

TIMETAL[®] 10-2-3**HIGH-STRENGTH FORGING ALLOY**

TIMETAL 10-2-3 is a TIMET developed, high-strength, deep hardenable forging alloy useful for airframes and engines. Metallurgically it is a near beta alloy. It offers the opportunity to use near-net shape forging techniques and has excellent strength-toughness combinations. TIMETAL 10-2-3 has very high fatigue life and is well-suited for safe-life designs. Current applications for TIMETAL 10-2-3 encompass numerous aircraft structural parts, including landing gear components.

TABLE 1

CHEMICAL COMPOSITION

ELEMENT	WEIGHT %	
	Min.	Max.
Vanadium	9.0	11.0
Iron	1.6	2.2
Aluminum	2.6	3.4
Oxygen	—	0.13
Carbon	—	0.05
Nitrogen	—	0.05
Hydrogen	—	0.015
Residual Elements, each	—	0.10
Residual Elements, total	—	0.13
Titanium	Remainder	

TABLE 2

PHYSICAL PROPERTIES

PROPERTY	VALUE	
	English	SI
Density	0.168 lb in ⁻³	4.65 g cm ⁻³
Beta Transus	1470°F	800°C
Mean Coefficient of Thermal Expansion	5.4 x 10 ⁻⁶ in in ⁻¹ °F ⁻¹ @ 75°-800°F	9.7 x 10 ⁻⁶ m m ⁻¹ °C ⁻¹ @ 24°-427°C
Tensile Modulus	15.9 Msi	109.6 GPa
Compressive Modulus	16.3 Msi	112.3 GPa
Shear Modulus	6.1 Msi	42.1 GPa
Poisson's Ratio	0.32	

TABLE 3

GUARANTEED MINIMUM MECHANICAL PROPERTIES**SOLUTION TREATED THEN AGED 8 HRS**

AMS Specification	Aging Temperature °F (°C)	Maximum Section Thickness in (cm)	Ultimate Tensile Strength ksi (MPa)	0.2% Yield Strength ksi (MPa)	Elongation % in 2 in	Reduction in Area %	Fracture Toughness ksi√in (MPa√m)
4984	900°-950° (482°-510°)	3 (7.6)	173 (1193)	160 (1103)	4	—	40 (44)
4986	950°-1000° (510°-538°)	4 (10.2)	160 (1103)	145 (998)	6	10	55 (60)
4987	1050°-1100° (566°-593°)	4 (10.2)	140 (965)	130 (896)	8	20	80 (88)

TABLE 4

HEAT TREATMENT

Solution Heat Treatment 50°-100°F (28°-56°C) below beta transus for a minimum of 30 minutes, then water quench (air cool may be used for parts less than 1 inch [2.5cm] thick)

Aging Heat Treatment 900°-1100°F (482°-593°C) for 8 hrs, air cool

TABLE 5

TYPICAL K_{1C} TREND WITH STRENGTH LEVEL

Ultimate Tensile Strength ksi (MPa)	K _{1C} ksi√in (MPa√m)
140 (965)	100 (110)
160 (1103)	74 (81)
180 (1241)	49 (54)

Typical K_{1SCC} Results from Forging, STA Condition

K _{1C} ksi√in (MPa√m)	K _{1SCC} ksi√in (MPa√m)
75 (82)	72 (79)
56 (62)	50 (55)



