

MOLYBDENUM ARC-CAST PRODUCTS

MOLYBDENUM ALLOY TZM ABT

Arc-Cast Bar

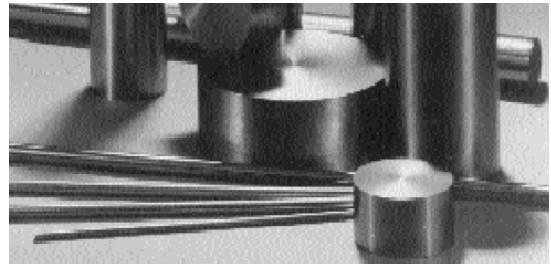
This specification covers carbon-deoxidized TZM alloy (molybdenum + 0.5 % titanium + 0.08 % zirconium) wrought bar of produced from ingots consolidated by the Elmet Technologies consumable electrode vacuum-arc-casting process.

CHEMICAL CHARACTERISTICS¹

(Mass fraction in % [cg/g]; ppm [μ g/g])

The chemical composition of the billet used for producing the wrought bar shall conform to the following limits:

Mo (By Difference)	min.	99.25 %
*N	max.	0.002 %
*O	max.	0.003 %
Ni	max.	0.002 %
Fe	max.	0.010 %
Si	max.	0.010 %
C	.01	0.030 %
Zr	.06 -	0.120 %
Ti	.40 -	0.550 %



¹Unless method of analysis is agreed upon, deviations from these limits alone shall not be cause for rejection.

STRUCTURE

Bar will be supplied in a stress-relieved condition. Material can be supplied in the recrystallized condition upon request.

MECHANICAL PROPERTIES

The hardness of stress-relieved material will be determined to conform to the following (measured at mid-radius location):

Diameter		Hardness	DPH (10 kg)
Inches	mm	Minimum	Maximum
1/8 to 7/8	3.2 - 22.2	260	320
Over 7/8 to 1 1/8	22.2 - 28.6	250	310
Over 1 1/8 to 1 7/8	28.6 - 47.6	245	300
Over 1 7/8 to 2 7/8	47.6 - 73.0	240	290
Over 2 7/8 to 3 1/2	73.0 - 88.9	235	285

All sizes of recrystallized bar shall exhibit mid-radius hardness of 215 DPH maximum.

Tensile tests are conducted at room temperature (65°F to 85°F) with test specimens made and tested to Specification ASTM E-8) using a strain rate of 0.002 to 0.005 in/in/min through 0.6 % offset and 0.02 to 0.05 in/in/min to fracture.

Tensile properties in the longitudinal direction, using such specimens taken from the center of round bars up to 1 1/4" diameter and from mid-radius location for larger bars, shall meet the following minimum values:

Diameter		Tensile Strength Minimum		Yield Strength (.2% Offset) Minimum		Elongation % Minimum
inches	mm	KSI	MPa	KS	Mpa	%
1/8 to 7/8	3.2 - 22.2	115	795	100	690	18
Over 7/8 to 1 1/8	22.2 - 28.6	110	760	95	655	15
Over 1 1/8 to 1 7/8	28.6 - 47.6	100	690	85	585	10
Over 1 7/8 to 2 7/8	47.6 - 73.0	90	620	80	550	10
Over 2 7/8 to 3 1/2	73.0 - 88.9	85	585	75	515	5

