

# TIMETAL<sup>®</sup> 7-4

## $\alpha+\beta$ ALLOY WITH EXCELLENT CREEP RESISTANCE AND HIGH STRENGTH

TIMETAL<sup>®</sup> 7-4 is an alpha-beta alloy with excellent creep resistance and higher strength than Ti-6Al-4V. TIMETAL<sup>®</sup> 7-4 can offers very good high temperature resistance, up to 900°F (480°C). TIMET currently supplies this material in plate form although bar, forgings and forging stock are also possible.

TABLE 1

CHEMICAL COMPOSITION			
ELEMENT	WEIGHT %		
	Min.	Max.	Nominal
Aluminum	6.50	7.30	6.90
Molybdenum	3.50	4.50	4.00
Iron	0.15	0.30	0.20
Carbon	-	0.010	
Nitrogen	-	0.05	
Oxygen	0.16	0.20	0.18
Hydrogen	-	0.013	
Residuals (each)		0.10	
Residuals (total)		0.30	

TABLE 2

PHYSICAL PROPERTIES		
PROPERTY	VALUE	
	English	SI
Density	0.162 lb/in <sup>3</sup>	4.48 g/cm <sup>3</sup>
Beta Transus	1840 ± 25 °F	1005 ± 15 °C
Tensile Modulus at RT		
Annealed	16.2 Msi	111 GPa
Solution Treated & Aged	16.9 Msi	116 GPa

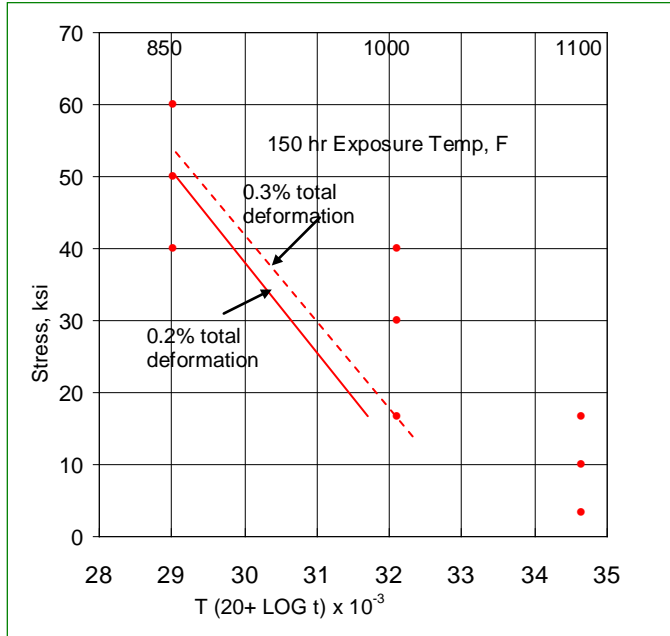
TABLE 3

SELECTED THERMAL PROPERTIES				
Temperature, °F (°C)	Electrical Resistivity, $\mu\Omega\cdot m$	Specific Heat Capacity, Btu/lb.°F (J/kg)	Thermal Conductivity $\lambda$ , Btu/ft.h. °F (W/m.K)	Coefficient of Thermal Expansion $10^{-6}/^{\circ}F$ ( $\times 10^{-6}/^{\circ}C$ )
75 (24)	1.7	0.123 (515)	3.5 (6.1)	-
RT → 850 (RT → 455)	-	-	-	5.4 (9.7)

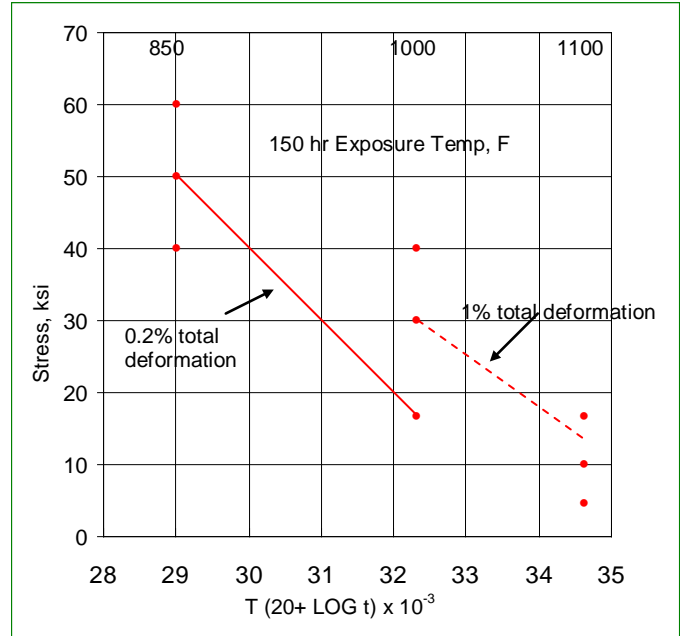
TABLE 4

SELECTED MECHANICAL PROPERTIES				
Product Form	UTS, ksi (MPa)	0.2% Yield Strength, ksi (MPa)	Elongation (%)	Reduction in Area
Forgings	130 (896)	120 (827)	10	10
Rolled Bar	130 (896)	120 (827)	20	25

**FIGURE 1**  
**CREEP BEHAVIOR - LARSON-MILLER PARAMETER VS STRESS**



0.5" rd bar, heat treated 1650°F / 1hr/ AC + 1100°F/8hr/ AC



0.5" rd bar, heat treated 1800°F / 1hr/ AC + 1100°F/8hr/ AC

**TABLE 5**  
**TYPICAL ROTATING BEAM FATIGUE PROPERTIES OF ROLLED HEAT-TREATED BARSTOCK**

Thermal Treatment	Stress, ksi	Cycles to Failure
1400°F, 24 hrs, AC	105	45,000 and 55,000
	100	50,000
	95	200,000
	90	140,000
	85	Run out at 10 <sup>6</sup>
	82	7,000,000
	80	Run out at 10 <sup>6</sup>
1800°F, 4 hrs, AC + 1000°F, 24 hrs, AC	105	85,000
	100	140,000
	95	200,000 and 300,000
	90	1,100,000 and 3,000,000
	85	Run out at 10 <sup>6</sup>
	82.5	Run out at 10 <sup>6</sup>

The data and other information contained herein are derived from a variety of sources, which TIMET believes are reliable. Because it is not possible to anticipate specific uses and operating conditions, TIMET urges you to consult with our technical personnel on your particular applications.

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