

**TIMETAL<sup>®</sup> 3-2.5 & 3-2.5.05Pd****COLD WORKABLE MEDIUM STRENGTH ALLOYS**

*TIMETAL* 3-2.5 and 3-2.5 .05Pd are intermediate strength, heat treatable, alpha/beta titanium alloys possessing excellent fabricability. The alloys are cold formable and easily welded, much like the commercially pure (unalloyed) grades of titanium. Yet the alloys offer nearly double the strength (both room and elevated) over *TIMETAL* 50A. *TIMETAL* 3-2.5 is ASME Boiler and Pressure Vessel code approved. The corrosion resistance of *TIMETAL* 3-2.5 is very close to that of commercially pure titanium, exhibiting complete resistance to sea water, and excellent resistance to general, crevice, pitting and stress crack corrosion. As with the commercially pure grades, palladium can be added to the alloy (*TIMETAL* 3-2.5 .05Pd) to further enhance its corrosion behavior. Typical applications in the aerospace industry include hydraulic tubing and lightweight honeycomb structures. *TIMETAL* 3-2.5 is also being used for industrial applications such as pressure vessels and piping, and in a growing number of consumer products (the most notable being bicycle tubing). *TIMETAL* 3-2.5 offers the highest structural efficiency of any of the common engineering metals approved by ASME. The alloy is available in all common product forms including billet, bar, plate, sheet, strip, tubing and pipe.

TABLE 1

**CHEMICAL COMPOSITION**

ELEMENT	WEIGHT %			
	<i>TIMETAL</i> 3-2.5 ASTM Grade 9 UNS Desig. R56320		<i>TIMETAL</i> 3-2.5 .05Pd ASTM Grade 18 UNS Desig. R56322	
	Min.	Max.	Min.	Max.
Aluminum	2.5	3.5	2.5	3.5
Vanadium	2.0	3.0	2.0	3.0
Nitrogen	—	0.03	—	0.03
Carbon	—	0.08	—	0.08
Oxygen	—	0.15	—	0.15
Iron	—	0.25	—	0.25
Hydrogen	—	0.015	—	0.015
Palladium	—	—	0.04	0.08
Residual Elements, each	—	0.1	—	0.1
Residual Elements, total	—	0.4	—	0.4

TABLE 3

**MINIMUM ROOM TEMPERATURE MECHANICAL PROPERTIES**

Condition	U.T.S. ksi (MPa)	YS ksi (MPa)	Elongation %	R.A. %	Bend Radius
Annealed	90 (620)	70 (483)	15	30	5-6T
Aged	120 (828)	100 (690)	8	—	—
CWSR	125 (862)	105 (724)	10	—	—

TABLE 2

**PHYSICAL PROPERTIES**

PROPERTY	VALUE
Density(a)	0.162 lb/in. <sup>3</sup> (4.48 g/cm <sup>3</sup> )
Beta Transus	1715±25°F (935±15°C)
Melting (liquidus) Point	3100°F (1700°C)
Thermal Conductivity(a)	4.8 Btu/ft-h-°F (8.3 W/m-K)
Electrical Resistivity(a)	1.27 μΩ-m
Magnetic Permeability	Nonmagnetic
Thermal Coefficient of Linear Expansion(b)	5.34x10 <sup>-6</sup> in/in-°F (9.61x10 <sup>-6</sup> m/m°C)
(a) Typical values at room temperature of about 20 to 25°C (68 to 78°F). (b) Mean coefficient from room temperature to 95°C (200°F)	
PROPERTY (ELASTIC)	VALUE
Young's Modulus	
At RT	14-15x10 <sup>6</sup> psi (95-105 GPa)
At 230°C (450°F)	11-12x10 <sup>6</sup> psi (75-85 GPa)
Shear Modulus	
At RT	6.2-6.5x10 <sup>6</sup> psi (43-45 GPa)
Poisson's Ratio	Typically 0.30

TABLE 4

**TYPICAL ELEVATED TEMPERATURE MECHANICAL PROPERTIES (ANNEALED CONDITION)**

TEMPERATURE	UTS	YS
	ksi (MPa)	ksi (MPa)
200°F (93°C)	97 (669)	77 (531)
600°F (316°C)	79 (545)	55 (380)
800°F (427°C)	71 (490)	50 (345)



