

Number PD-7033  
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## ULTRA 76 ALLOY (Ta 2.5%W)

**Benefits** Significantly improved corrosion resistance in HCl and H<sub>2</sub>SO<sub>4</sub> acids.  
 Minimized hydrogen embrittlement rates compared to standard NRC®76  
 Up to 100 times lower in HCl acid  
 Up to 10 times lower in H<sub>2</sub>SO<sub>4</sub> acid  
 Eliminates the need for a separate Pt application step to protect against H embrittlement.  
 Maintains all the excellent mechanical properties of NRC®76.  
 Potential for increased operating temperatures in both HCl and H<sub>2</sub>SO<sub>4</sub>.

**Applications** High strength alloy for corrosion applications in heat transfer equipment, vessels, piping, etc., and all applications where tantalum's physical properties are desired at a higher strength level than pure tantalum, and better corrosion resistance in HCl and H<sub>2</sub>SO<sub>4</sub> acids.

**Forms Available** Foil: 0.001" to 0.006" thick by widths up to 12" wide. Sheet: 0.006" to 0.1875" thick by widths up to 40" wide. Plate 0.1875" to 1" thick in common widths. Welded Tubing .015" to .035" wall x 1/2" to 2" diameter. Also, rod, plate, wire, bar and customer specified specialty sizes of all materials.

### Chemical Characteristics<sup>1)</sup> (Mass fraction in % [cg/g]; ppm [µg/g])

Element	ppm (max)	Element	ppm (max)
C	50	Ti	40
O	100	Ni	50
N	50	Mo	200
H	10	Si	25
Nb	0.1 % (1000)	W	2.0 - 3.5 wt %
Fe	50	PGM*	1000 - 2000
Ta	balance		

\*Platinum Group Metals

### Mechanical Properties (Design minimum)

Temp °F	Yield Strength 0.2% offset KSI	Tensile Strength (KSI)	Elongation % inch
70	35.5	50	20
210	30.5	48	15
390	27.4	42	10
480	25.5	40	10

### Metallurgical Characteristics

Material is single-phase tantalum with tungsten and platinum group metals in solid solution.  
 Stress relieve at 2000°F  
 Re-crystallize at 2400°F

1) Information on testing methods on request.

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**Physical Properties**

Density		0.602	Lb/in <sup>3</sup>
Melting Point		2996	°C
Coefficient of Expansion (20° - 500° C)		3.6 X 10 <sup>-6</sup>	°F <sup>-1</sup>
Specific Heat (at 100° C)		0.0336	BTU/Lb°F
Thermal Conductivity (20° – 100°)		32	BTU/Hr-Ft °F
Electrical Resistivity (0° – 100°)		14.7	Microhm-cm
Thermal Neutron Absorption Cross Section		21.3	Barns/atom
Typical Ultimate Tensile Strength at 20° C		45 - 55	KPSI
Typical Yield Strength at 20° C		35 - 45	KPSI
Modulus of Elasticity		27 X 10 <sup>6</sup>	PSI
Hardness as Annealed (Typical)	Vickers	115 - 160	
	Rockwell B	50 - 80	

**Main Products**

- Bayonet Heaters** - Single and multi-tube types for use in steam heating in corrosive atmospheres.
- Heat Exchangers, Condensers and Coils**
- Thermocouple Protection Sheaths** Loose lined or machined from solid.
- Pumps, Bodies or Cases, Shafts and Impellers** - For corrosive chemical solutions.
- Paddle Stirrers and Agitators** - Solid or covered (loose-lined)
- Distillation Columns, Boilers and Condensers**
- Tantalum Clad Dip Pipes, Heaters and Chemical Plant Equipment**
- Repairs Kits** - For tanks, vats and other glass-lined containers
- Crucibles** - In standard and special shapes and sizes
- Furnaces and Furnace Parts** - For use at temperatures up to 2500°F in controlled atmospheres.

**Hazards identification in Advertising (Directive 67/548/EEC Article 26, Directive 1999/45/EC Article 13 and REGULATION (EC) No 1272/2008 Article 48)**  
 Metal powder, flammable, n.o.s.

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In hydrochloric acid applications using higher temperatures and concentrations, Ultra 76 improves corrosion resistance, but more importantly, hydrogen embrittlement is minimized, as hydrogen pickup is reduced by two magnitudes over standard NRC<sup>®</sup>76 material. Similar results are seen in sulphuric acid applications. Use of Ultra 76 will help extend equipment life, reduce downtime and allow operation in more demanding environments compared to alternative materials.