DIMENSIONAL TOLERANCES

Diameter		Diameter Variation		Out-of-Round	
Inches	mm	Inches	mm	Inches	mm
1/8 to 9/32	3.2 - 7.1	+0.002 -0.002	+0.05-0.05	0.004	0.10
Over 9/32 to 13/32	7.1 - 10.3	+0.003 -0.003	+0.07-0.07	0.006	0.15
Over 13/32 to 5/8	10.3 - 15.9	+0.010 -0.005	+0.25-0.13	0.012	0.30
Over 5/8 to 7/8	15.9 - 22.2	+0.015 -0.005	+0.38-0.13	0.015	0.38
Over 7/8 to 1	22.2 - 25.4	+0.020 -0.005	+0.51-0.13	0.015	0.38
Over 1 to 1 3/8	25.4 - 34.9	+0.020 -0.010	+0.51-0.25	0.018	0.46
Over 1 3/8 to 1 1/2	34.9 - 38.1	+0.020 -0.015	+0.51-0.38	0.020	0.51
Over 1 1/2 to 1 5/8	38.1 - 41.3	+0.025 -0.015	+0.64-0.38	0.020	0.51
Over 1 5/8 to 2	41.3 - 50.8	+0.030 -0.020	+0.76-0.51	0.025	0.64
Over 2 to 2 1/2	50.8 - 63.5	+0.032 -0.032	+0.81-0.81	0.025	0.64
Over 2 1/2 to 3 1/2	63.5 - 88.9	+0.032 -0.032	+0.81-0.81	0.027	0.69

Special finished bars can be supplied with a tolerance of ± 0.002 inch for 2 inches diameter or smaller sizes, and ± 0.003 inch for larger size bars.

Maximum variation from straightness will be 0.050 inch per foot.

Maximum variation in cut length will be + 1/4 inch, -0.

SURFACE CONDITION AND INTERNAL CONDITION

Bars will be supplied with chemically or mechanically cleaned surfaces.

Minor surface imperfections, revealed by dye penetrant inspection, may be removed by conditioning, provided such removal does not reduce dimensions below specified tolerance limits. Special finished bars will be supplied with a surface finish of 90 RMS or better.

The internal integrity of bar >2.0" diameter will be determined by ultrasonic inspection and shall satisfy Elmet Technologies Ultrasonic Specification No. H.C. Starck QC-32 (latest version).

HAZARDS IDENTIFICATION IN ADVERTISING (DIRECTIVE 67/548/EEC ARTICLE 26, DIRECTIVE 1999/45/EC ARTICLE 13 AND REGULATION (EC) NO 1272/2008 ARTICLE 48)

IDENTIFICATION

Bar will be identified with an appropriate lot number. Each shipping container will be marked with the name of the customer and the purchase order number.

REPORTS

A product certification report that details pertinent chemical, mechanical, structural and physical integrity features will be provided.

REJECTION

Elmet Technologies must receive written notification of rejected material with the reason for rejection. The right is reserved to inspect rejected material at customer plant for claim validation. The material may be returned only after proper authorization.

ELMET
TECHNOLOGIES

ELMET TECHNOLOGIES

1560 Lisbon Street • Lewiston, Maine 04240

P +1.207.333.6100 • F X.XXX.XXX.XXXX

sales@elmettech.com

www.elmettechnologies.com

The conditions of your use and application of Elmet Technologies products, technical assistance, and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations, is your responsibility. Therefore, you are encouraged to test our products and review any technical assistance and/or information you may receive from Elmet Technologies with your own resources, and determine to your own satisfaction whether Elmet Technologies products are suitable for your intended uses and applications. This application-specific analysis should include at minimum testing to determine suitability for the intended use from a technical as well as health, safety, and environmental standpoint. Any technical assistance and/or information provided by Elmet Technologies is given without any express or implied warranty or guarantee. You agree and understand and hereby expressly release Elmet Technologies from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance and/or information, except as may be contained otherwise in a written agreement between you and Elmet Technologies. Any statement or recommendation not contained herein or in a written agreement between you and Elmet Technologies is unauthorized and shall not bind Elmet Technologies. Nothing herein shall be construed as a recommendation to use any Elmet Technologies products in a manner violative of the intellectual property rights of any third party. No license is implied or granted under or to Elmet Technologies intellectual property. All product deliveries are based on the then current product specification and Elmet Technologies' Conditions of Sale. IN NO EVENT WILL ELMET TECHNOLOGIES BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.