this standard, visit
https://www.sae.org/standards/content/AMS5085K/

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.

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, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness Rockwell Hardness

ASTM E1077 Estimating the Depth of Decarburization of Steel Specimens

3. TECHNICAL REQUIREMENTS

3.1 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 purchaser.

Table 1 - Composition

Element	Min	Max
Carbon	0.48	0.55
Manganese	0.60	0.90
Silicon	0.15	0.30
Phosphorus	--	0.030
Sulfur	--	0.035

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 3.3.3.

3.1.2 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 not higher than 85 HRB, or equivalent (see 8.2), determined in accordance with ASTM A370.

3.2.1 Sheet and Strip

Cold rolled and bright annealed; or hot rolled, annealed, sub-critically annealed or normalized, if necessary, and descaled.

3.2.2 Plate

Hot rolled, annealed, sub-critically annealed or normalized, if necessary, and descaled.

3.2.2.1 If allowed by the purchaser, cold rolled, annealed, sub-critically annealed or normalized, if necessary, and descaled as necessary, having hardness not higher than 85 HRB, or equivalent (see 8.2).

3.3 Properties

The product shall conform to the following requirements; hardness and bend tests shall be performed in accordance with ASTM A370.

3.3.1 Bending

Sheet and strip shall be tested in accordance with ASTM E290. Samples shall be nominally 0.75 inch (19 mm) in width and testing shall be performed at room temperature. Samples shall be tested with the axis of bending parallel to the direction of rolling. Samples shall withstand bending, without cracking, 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 E290 shall govern.

Table 2 - Bend requirements

Bend Angle Degrees	Bend Radius t = nominal thickness
180	2t

3.3.2 Decarburization

Decarburization shall be evaluated by one of the methods of 3.3.2.1 or 3.3.2.2.

3.3.2.1 Metallographic (Microscopic) Method

A cross section taken perpendicular to the surface shall be prepared, etched, and examined metallographically at a magnification not to exceed 100X in accordance with ASTM E1077. The product shall not show a layer of complete (ferrite) or partial decarburization exceeding the limits of Table 2.

3.3.2.2 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 but untempered 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 3.

Table 3A - Maximum depth of decarburization, inch/pound units

Nominal Thickness Inches	Total Depth of Decarburization Inches
0.375 to 0.500, incl	0.015
Over 0.500 to 1.000, incl	0.025
Over 1.000 to 2.000, incl	0.035

Table 3B - Maximum depth of decarburization, SI units

Nominal Thickness Millimeters	Total Depth of Decarburization Millimeters
9.52 to 12.70, incl	0.38
Over 12.70 to 25.40, incl	0.64
Over 25.40 to 50.80, incl	0.89

3.3.2.3 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.

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

3.3.3 Average Grain Size

Average grain size shall be determined by either 3.3.3.1 or 3.3.3.2.

3.3.3.1 Shall be ASTM No. 5 or finer, determined in accordance with ASTM E112.

3.3.3.2 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 7).

3.3.3.2.1 A total aluminum content of 0.020 to 0.050%.

3.3.3.2.2 An acid soluble aluminum content of 0.015 to 0.050%.

3.3.3.2.3 A vanadium content of 0.02 to 0.08%.

3.3.3.2.4 A columbium (niobium) content of 0.02 to 0.05%.

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.

3.5 Tolerances

Shall conform to all applicable requirements of AMS2232.

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 producer'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 classified as acceptance tests and shall be performed on each heat or lot as applicable. If grain refining elements (3.3.3.2) are not present, the ASTM E112 grain size test (3.3.3.1) shall be conducted on each lot.

4.2.1 If grain refining elements (3.3.3.2) are present, the ASTM E112 grain size test (3.3.3.1) shall be conducted on a periodic basis and shall be performed at a frequency selected by the producer (not to exceed 1 year), unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be in accordance with the AMS2370.

4.4 Reports

4.4.1 The producer of the product shall furnish with each shipment a report showing the producer identity, results of tests for composition of each heat and for hardness, bending, and (if measured) average grain size of each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS5085K, size, product form, and quantity. If the grain size requirement of 3.3.3.2 is met by the aluminum, vanadium and or columbium (niobium) content, the aluminum, vanadium, and/or columbium (niobium) content shall be reported and a statement that the chemistry satisfies the grain size requirement shall be included.

4.4.2 When material produced to this specification has exceptions taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS5085K(EXC) because of the following exceptions:" and the specific exceptions shall be listed (also see 5.1.1).

4.5 Resampling and Retesting

Shall be in accordance with AMS2370.

5. PREPARATION FOR DELIVERY

5.1 Identification

Shall be in accordance with AMS2807.

5.1.1 When technical exceptions are taken (see 4.4.2), the material shall be identified with AMS5085K(EXC).

5.2 Protective Treatment

Product shall be protected from corrosion prior to shipment.

5.3 Packaging

The product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

A producer shall include this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS

Product not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES

8.1 Revision Indicator

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

8.2 Hardness conversion tables for metals are presented in ASTM E140.

8.3 Terms used in AMS are defined in AS7766.

8.4 Dimensions and properties in inch/pound units and the Fahrenheit temperatures are primary; dimensions and properties in SI units and the Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.5 It is the purchaser's obligation to ensure that product they procure or resell as AMS5085K has any exceptions approved by their subsequent purchaser.

8.6 Unless otherwise specified, the material producer shall work to the revision of this specification (AMS5085) in effect on the date of order placement. Unless otherwise specified, material manufactured and certified to the immediately previous revision of this specification (AMS5085) may be procured and used until inventory is depleted.

8.7 Grain Size

The average grain size resulting from using the appropriate test procedures per ASTM E112 will satisfy an ASTM No. 5 or finer grain size when the elements defined in 3.3.3.2 as grain refiner are present. Other technical societies have adopted the verification of fine grain steel based on chemistry alone. Included are ASTM International (Documents A6, A20, and A29); American Society of Mechanical Engineers (Documents SA6, SA20, and SA29); American Bureau of Shipping; CSA Group (Canada); EuroNorm documents; American Association of State Highway and Transportation Officials.

8.8 Purchase documents should specify not less than the following:

AMS5085K
Product form and size of product desired
Quantity of product desired

PREPARED BY SAE AMS E CARBON AND LOW ALLOY STEELS COMMITTEE