

MOLYBDENUM ARC-CAST PRODUCTS

MOLYBDENUM ALLOY AST-4 TZM

Arc-Cast Sheet 3402

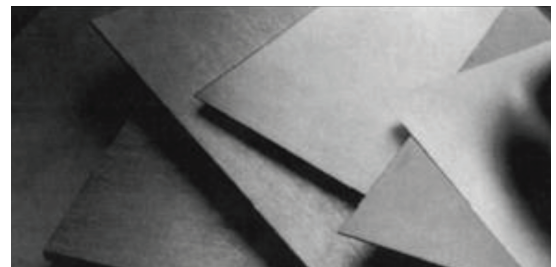
This specification covers rolled sheet of carbon-deoxidized TZM alloy (Molybdenum + 0.5 Titanium + 0.08 Zirconium) produced from sheet bar consolidated by the consumable electrode vacuum-arc-casting process.

CHEMICAL CHARACTERISTICS¹

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

The chemical composition of the sheet bar used to produce rolled sheet shall conform to the following limits:

Mo (By Difference)	min.	99.25 %
N	max.	0.002 %
Ni	max.	0.002 %
O	max.	0.003 %
Si	max.	0.010 %
Fe	max.	0.010 %
C	0.01 -	0.030 %
Zi	0.06 -	0.120 %
Ti	0.40 -	0.550 %



AST-4 TZM

STRUCTURE

Sheet will be supplied in a stress-relieved condition unless otherwise requested.

MECHANICAL PROPERTIES

Tensile tests will be conducted at room temperature (65°F – 85°F) using in 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 will be determined on specimens taken transverse to the final rolling direction. Test specimens will be prepared and tested according to ASTM Specification No. E-8, utilizing a gage length of 2 inches.

¹ Information on testing methods on request.

PHYSICAL CHARACTERISTICS

Tensile properties shall meet the following minimum values:

Thickness (inches)	Tensile Strength (psi Minimum)	Yield Strength (.2% Offset) (psi Minimum)	Elongation (% Minimum)
0.010 to 0.025	120	100	6
Over 0.025 to 0.060	120	100	7
Over 0.060 to 0.090	120	100	9
Over 0.090 to 0.187	120	100	10

Bend tests will be conducted on specimens, at least 1 inch wide x 2 inches long, taken from the sheet with the major axis transverse to the final rolling direction.

Bend Radius Bend Severity 90°
2T to 0.065 in. T

indicates the sheet thickness. Bend radius is equivalent to one half of the mandrel (or insert) diameter. Testing is performed at room temperature (65°F - 85°F).

THICKNESS TOLERANCE:

Thickness (inches)	Up to 12 inches wide (inches)	Over 12 - 24 inches wide (inches)
0.010 to 0.019	± 0.0015	
Over 0.019 to 0.029	± 0.0020	
Over 0.029 to 0.039	± 0.0025	± 0.0030
Over 0.039 to 0.049	± 0.0030	± 0.0035
Over 0.049 to 0.070	± 0.0040	± 0.0040
Over 0.070 to 0.187	± 5%	± 5%

WIDTH TOLERANCE:

Thickness* (inches)	Slit (inches)				Sheared (inches)	
	.250 - .500	over .500 - 6	over 6 - 12	over 12 - 24	.500 - 12	over 12 - 24
0.010 to 0.015	± 0.10	± 0.10	± 0.15		± 0.31	
0.016 to 0.020	± 0.10	± 0.15	± 0.31		± 0.31	
0.021 to 0.035		± 0.31	± 0.31	± 0.62	± 0.31	± 0.62
0.036 to 0.060		± 0.31	± 0.62	± 0.62	± 0.62	± 0.62
0.061 to 0.070		± 0.62	± 0.62	± 0.62	± 0.62	± 0.62
0.071 to 0.090					± 0.62	± 0.62
0.091 to 0.187					± 0.125	± 0.125

*For thickness 0.71 to 0.187 inches; sheet will be sheared, abrasive cut, band saw cut, or water jet cut to the tolerances shown.

Bedsheet is sold as a usable width, therefore any cracks or delaminations on the edges are acceptable as long as a 6, 12 or 24 inch minimum width can be yielded from the material.

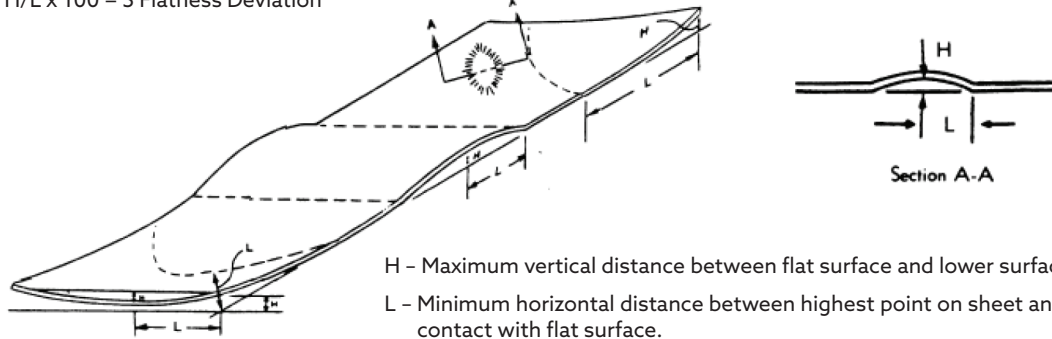
LENGTH TOLERANCE

For specified lengths, the tolerance for all sizes is + .0625 - 0 inch per foot of length. Edge Straightness-Maximum camber is .0625 inch per foot of length.

FLATNESS TOLERANCE

The total deviation from flatness will not exceed 4 % maximum, as determined by the following formula:

$$H/L \times 100 = 5 \text{ Flatness Deviation}$$



SURFACE CONDITION

Sheet is supplied with a matte finish. It will be of uniform quality, clean, and free from foreign matter. It will be free from edge delaminations as determined by visual examination, with the exception of bedsheet width. Normal shear tears are not considered as delaminations.

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.

IDENTIFICATION

The material will be identified with appropriate specification number, ingot or lot number, and nominal size. Shipping containers will be marked with the name of the customer and the purchase order number.

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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