

AEROSPACE MATERIAL SPECIFICATION



AMS 5020D

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Superseding AMS 5020C

Steel Bars, Forgings, and Tubing, Free-Cutting 1.5Mn - 0.25Pb (0.32 - 0.39C) (11L37)

UNS G11374

1. SCOPE:

1.1 Form:

This specification covers a leaded carbon steel in the form of bars, forgings, mechanical tubing, and forging stock.

1.2 Application:

These products have been used typically for parts on which the amount or complexity of machining warrants use of a free-cutting steel to yield good surface finish, but usage is not limited to such applications.

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.

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 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

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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 DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

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	0.32	0.39
Manganese	1.35	1.65
Phosphorus	--	0.040
Sulfur	0.08	0.13
Lead	0.15	0.35

3.1.1 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 OD or Distance Between Parallel Sides: Cold finished, suitable for machining on high speed automatic screw machines.

3.2.2 Bars and Mechanical Tubing Over 2.50 Inches (63.5 mm) in OD or Distance Between Parallel Sides: Hot finished and normalized or otherwise heat treated to produce best machining qualities.

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

3.2.4 Forging Stock: As ordered by the forging 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 (see 8.2).

3.3.1.1 Bars and Tubing: See Table 2.

TABLE 2

Nominal OD or Distance Between Parallel Sides Inches	Nominal OD or Distance Between Parallel Sides mm	Hardness HB
Up to 0.625, incl	Up to 15.88, incl	207 to 255
Over 0.625 to 1.000, incl	Over 15.88 to 25.40, incl	187 to 255
Over 1.000 to 3.000, incl	Over 25.40 to 76.20, incl	170 to 241
Over 3.000	Over 76.20	149 to 217

3.3.1.2 Forgings: 163 to 229 HB.

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 performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for 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:

4.3.1 Bars, Mechanical Tubing and Stock for Forging: AMS 2370

4.3.2 Forgings: AMS 2372

4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for hardness of each lot. This report shall include the purchase order number, heat and lot number, AMS 5020D, size, and quantity. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.5 Resampling and Retesting:

Shall be in accordance with the following:

4.5.1 Bars, Mechanical Tubing and Stock for Forging: AMS 2370

4.5.2 Forgings: AMS 2372

5. PREPARATION FOR DELIVERY:

5.1 Sizes:

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