Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 7805A
Superseding AMS 7805
Issued 1-15-62
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MOLYBDENUM BARS
Arc-Cast, Stress Relieved

1. SCOPE:

1.1 Form: This specification covers vacuum-arc-cast molybdenum in the form of wrought round bars.

1.2 Application: Primarily for parts requiring high modulus and uniform strength up to 1800° F (975° C). This material is not recommended for use in oxidizing atmospheres above 1000° F (540° C) unless protected by a suitable coating.

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., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

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 E92 - Vickers 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, 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

2.4 ANSI Publications: Available from American National Standards Institute, 1430 Broadway, New York, NY 10018.

ANSI B46.1 - Surface Texture

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3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight; carbon shall be determined in accordance with ASTM E350, molybdenum by difference, gaseous elements by vacuum fusion, and other metallic elements by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max	Check Analysis Over Max
Molybdenum	99.95	--	--
Ø Carbon	--	0.030	0.005
Iron	--	0.008	0.002
Silicon	--	0.008	0.002
Nickel	--	0.002	0.002
Nitrogen	--	0.002 (20 ppm)	0.0005 (5 ppm)
Oxygen	--	0.0015 (15 ppm)	--
Hydrogen	--	0.0005 (5 ppm)	--

3.2 Condition: Hot-cold worked, descaled, and stress-relieved; when so specified bars shall be centerless ground to a surface texture of 90 microinches (2.3 µm) or smoother, determined in accordance with ANSI B46.1.

3.3 Properties: Bars 0.125 to 4.500 in. (3.18 to 114.30 mm), incl, in nominal diameter shall conform to the following requirements; bars under 0.125 in. (3.18 mm) or over 4.500 in. (114.30 mm) in nominal diameter shall have tensile properties and hardness as agreed upon by purchaser and vendor:

3.3.1 As-Received:

3.3.1.1 Tensile Properties: Shall be as specified in Table I, determined in accordance with ASTM E8 with the rate of strain maintained at 0.002 - 0.005 in. per in. per min. (0.002 - 0.005 (mm/mm)/min.) through the 0.6% offset and 0.02 - 0.05 in. per in. per min. (0.02 - 0.05 (mm/mm)/min.) above the 0.6% offset to fracture.

TABLE I

Nominal Diameter Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 4D %, min
Ø 0.125 to 0.281, incl	95,000	80,000	30
Over 0.281 to 0.406, incl	90,000	75,000	25
Over 0.406 to 0.875, incl	90,000	75,000	20
Over 0.875 to 1.125, incl	85,000	70,000	20
Over 1.125 to 1.875, incl	75,000	65,000	15
Over 1.875 to 2.875, incl	70,000	60,000	15
Over 2.875 to 3.500, incl	70,000	60,000	10
Over 3.500 to 4.500, incl	65,000	55,000	10

TABLE I (SI)

Nominal Diameter Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 4D %, min
3.18 to 7.14, incl	655	552	30
Over 7.14 to 10.31, incl	621	517	25
Over 10.31 to 22.22, incl	621	517	20
Over 22.22 to 28.58, incl	586	483	20
Over 28.58 to 47.62, incl	517	448	15
Over 47.62 to 73.02, incl	483	414	15
Over 73.02 to 88.90, incl	483	414	10
Over 88.90 to 114.30, incl	448	379	10

3.3.1.2 Hardness: Shall be as follows, determined in accordance with ASTM E92:

Nominal Diameter Inches	Nominal Diameter (Millimetres)	Maximum Hardness HV/10
0.125 to 0.406, incl	(3.18 to 10.31, incl)	280
ø Over 0.406 to 0.875, incl	(10.31 to 22.22, incl)	260
Over 0.875 to 1.125, incl	(22.22 to 28.58, incl)	250
Over 1.125 to 1.875, incl	(28.58 to 47.62, incl)	240
Over 1.875 to 2.875, incl	(47.62 to 73.02, incl)	235
Over 2.875 to 3.500, incl	(73.02 to 88.90, incl)	235
Over 3.500 to 4.500, incl	(88.90 to 114.30, incl)	230

3.3.2 After High-Temperature Exposure: Bars shall meet the tensile property (3.3.1.1) and hardness (3.3.1.2) requirements after being heated in a suitable protective atmosphere to 1700°F ± 25 (920°C ± 15), held at heat for 30 min. + 3, and cooled rapidly.

3.4 Quality:

3.4.1 Material shall be carbon deoxidized and vacuum arc melted using consumable electrode practice.

3.4.2 Bars, as received by purchaser, shall be uniform in quality and condition, sound, smooth, and free ø from foreign materials and from internal and external imperfections detrimental to usage of the bars.

3.5 Tolerances: Unless otherwise specified, tolerances shall be as follows:

3.5.1 Hot-Cold Worked and Descaled: Shall be as shown in Table II.

TABLE II

Nominal Diameter Inches	Tolerance, Inch plus	Tolerance, Inch minus	Out of Round Inch
0.125 to 0.281, incl	0.002	0.002	0.004
Over 0.281 to 0.406, incl	0.003	0.003	0.006
Over 0.406 to 0.625, incl	0.010	0.005	0.012
Over 0.625 to 0.875, incl	0.015	0.005	0.015
ø Over 0.875 to 1.000, incl	0.020	0.005	0.015
Over 1.000 to 1.375, incl	0.020	0.010	0.018
Over 1.375 to 1.500, incl	0.020	0.015	0.020
Over 1.500 to 1.625, incl	0.025	0.015	0.020
Over 1.625 to 2.000, incl	0.030	0.020	0.025
Over 2.000 to 2.500, incl	0.032	0.032	0.025
Over 2.500 to 3.250, incl	0.032	0.032	0.027
Over 3.250 to 3.500, incl	0.045	0.045	0.040
Over 3.500 to 4.500, incl	0.062	0.062	0.050

TABLE II (SI)

Nominal Diameter Millimetres	Tolerance, Millimetres plus	Tolerance, Millimetres minus	Out of Round Millimetres
3.18 to 7.14, incl	0.05	0.05	0.10
Over 7.14 to 10.31, incl	0.08	0.08	0.15
Over 10.31 to 15.88, incl	0.25	0.13	0.30
Over 15.88 to 22.22, incl	0.38	0.13	0.38
Over 22.22 to 25.40, incl	0.51	0.13	0.38
Over 25.40 to 34.92, incl	0.51	0.25	0.46
Over 34.92 to 38.10, incl	0.51	0.38	0.51
Over 38.10 to 41.28, incl	0.64	0.38	0.51
Over 41.28 to 50.80, incl	0.76	0.51	0.64
Over 50.80 to 63.50, incl	0.81	0.81	0.64
Over 63.50 to 82.55, incl	0.81	0.81	0.69
Over 82.55 to 88.90, incl	1.14	1.14	1.02
Over 88.90 to 114.30, incl	1.57	1.57	1.27

3.5.2 Centerless Ground:

Nominal Diameter Inches	Nominal Diameter Millimetres	Tolerance, Plus and Minus Inches	Tolerance, Plus and Minus (Millimetres)
0.125 to 2.000, incl	(3.18 to 50.80, incl)	0.002	(0.05)
Over 2.000	(Over 50.80)	0.003	(0.08)

4. QUALITY ASSURANCE PROVISIONS:

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