Ti-6Al-2Sn-4Zr-2Mo

TIMETAL® 6-2-4-2

MEDIUM-STRENGTH, ELEVATED TEMPERATURE ALLOY

TIMETAL 6-2-4-2 has an outstanding combination of tensile strength, creep strength, toughness, and high-temperature stability for long-term application at temperatures up to 1000°F (538°C). Its primary application is gas turbine compressor components such as blades, discs, and impellers. *TIMETAL* 6-2-4-2 is also used in sheet metal form for engine afterburner structure and for various hot airframe skin applications. Forging and machining characteristics of *TIMETAL* 6-2-4-2 are very similar to *TIMETAL*® 6-4.

TABLE 1

CHEMICAL COMPOSITION

ELEMENT	WEIGHT %	
	Min.	*Max.*
Aluminum	5.50	6.50
Tin	1.80	2.20
Zirconium	3.60	4.40
Molybdenum	1.80	2.20
Silicon	0.06	0.13
Iron	—	0.25
Oxygen	—	0.15
Carbon	—	0.08
Nitrogen	—	0.05
Hydrogen	0.010	0.0125
Residual Elements, each	—	0.10
Residual Elements, total	—	0.40
Titanium	Remainder	

TABLE 2

PHYSICAL PROPERTIES

Property	*Value*	*Value SI*
Density [a]	0.164 lb in^{-3}	4.54 g cm^{-3}
Beta Transus	1825°F + 25°F	995°C + 15°C
Melting (liquidus) Point	~3100°F	~1705°C
Thermal Conductivity [a]	4.00 Btu hr^{-1} ft^{-1} $°F^{-1}$	6.92 W m^{-1} K^{-1}
Specific Heat Capacity [a]	0.110 Btu lb^{-1} $°F^{-1}$	460 J kg^{-1} K^{-1}
Electrical Resistivity [a]	72.8-74.8 μΩ•in	1.85-1.90 μΩ•m
Magnetic Permeability	Nonmagnetic	Nonmagnetic
Coefficient of Thermal Expansion [b]	4.3 x 10^{-6} in in^{-1} $°F^{-1}$	7.7 x 10^{-6} m m^{-1} $°C^{-1}$
Modulus of Elasticity	16.5 Msi	114 GPa

[a] Typical values at room temperature of about 68-78°F (20-25°C)
[b] Mean coefficient from 32-212°F (0-100°C)

TABLE 3

GENERAL FABRICATION AND HEAT TREATMENTS

Weldability	Fair
Forging	Rough: 1900-1950°F (1038-1066°C), Finish: 1750-1800°F (954-982°C)
Stress Relief Anneal	900-1200°F (482-649°C), 1-4hrs, Air Cool
Mill Anneal	1300-1550°F (704-843°C), Air Cool
Solution Treatment	25-50°F (15-30°C) below beta transus, 1hr, Water Quench
Aging	1000-1100°F (538-593°C), 8hrs, Air Cool

TABLE 4

HEAT TREATMENTS FOR SHEET

Treatment	*Temperature °F (°C)*	*Time Hours*	*Cooling Method*
Duplex Anneal(DA)			
1st stage	1650 (900)	–	Air Cool
2nd stage	1450 (785)	–	Air Cool
Triplex Anneal(TA)			
1st stage	1650 (900)	2	Air Cool
2nd stage	1450 (785)	–	Air Cool
3rd stage	1100 (595)	2	Air Cool

TABLE 5

HEAT TREATMENTS FOR BAR AND FORGINGS

Treatment in (mm)	*Temperature °F (°C)*	*Time Hours*	*Cooling Method*
Sections < 2.5 (63.5)			
Anneal	1750 (955)	1	Air Cool
Stabilization	1100 (595)	8	Air Cool
Sections < 2.5 (63.5)			
Anneal	1650 (900)	1	Air Cool
Stabilization	1100 (595)	8	Air Cool

TIMET®
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