

TIMETAL[®] Grade 12

TITANIUM ALLOY WITH EXCELLENT CORROSION RESISTANCE AND STRENGTH

TIMETAL[®] Grade 12 (ASTM Grade 12) is a lean titanium alloy with excellent corrosion resistance and higher strength than ASTM Grade 2. TIMETAL[®] Grade 12 shows significant improvement over unalloyed titanium, particularly crevice corrosion in hot brines. It also offers excellent corrosion resistance to acids over unalloyed grades. The higher strength than Grade 2 or Grade 7 at room and elevated temperatures allow material and cost saving through use of thinner sections. Grade 12 is approved by ASME Boiler Code for use up to 600°F.

TABLE 1

CHEMICAL COMPOSITION

ELEMENT	WEIGHT %	
	Max.	Nominal
Molybdenum	0.4	0.3
Nickel	0.9	0.8
Iron	0.30	0.15
Carbon	0.08	0.08
Nitrogen	0.03	0.03
Oxygen	0.25	0.12
Hydrogen	0.015	-
Residuals (each)	0.10	
Residuals (total)	0.30	

TABLE 2

PHYSICAL PROPERTIES

PROPERTY	VALUE	
	English	SI
Density	0.163 lb/in ³	4.51 g/cm ³
Tensile Modulus		
Tension	15 Msi	103 GPa
Torsion	6.2 Msi	42.7 GPa

TABLE 3

SELECTED THERMAL PROPERTIES

Temperature, °F (°C)	Electrical Resistivity, μΩ.cm	Specific Heat Capacity, Btu/lb.°F (J/kg)	Thermal Conductivity λ, Btu/ft.h. °F (W/m.K)	Coefficient of Thermal Expansion 10 ⁻⁶ /°F (10 ⁻⁶ /°C)
75 (24)	52	0.13 (544)	11 (19.02)	5.3 (9.54)

TABLE 4

MINIMUM MECHANICAL PROPERTIES

Product Form	UTS, ksi (MPa)	0.2% Yield Strength, ksi (MPa)	Elongation (%)	Reduction in Area	Minimum Bend Radius (D/T)	Flatten Ability (distance between platens)	Flaring Ability (% expansion of inside diameter)
All	70 (483)	50 (345)	18	For bar, billet, forgings: 25	For sheet, plate: T < 0.070" = 4 0.070" < T < 0.187" = 5	Tubing: 9 x nominal wall thickness	Tubing: 17

TABLE 5

RESISTANCE OF TITANIUM TO BOILING NON-AERATED ORGANIC ACIDS

Product	50% Citric	10% Sulfamic	45% Formic	88-90% Formic	90% Formic (Anodized Specimens)	10% Oxalic
Grade 2	14	538	433	83-141	90	3,700
Grade 12	0.5	455	NIL	0-22	2.2	4,100
Grade 7	0.6	14.6	NIL	0-2.2	0	1,270

FIGURE 1

EFFECT OF TEMPERATURE AND PH ON CREVICE CORROSION OF TITANIUM (GRADE 2) COMPARED TO GRADE 12 IN SATURATED NACL BRINE

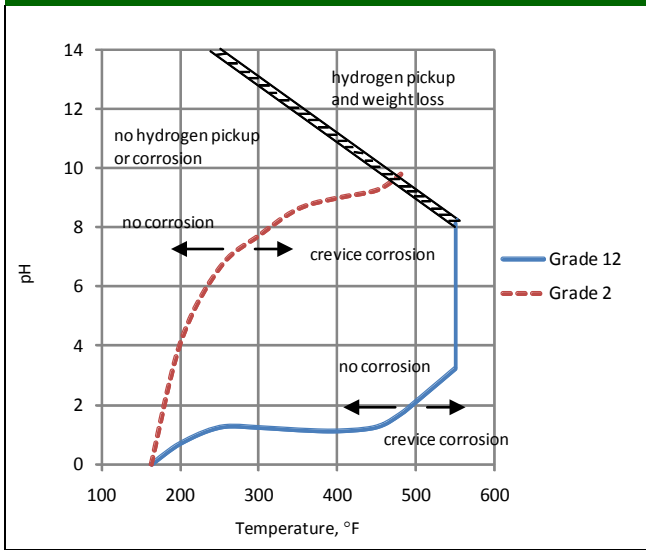


FIGURE 2

STRUCTURAL EFFICIENCY FOR DESIGN OF PRESSURE VESSELS (PER ASME DESIGN ALLOWABLES)

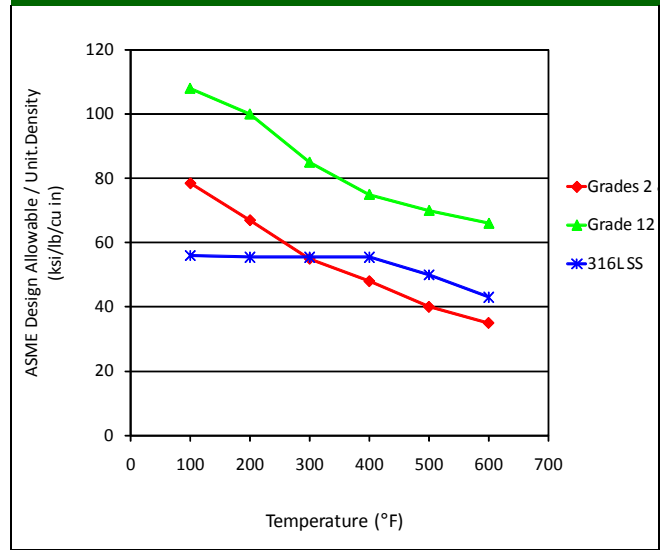


FIGURE 3

EFFECT OF REDUCING ACID ON GENERAL CORROSION OF VARIOUS INDUSTRIAL TITANIUM GRADES

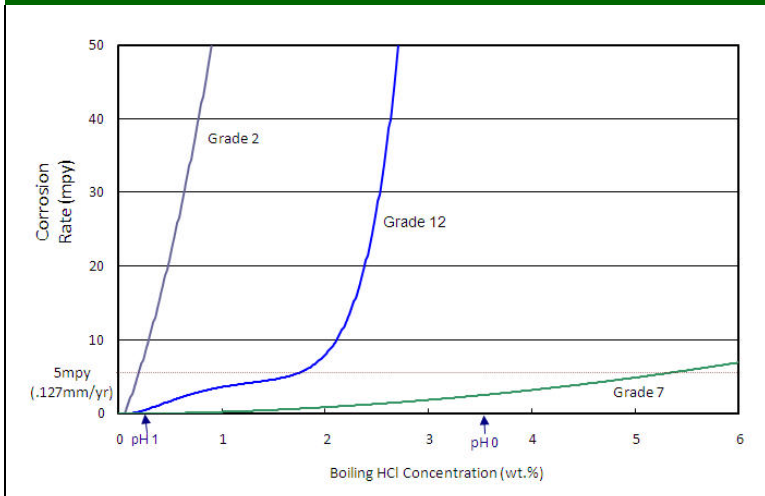
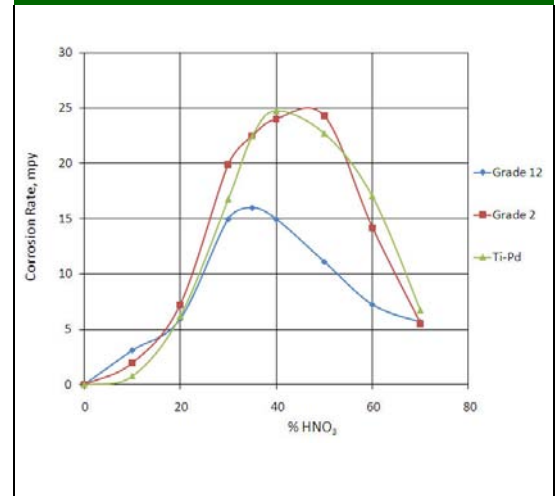


FIGURE 4

EFFECT OF BOILING NITRIC ACID ON THE CORROSION RESISTANCE OF TITANIUM



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.

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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