

SAE-AMS5022

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AEROSPACE MATERIAL SPECIFICATION

SAE AMS-5022

REV

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Issued 1940-01-22

Revised 1990-10-01

Superseding AMS-5022K

Submitted for recognition as an American National Standard

STEEL BARS, FORGINGS, AND TUBING, FREE CUTTING
0.14 - 0.20C (SAE 1117)

UNS G11170

1. SCOPE:

- 1.1 **Form:** This specification covers a carbon steel in the form of bars, forgings, mechanical tubing, and stock for forging or heading.
- 1.2 **Application:** Primarily for parts requiring good machinability and response to carburizing heat treatment.

2. **APPLICABLE DOCUMENTS:** The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

- 2.1 **SAE Publications:** Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

- 2.1.1 AMS-2231 - Tolerances, Carbon Steel Bars
MAM-2231 - Tolerances, Metric, Carbon Steel Bars
AMS-2253 - Tolerances, Carbon and Alloy Steel Tubing
MAM-2253 - Tolerances, Metric, Carbon and Alloy Steel Tubing
AMS-2259 - Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS-2370 - Quality Assurance Sampling of Carbon and Low-Alloy Steels, Wrought Products Except Forgings and Forging Stock
AMS-2372 - Quality Assurance Sampling of Carbon and Low-Alloy Steels, Forgings and Forging Stock
AMS-2806 - Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys
AMS-2808 - Identification, Forgings

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SAE AMS-5022 Revision L

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 10 - Brinell Hardness of Metallic Materials
 ASTM E 350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

2.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

2.3.1 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 E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Carbon	0.14	0.20
Manganese (3.1.1)	1.00	1.30
Phosphorus	--	0.040
Sulfur	0.08	0.13

3.1.1 When agreed upon by purchaser and vendor, manganese may be as high as 1.60.

3.1.2 Check Analysis: Composition variations shall meet the applicable requirements of AMS-2259.

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Bars and Mechanical Tubing 2.50 Inches (63.5 mm) and Under in Nominal Diameter or Distance Between Parallel Sides: Cold finished, suitable for machining on high speed automatic screw machines.

3.2.2 Rounds Over 2.50 to 6.25 Inches (63.5 to 158.8 mm), Inclusive, in Nominal Diameter and Hexagons Over 2.50 to 3.125 Inches (63.5 to 79.38 mm), Inclusive, in Nominal Distance Between Parallel Sides: Cold finished, suitable for machining on high speed automatic screw machines or, when specified, hot finished and normalized or otherwise heat treated to produce best machining qualities.

3.2.3 Rounds Over 6.25 Inches (158.8 mm), Hexagons Over 3.125 Inches (79.38 mm), Bars Other Than Rounds and Hexagons Over 2.50 Inches (63.5 mm), and Mechanical Tubing Over 2.50 Inches (63.5 mm) in Nominal OD or Distance Between Parallel Sides: Hot finished and normalized or otherwise heat treated to produce best machining qualities.

SAE AMS-5022 Revision L

3.2.4 Forgings: Normalized or otherwise heat treated to produce best machining qualities.

3.2.5 Stock for Forging or Heading: As ordered by the forging or heading manufacturer.

3.3 Properties: The product shall conform to the following requirements:

3.3.1 Hardness: Shall be as follows, or equivalent, determined in accordance with ASTM E 10 on the surface except on rounds where a flat as necessary for Brinell accuracy may be made:

3.3.1.1 Bars:

3.3.1.1.1 Cold Finished:

Nominal Diameter or Distance Between Parallel Sides		Brinell Hardness	
Inches	Millimetres	min	max
Up to 1.00, excl	Up to 25.4, excl	156	207
1.00 to 6.25, incl	25.4 to 158.8, incl	143	207

3.3.1.1.2 Hot Finished:

Nominal Diameter or Distance Between Parallel Sides		Brinell Hardness	
Inches	Millimetres	min	max
Over 2.50	Over 63.5	--	179

3.3.1.2 Mechanical Tubing:

Nominal OD		Brinell Hardness	
Inches	Millimetres	min	max
Up to 1.00, excl	Up to 25.4, excl	156	248
1.00 to 2.50, incl	25.4 to 63.5, incl	143	248
Over 2.50	Over 63.5	--	179

3.3.1.3 Forgings: Not higher than 179 HB, or equivalent.

3.4 Quality: The product, as received by purchaser, shall be uniform in quality and condition, sound, and, consistent with the type of steel involved, free from foreign materials and from imperfections detrimental to usage of the product.

3.5 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight bars and tubing will be acceptable in mill lengths of 6 - 20 feet (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).