SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 5022M

Issued JAN 1940
Revised JAN 2001

Superseding AMS 5022L

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:

These products have been used typically for parts requiring good machinability and response to carburizing heat treatment, 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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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 and Testing, Carbon and Low-Alloy Steels, Wrought Products and Forging Stock
AMS 2372	Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Forgings
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

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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

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	0.14	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 Least 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 Least Distance Between Parallel Sides: Hot finished and normalized or otherwise heat treated to produce best machining qualities.

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 (See 8.2), 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:

TABLE 2

Nominal Diameter or Least Distance Between Parallel Sides Inches	Nominal Diameter or Least Distance Between Parallel Sides Millimeters	Brinell Hardness min	Brinell Hardness 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:

TABLE 3

Nominal Diameter or Least Distance Between Parallel Sides Inches	Nominal Diameter or Least Distance Between Parallel Sides Millimeters	Brinell Hardness min	Brinell Hardness max
Over 2.50	Over 6.35	--	179

3.3.1.2 Mechanical Tubing:

TABLE 4

Nominal OD Inches			Nominal OD Millimeters			Brinell Hardness min	Brinell Hardness 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 (See 8.2).

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 Tolerances:

Shall conform to all applicable requirements of the following:

3.5.1 Bars: AMS 2231 or MAM 2231.

3.5.2 Mechanical Tubing: AMS 2253 or MAM 2253.

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 the following: