

TIMETAL[®] 550**HIGH-STRENGTH FORGING ALLOY**

TIMETAL 550 is a high strength, forgeable alpha beta alloy. In the solution treated and aged condition, the alloy has superior tensile and fatigue properties compared to TIMETAL[®] 6-4 combined with good elevated temperature tensile strength and creep properties up to 750°F (400°C). TIMETAL 550 has applications in the aerospace industry, both as aeroengine and airframe components. Typical applications include compressor discs and flap tracks. The alloy has also found applications in high performance automotive engines. The alloy may be welded using controlled electron beam or laser welding techniques. Slow welding speeds and low cooling rates are necessary to achieve adequate weld properties. In sheet form, the alloy has good superplastic properties and excellent balance of strength and toughness.

TABLE 1

CHEMICAL COMPOSITION

ELEMENT	WEIGHT %	
	Min.	Max.
Aluminum	3.0	5.0
Molybdenum	3.0	5.0
Tin	1.5	2.5
Silicon	0.3	0.7
Iron	—	0.2
Hydrogen	—	0.0125
Oxygen plus 2 Nitrogen	—	0.27
Residual Elements, each	—	0.10
Residual Elements, total	—	0.40

TABLE 2

PHYSICAL PROPERTIES

PROPERTY	VALUE	
	English	SI
Density	0.166 lb in ⁻³	4.60 g cm ⁻³
Beta Transus	1787°F	975°C
Thermal Conductivity	4.35 Btu hr ⁻¹ ft ⁻¹ °F ⁻¹	7.52 W m ⁻¹ K ⁻¹
Specific Heat Capacity (930°F/500°C)	0.15 Btu lb ⁻¹ °F ⁻¹	634 J kg ⁻¹ K ⁻¹
Mean Coefficient of Thermal Expansion 68-240°F (20-100°C)	4.9 x 10 ⁻⁶ in in ⁻¹ °F ⁻¹	8.8 x 10 ⁻⁶ m m ⁻¹ °C ⁻¹
	68-930°F (20-500°C)	5.4 x 10 ⁻⁶ in in ⁻¹ °F ⁻¹
Tensile Modulus STA (Dynamic)	15.9-17.4 Msi	110-120 GPa

TABLE 3

GUARANTEED MINIMUM MECHANICAL PROPERTIES

Product Form	Limit Dimensions in (mm)	Acceptance Standard	Ultimate Tensile Strength ksi (MPa)	0.2% Yield Strength ksi (MPa)	Elongation on 5D %	Reduction in Area, %
Rod/Bar	<1 in (<25mm)	BS TA45	160 (1100)	139 (960)	9	25
	1-4 in (25-100mm)	BS TA46	152 (1050)	133 (920)	9	20
	4-6 in (100-150mm)	BS TA49	145 (1000)	126 (870)	9	20
Forging Stock	<1 in (<25mm)	BS TA47	160 (1100)	139 (960)	9	20
	1-4 in (25-100mm)	BS TA47	152 (1050)	133 (920)	9	20
	4-6 in (100-150mm)	BS TA50	145 (1000)	126 (870)	9	20
Forgings	<4 in (<100mm)	BS TA48	152 (1050)	133 (920)	9	20
	4-6 in (100-150mm)	BS TA51	145 (1000)	126 (870)	9	20
Plate	0.2-0.4 in (5-10mm)	BS TA57	149 (1030)	130 (900)	9	20
	0.4-1.0 in (10-25mm)					
	1.0-2.5 in (25-65mm)					

TABLE 4

TYPICAL NOTCH TENSILE AND FRACTURE TOUGHNESS PROPERTIES

Material (Heat Treatment)	Yield Strength ksi (MPa)	Ultimate Tensile Strength ksi (MPa)	Notch-Tensile Ratio	K _{1C} ksi√in (MPa√m)
Bar (Longitudinal)	144 (996)	160 (1101) 1.46 (K _t =4)	1.61 (K _t =3)	59-63 (65-69)
Forging (Tangential)	145 (1002)	158 (1093)	1.42-1.63 (K _t =3)	52-64 (57-70)



