

## PURE MOLYBDENUM AB Arc-Cast Bar

**Description of Product** This specification covers carbon-deoxidized molybdenum wrought bar produced from ingots consolidated by the H.C. Starck consumable electrode vacuum-arc-casting process.

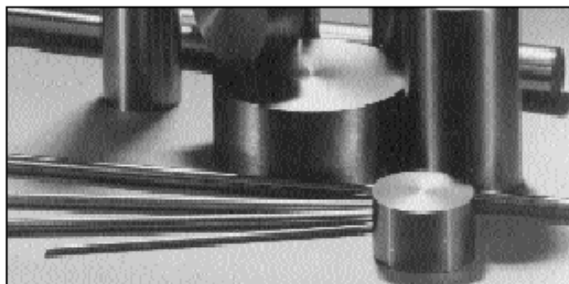
### Chemical Characteristics<sup>1)</sup> (Mass fraction in % [cg/g]; ppm [ $\mu$ g/g])

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	%

\*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.



Arc-Cast Products

1) Information on testing methods on request.

Number PD-7006  
Issue 1-10/08/2021

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

Inches	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:

Inches	Diameter		Tensile Strength		Yield Strength (0.2 % Offset)		Elongation
	Inches	mm	Minimum	Minimum	Minimum	Minimum	% Minimum
	1/8 to 13/32	3.2 - 10.3	KSI	MPa	KSI	MPa	
Over	13/32 to 7/8	10.3 - 22.2	75	515	55	380	15
Over	7/8 to 1 1/8	22.2 - 28.6	90	620	75	515	15
Over	1 1/8 to 1 7/8	28.6 - 47.6	85	585	70	485	15
Over	1 7/8 to 2 7/8	47.6 - 73.0	75	515	65	450	10
Over	2 7/8 to 3 1/2	73.0 - 88.9	70	485	60	415	10
Over	3 1/2 to 4 1/8	88.9 - 108.0	65	450	55	380	10

Inches	Diameter		Diameter Variation				Out-of-Round	
	Inches	mm	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 1/8	41.3 - 50.8	-0.020	+0.030	-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.

Number PD-7006  
Issue 1-10/08/2021

Maximum variation from straightness will be 0.050 inch per foot.

Maximum variation in cut length will be + ¼ inch, -0.

<b>Surface</b>	Bars will be supplied with chemically or mechanically cleaned surfaces.
<b>Internal Condition</b>	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).
<b>Identification</b>	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.
<b>Hazards identification in Advertising (Directive 67/548/EEC Article 26, Directive 1999/45/EC Article 13 and REGULATION (EC) No 1272/2008 Article 48)</b>	none.
<b>Reports</b>	A product certification report that details pertinent chemical, mechanical, structural and physical integrity features will be provided.
<b>Rejection</b>	H.C. Starck 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.

H.C. Starck Inc.  
460 Jay St  
Coldwater, MI 49036 / USA  
Phone +1 (480) 977 6108

[info@hcstarcksolutions.com](mailto:info@hcstarcksolutions.com)

H.C. Starck   
High Performance Metal Solutions

[www.hcstarcksolutions.com](http://www.hcstarcksolutions.com)

The conditions of your use and application of H.C. Starck 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 H.C. Starck with your own resources, and determine to your own satisfaction whether H.C. Starck 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 H.C. Starck is given without any express or implied warranty or guarantee. You agree and understand and hereby expressly release H.C. Starck 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 H.C. Starck. Any statement or recommendation not contained herein or in a written agreement between you and H.C. Starck is unauthorized and shall not bind H.C. Starck. Nothing herein shall be construed as a recommendation to use any H.C. Starck products in a manner violative of the intellectual property rights of any third party. No license is implied or granted under or to H.C. Starck intellectual property. All product deliveries are based on the then current product specification and H.C. Starck's Conditions of Sale. IN NO EVENT WILL H.C. STARCK BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.