Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

AEROSPACE MATERIAL SPECIFICATION

AMS 5024E
Superseding AMS 5024D

Issued 1-22-40
Revised 11-15-72

STEEL BARS, FORGINGS, AND TUBING, FREE-CUTTING
1.5Mn (0.32 - 0.39C) (SAE 1137)

1. SCOPE:

1.1 Form: This specification covers a free-cutting carbon steel in the form of bars, forgings, mechanical tubing, and forging stock.

1.2 Application: Primarily for parts requiring moderate strength and where free machining qualities are desirable.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2231 - Tolerances, Carbon Steel Bars
AMS 2253 - Tolerances, Carbon and Alloy Steel Tubing
AMS 2259 - Chemical Check Analysis Limits, Wrought Low Alloy and Carbon Steels
AMS 2350 - Standards and Test Methods
AMS 2370 - Quality Assurance Sampling of Carbon and Low Alloy Steels, Wrought Products Except Forgings
AMS 2372 - Quality Assurance Sampling of Carbon and Low Alloy Steels, Forgings and Forging Stock
AMS 2808 - Identification, Forgings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

ASTM E10 - Brinell Hardness of Metallic Materials
ASTM E350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E350, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Carbon (3.1.1)	0.32	0.39
Manganese	1.35	1.65
Phosphorus	--	0.040
Sulfur	0.08	0.13

3.1.1 When permitted by purchaser, carbon may be 0.37 - 0.44.

3.1.2 Check Analysis: Composition variations shall meet the requirements of AMS 2259, paragraph titled, "Carbon Steels."

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

3.2.1 Bars and Mechanical Tubing 2.50 In. (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 In. (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:

3.3.1 Hardness: The product shall have hardness as follows or equivalent, determined in accordance with ASTM E10:

3.3.2 Bars and Tubing:

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

3.3.3 Forgings: 163 - 229 HB.

3.4 Quality: The product shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections, consistent with the type of steel involved, detrimental to fabrication or to performance of parts.

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

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of the following:

3.6.1 Bars: AMS 2231.

3.6.2 Tubing: AMS 2253.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to assure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Test to determine conformance to all technical requirements of this specification are classified as acceptance or routine control tests.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 Bars and Tubing: AMS 2370.

4.3.2 Forgings and Forging Stock: AMS 2372.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification: The product shall be identified as follows:

5.1.1 Bars and Tubing: Individual pieces or bundles shall have attached a metal or plastic tag embossed with the purchase order number, AMS 5024E, nominal size, and heat number or shall be boxed and the box marked with the same information. In addition to the above identification, flats 2 in. (51 mm) and larger in both dimensions and other bars 2 in. (51 mm) and over in diameter or distance between parallel sides shall be marked with the heat number on or within 2 in. (51 mm) of one end.

5.1.2 Forgings: In accordance with AMS 2808.

5.1.3 Forging Stock: As agreed upon by purchaser and vendor.

5.2 Protective Treatment: Bars and tubing ordered cold drawn, cold rolled, ground, turned, or polished shall be coated with a suitable corrosion-preventive compound prior to shipment.

5.3 Packaging: The product shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.