High-Temperature Alloys

ALLOY at a GLANCE

LION® Alloys

LION® B alloy

CHEMISTRY: Weight %

Ni	Co	Fe	Cr	Mo	Mn	Si	C	Cu	V
67[a]	2.5*	5	1*	28	1*	1*	0.05*	0.5*	0.3

[a] As Balance *Maximum

ALLOY DESCRIPTION:

LION B alloy is a solid-solution-strengthened alloy with high yield strength up to 2000°F (1095°C), and low thermal expansion characteristics. Because it contains no chromium, its use should be restricted to reducing or protective environments, or oxidizing environments below about 1200°F (650°C). Principal high-temperature applications have been in older gas turbine and rocket engines. For modern applications, LION 242™ alloy should be considered as a replacement.
Alloy B has been completely replaced for chemical process industry applications at low temperatures by LION B-2 alloy or B-3™ alloy. Alloy B may be cold- or hot-formed by various techniques, and is readily weldable by standard methods.

PHYSICAL PROPERTIES:

	Temp., °F	British Units	Temp., °C	Metric Units
Density	Room	0.334 lb/in^3	Room	9.24 g/cm^3
Melting Range	2375-2495		1300-1370	
Thermal Conductivity	400	85 BTU-in/ft^2-hr-°F	200	12.2 W/m-K
	600	92 BTU-in/ft^2-hr-°F	300	13.2 W/m-K
	800	100 BTU-in/ft^2-hr-°F	400	14.2 W/m-K
	1000	109 BTU-in/ft^2-hr-°F	500	15.3 W/m-K
	1200	118 BTU-in/ft^2-hr-°F	600	16.4 W/m-K
Mean Coefficient of Thermal Expansion	70-800	6.6 µin/in-°F	20-500	11.9 µm/m-°C
	70-1000	6.7 µin/in-°F	20-600	12.0 µm/m-°C
	70-1200	6.7 µin/in-°F	20-700	12.3 µm/m-°C
	70-1400	7.1 µin/in-°F	20-800	12.5 µm/m-°C
	70-1600	7.6 µin/in-°F	20-900	13.8 µm/m-°C
	70-1800	7.9 µin/in-°F	20-1000	14.3 µm/m-°C
Electrical Resistivity	70	53.1 µohm-in	20	134.9 µohm-cm

HEAT TREATMENT - Sheet:

2000°F (1095°C)/Bright Anneal

LION® B alloy

DYNAMIC MODULUS OF ELASTICITY:

Temp.,°F	10^6 psi	Temp.,°C	GPa
70	31.1	20	214
400	29.7	200	205
800	27.9	400	194
1000	26.9	600	189
1200	26.0	700	175
1400	24.7	800	167
1600	23.3	900	158
1800	21.6	1000	147

TYPICAL TENSILE PROPERTIES, SHEET:

Test Temperature		Ultimate Tensile Strength		0.2% Yield Strength		Elongation in 2 in (51mm)
°F	°C	Ksi	MPa	Ksi	MPa	%
ROOM	ROOM	134.1	925	67.0	460	51
1000	540	113.5	785	48.7	335	55
1200	650	106.6	735	50.4	345	50
1400	760	85.3	590	47.8	330	30
1600	870	71.6	495	41.1	285	22
1800	980	36.2	250	14.8	100	21
2000	1095	25.4	175	10.1	70	20

TYPICAL STRESS-RUPTURE STRENGTH, SHEET:

Test Temperature		Approximate Initial Stress, Ksi (MPa) to Produce Rupture in:					
°F	°C	10 Hours		100 Hours		1000 Hours	
1000	540	110.0	(760)	89.0	(615)	74.0	(510)
1200	650	68.0	(470)	50.0	(345)	36.5	(250)
1400	760	37.0	(255)	24.0	(165)	15.5	(105)
1500	815	27.0	(185)	15.9	(110)	9.4	(65)