

Niobium C-103 Alloy Mill Products *PRODUCTS*

Number PD-7053
Issue 0-15.05.2018

Niobium C-103 Alloy Plate & Sheet Products

Applications High-performance rocket nozzle applications where high stresses and temperatures up to 2700°F (1482°C) are encountered. Applications where high frequency vibrations occur at cryogenic temperatures. Aerospace applications such as afterburner liners & seals.

Forms Available Sheet: 0.024" to 0.1875" thick by widths up to 24" wide. Plate 0.1875" to 1" thick in common widths.

Chemical Characteristics¹⁾

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

Nb	balance
Hf	9.0 to 11.0 wt%
Ti	0.7 to 1.3 wt%
Ta	max. 0.5 wt%
W	max. 0.5 wt%
Zr	max. 0.7 wt%
C	max. 150 ppm
H	max. 10 ppm
N	max. 150 ppm
O	max. 225 ppm
Total Other Elements	max. 3000 ppm

Structure Plate and sheet will be supplied in a fully recrystallized condition unless otherwise requested.

Mechanical Properties Tensile properties can be supplied on request when Purchase Order is placed.

Temp °F (°C)	Yield Strength 0.2% offset KSI	Tensile Strength (KSI)	Elongation % inch
Material ≤ 0.050 " thick			
70 (25)	40	56	20
2000 (1093)	16	21	20
Material > 0.050 " thick			
70 (25)	38	54	20
2000 (1093)	16	21	20

1) Information on testing methods on request.

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Metallurgical Characteristics

Material is a single-phase niobium alloy with all elements in solid solution.

Stress relieve as requested
Re-crystallize at 2300°F

Physical Properties

Density		0.32	lb/in ³
Melting Point		2350	°C
Coefficient of Expansion (90° - 1200° C)		3.8 to 4.5	10 ⁻⁶ °F ⁻¹
Specific Heat (at 100° C)		0.082	BTU/Lb°F
Thermal Conductivity (870° – 1300°C)		22 to 26	BTU/Hr-Ft °F
Modulus of Elasticity (20°C)		13 X 10 ⁶	PSI
	(1200°C)	9.3 X 10 ⁶	PSI
Emissivity (816°C)		0.28	
	(1093°C)	0.23	

Physical Characteristics

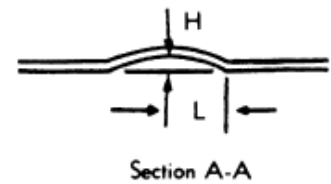
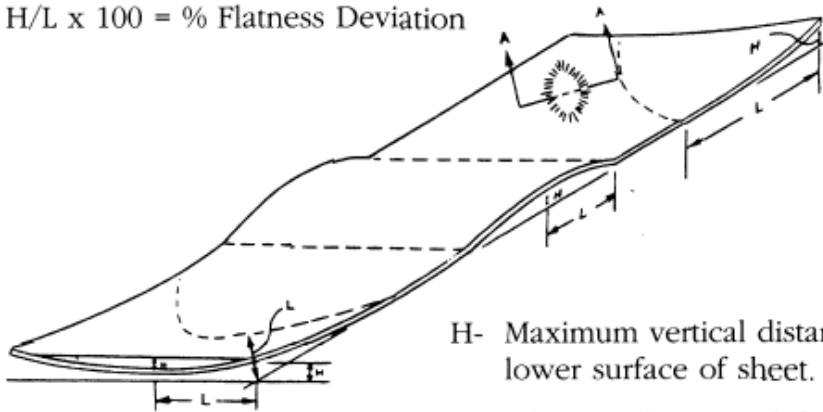
Thickness of Material, in. [mm in lower table]	Tolerance on Thickness, ^A plus or minus, in. [mm in lower table]		Tolerance on Width (slit), ^B plus or minus, in. [mm in lower table]		Tolerance on Sheared Lengths, in. [mm in lower table]			
	Width under 6 in. or 150 mm	Width 6 to 24 in. or 150 to 610 mm	Width under 6 in. or 150 mm	Width 6 to 24 in. or 150 to 610 mm	Length 12 in. or 305 mm and under		Length over 12 in. or 305 mm	
					Plus	Minus	Plus	Minus
0.005 to 0.010 excl	0.0005	0.001	0.012	...	1/16	0	3/32	0
0.010 to 0.015 excl	0.0007	0.001	0.015	0.015	1/16	0	3/32	0
0.015 to 0.020 excl	0.0008	0.0015	0.015	0.015	1/16	0	3/32	0
0.020 to 0.030 excl	0.0015	0.0025	0.020	0.025	1/16	0	3/32	0
0.030 to 0.060 excl	0.0025	0.0035	0.025	0.030	1/16	0	3/32	0
0.060 to 0.090 excl	0.004	0.005	0.025	0.035	1/16	0	3/32	0
0.090 to 0.125 excl	0.006	0.007	...	...	1/16	0	3/32	0
0.125 to 0.187 excl	0.010	0.010	...	...	1/16	0	3/32	0
0.187 to 0.250 excl	0.015	0.015	...	...	1/8	0	5/32	0
0.250 to 0.312 excl	0.020	0.020	...	...	1/8	0	5/32	0
0.312 to 0.375 excl	0.025	0.025	...	...	3/16	0	7/32	0
Millimeters								
0.13 to .25 excl	0.013	0.025	0.30	...	1.6	0	2.4	0
0.25 to 0.40 excl	0.018	0.025	0.4	0.4	1.6	0	2.4	0
0.40 to 0.50 excl	0.020	0.04	0.4	0.4	1.6	0	2.4	0
0.50 to 0.8 excl	0.04	0.06	0.5	0.6	1.6	0	2.4	0
0.8 to 1.5 excl	0.06	0.09	0.6	0.8	1.6	0	2.4	0
1.5 to 2.3 excl	0.10	0.13	0.6	0.9	1.6	0	2.4	0
2.3 to 3.2 excl	0.15	0.18	...	...	1.6	0	2.4	0
3.2 to 4.8 excl	0.25	0.25	...	...	1.6	0	2.4	0
4.8 to 6.4 excl	0.4	0.4	...	...	3.2	0	4.0	0
6.4 to 8.0excl	0.5	0.5	...	...	3.2	0	4.0	0
8.0 to 9.5 excl	0.6	0.6	...	...	4.8	0	5.6	0

^A Tolerance on thickness of sheet over 24 in. [600 mm] wide shall be ±10 % of the thickness.

^B Tolerance on width of sheared sheet shall be + 1/16, -0 in. [+ 1.6, -0 mm].

Plate will be sheared, abrasive cut, band saw cut, or water jet cut to the tolerances shown.
The total deviation from flatness is determined by the following formula:

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



H- Maximum vertical distance between flat surface and lower surface of sheet.

L- Minimum horizontal distance between highest point on sheet and point contact with flat surface.

Surface Condition

Sheet is supplied with a matte finish. The sheet will be of uniform quality, clean, and free from foreign matter. It will be essentially free from edge delaminations as determined by visual examination.

Hazards identification in Advertising (Directive 67/548/EEC Article 26 and Directive 1999/45/EC Article 13)

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

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.

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