FIGURE 1

EFFECT OF TEMPERATURE ON TENSILE PROPERTIES

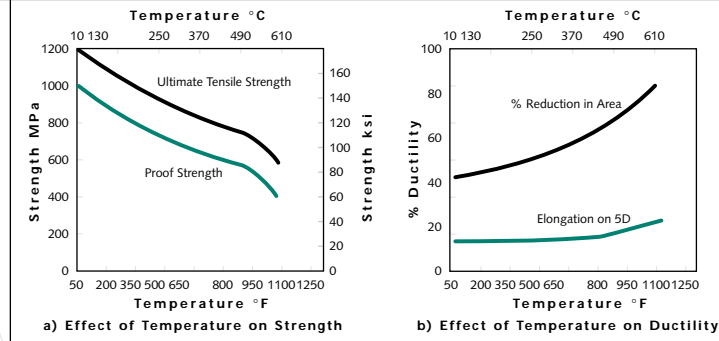


FIGURE 2

CREEP AND STRESS RUPTURE PROPERTIES OF TIMETAL 550 ROD

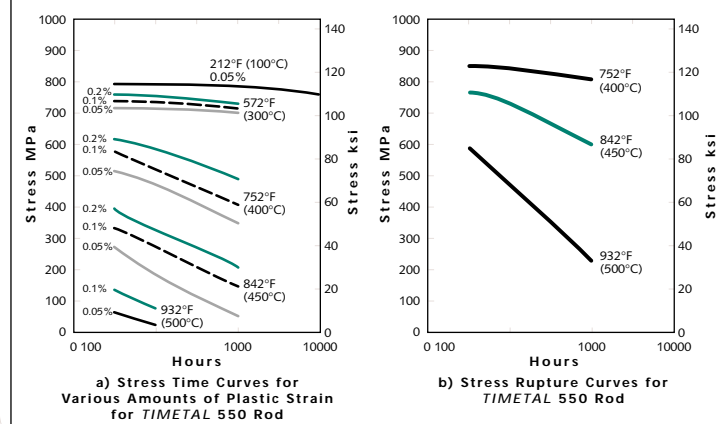


FIGURE 3

FATIGUE PROPERTIES OF TIMETAL 550

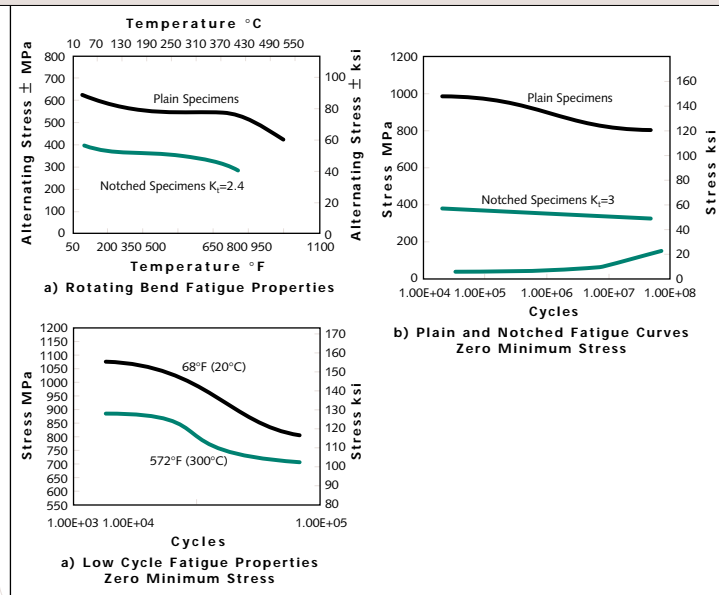


TABLE 5

HEAT TREATMENT

Solution	1650°F/1hr per inch section/AC
Heat Treatment	(900°C/1hr per 25mm section/AC)
Aging Treatment	930°F/24hrs/AC (500°C/24hrs/AC)

TABLE 6

ROOM TEMPERATURE TENSILE PROPERTIES OF TIMETAL 550 SHEET

Condition	UTS ksi (MPa)	0.2% YS ksi (MPa)	Elongation %
As SPF'd (Zero Strain)	160 (1100)	132 (910)	12
As SPF'd (>100% SPF Strain)	162 (1120)	137 (948)	6
SPF + STA	194 (1340)	164 (1130)	7

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 service personnel on your particular applications.

For more information, please contact the TIMET Sales Office/Service Center nearest you, TIMET's Technical Laboratories or TIMET's Website @ www.timet.com

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