

## MOLYBDENUM ARC-CAST PRODUCTS

# PURE MOLYBDENUM AB

## Arc-Cast Bar

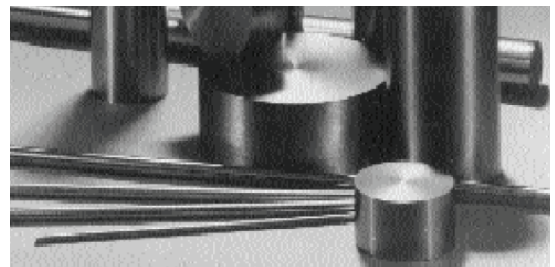
This specification covers carbon-deoxidized molybdenum wrought bar produced from ingots consolidated by the Elmet Technologies consumable electrode vacuum-arc-casting process.

### CHEMICAL CHARACTERISTICS<sup>1</sup>

(Mass fraction in % [cg/g]; ppm [ $\mu$ g/g])

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

Mo (By Difference)	min.	99.95 %
*O	max.	0.002 %
Ni	max.	0.002 %
*N	max.	0.002 %
Fe	max.	0.010 %
Si	max.	0.010 %
c	max.	0.030 %



**ARC-CAST PRODUCTS**

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

### STRUCTURE

Material can be supplied in the recrystallized condition upon request.

<sup>1</sup> Information on testing methods on request.

## MECHANICAL PROPERTIES

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

Diameter		Hardness, DPH (10 kg)	
Inches	mm	Minimum	Maximum
Over 1/8 to 7/8	3.2 - 22.2	230	280
Over 7/8 to 1 1/8	22.2 - 28.6	225	270
Over 1 1/8 to 1 7/8	28.6 - 47.6	215	260
Over 1 7/8 to 2 7/8	47.6 - 73.0	210	250
Over 2 7/8 to 3 1/2	73.0 - 88.9	205	240

All sizes of recrystallized bar shall exhibit mid-radius hardness of 200 DPH maximum.

Tensile tests are conducted at room temperature (65°F to 85°F) with test specimens made and tested to ASTM Specification 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 ¼ inch 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	KSI	Mpa	%
1/8 to 13/32	3.2 - 10.3	75	515	55	380	15
Over 13/32 to 7/8	10.3 - 22.2	90	620	75	515	15
Over 7/8 to 1 1/8	22.2 - 28.6	85	585	70	485	15
Over 1 1/8 to 1 7/8	28.6 - 47.6	75	515	65	450	10
Over 1 7/8 to 2 7/8	47.6 - 73.0	70	485	60	415	10
Over 2 7/8 to 3 1/2	73.0 - 88.9	65	450	55	380	10

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 + ¼ inch, -0.

## **SURFACE CONDITION**

Bars will be supplied with chemically or mechanically cleaned surfaces.

## **INTERNAL CONDITION**

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 H.C. Starck Ultrasonic Specification No. H.C. Starck QC-32 (latest version).

## **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.

**Hazards identification in Advertising (Directive 67/548/EEC Article 26, Directive 1999/45/EC Article 13 and REGULATION (EC) No 1272/2008 Article 48) none.**

## **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.



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