

AEROSPACE
MATERIAL
SPECIFICATION

AMS 5070F
Superseding AMS 5070E

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STEEL BARS AND FORGINGS
(0.18 - 0.23C) (SAE 1022) UNS G10220

1. SCOPE:

- 1.1 Form: This specification covers a carbon steel in the form of bars, forgings, and forging stock.
- 1.2 Application: Primarily for parts requiring low strength and high ductility.

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 SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

- AMS 2231 - Tolerances, Carbon Steel Bars
- 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 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 Heat and Corrosion Resistant Steels and Alloys
- AMS 2808 - Identification, Forgings

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

- ASTM E8 - Tension Testing of Metallic Materials
- ASTM E112 - Estimating the Average Grain Size of Metals
- ASTM E350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

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

2.3.1 Federal Standards:

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

2.3.2 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 E350, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	min	max
Carbon	0.18	0.23
Manganese (3.1.1)	0.70	1.00
Silicon	0.10	0.30
Phosphorus	--	0.040
Sulfur	--	0.050

3.1.1 When permitted by purchaser, manganese may be as low as 0.30.

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: Cold finished.

3.2.2 Forgings: Normalized.

3.2.3 Forging Stock: As ordered by the forging manufacturer.

3.3 Properties: Bars and forgings shall conform to the following requirements:

3.3.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E8:

3.3.1.1 Bars:

TABLE I

Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength psi, min	Yield Strength 0.2% Offset psi, min	Elongation in 4D %, min
Up to 0.875, incl	70,000	60,000	18
Over 0.875 to 1.250, incl	65,000	55,000	16
Over 1.250 to 2.000, incl	60,000	50,000	15
Over 2.000 to 3.000, incl	55,000	45,000	15

TABLE I (SI)

Nominal Diameter or Distance Between Parallel Sides Millimetres	Tensile Strength MPa, min	Yield Strength 0.2% Offset MPa, min	Elongation in 4D %, min
Up to 22.00, incl	485	415	18
Over 22.00 to 31.25, incl	450	380	16
Over 31.25 to 50.00, incl	415	345	15
Over 50.00 to 75.00, incl	380	310	15

3.3.1.1.1 Tensile property requirements for bars over 3.000 in. (75.00 mm) in nominal diameter or least distance between parallel sides shall be as agreed upon by purchaser and vendor.

3.3.1.2 Forgings:

Tensile Strength, min	55,000 psi (380 MPa)
Yield Strength at 0.2% Offset, min	36,000 psi (250 MPa)
Elongation in 4D, min	22%

3.3.1.2.1 For each 2000 psi (15 MPa) in excess of 55,000 psi (380 MPa) tensile strength, a reduction in elongation of 1% to a minimum elongation of 10% is permissible.

3.3.2 Grain Size: Predominantly 4 or finer with occasional grains as large as 2 permissible, ASTM E112.

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

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3.5 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight bars will be acceptable in mill lengths of 6 - 20 ft (2 - 6 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 ft (3 m).

3.6 Tolerances: Unless otherwise specified, tolerances for bars shall conform to all applicable requirements of AMS 2231.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all \emptyset samples for vendor's tests 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 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 to determine conformance to all technical \emptyset requirements of this specification are classified as acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 Bars: 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 showing the results of tests for chemical composition and grain size of each heat and for tensile properties of each lot. This report shall include the purchase order number, heat number, AMS 5070F, lot number, 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, AMS 5070F, 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 either a statement that the material conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with the following:

4.5.1 Bars: AMS 2370.