



Application Note: Tantaline® Treated Metal Bellows

Description

Tantaline® treatment is a unique solution that can extend the life of metal bellows in a wide range of aggressive chemical environments. Bellows compensate for misalignment, vibration, and thermal expansion of rigid piping, valve, and vacuum seals. Tantalum is recognized as the most corrosion resistant metal available for industrial use. Tantalum applied by the proprietary Tantaline® treatment process provides superior corrosion resistance for extended service life and reduced maintenance in a wide range of industrial processes and applications.

Benefits

The Chemical Vapor Deposition (CVD) process used by Tantaline produces a uniform tantalum layer that conforms to complex geometries and adheres to the substrate through diffusion bonding. Tantaline® treated bellows offer superior high temperature corrosion resistance compared to Hastelloy®, Inconel®, and Stainless Steel. The ductile and fully bonded layer enables bending and flexing while maintaining full integrity. Performance is verified through manufacturing QC testing in concentrated HCl at 60° C for 48 hours. The metallurgical properties of the tantalum surface combined with the uniform and conformal CVD layer results in a robust product that can be offered with economic pricing and short lead-times.

Availability

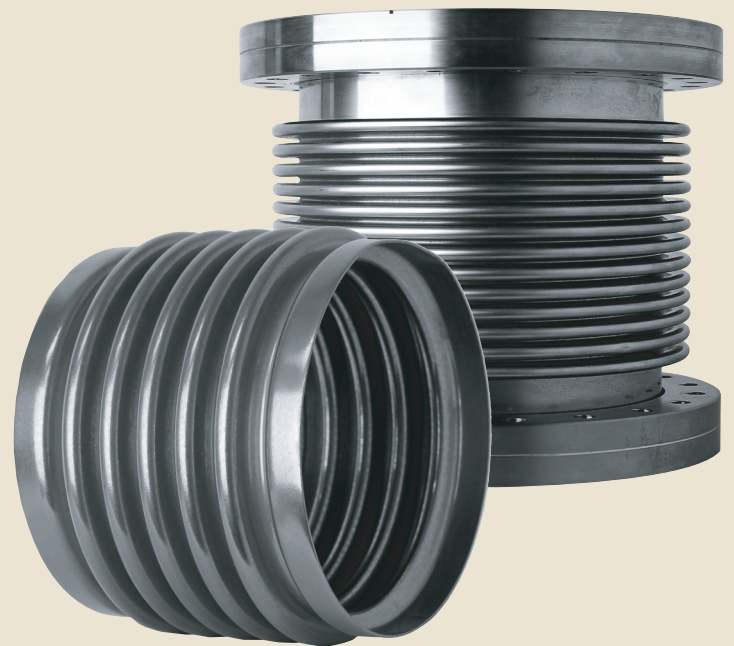
A wide range of styles and configurations are suitable for Tantaline® treatment.

Types – Formed and electro formed

Nominal sizes- up to 18" (460mm) diameter, lengths up to 32" (810mm)

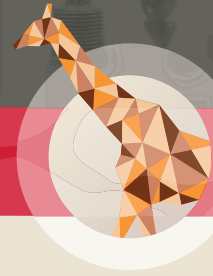
End connections

- ✓ Fixed flanged ASA, CF, ISO, KF and NW
- ✓ Fixed and rotatable flanges
- ✓ Tube end



SUPERIOR CORROSION RESISTANCE FOR AGGRESSIVE SERVICE CONDITIONS

- ✓ Hydrochloric acid
- ✓ Sulfuric acid
- ✓ Acetic acid
- ✓ Nitric acid
- ✓ Sour gas (H₂S)
- ✓ Chlorine
- ✓ Many other process fluids



Use

MARKET	TYPICAL PROCESSES	TYPICAL USES
Chemical Processing	Hot acids, wet and dry chlorine, sulfur compounds, sour gases containing H ₂ S compounds	Valve trim, expansion joints, mechanical seals for pumps and pipe couplings
Oil & Gas	Acid gases (CO ₂ , H ₂ S, SO ₂), ammonia (NH ₃), hydrogen cyanide (HCN), alkylation, and amine derivatives	Wet Scrubbers, exhaust ducts, fuel nozzles (exhaust), gate valves, gas lines
Pharmaceutical	Oxidizing agents including hydrogen peroxide (H ₂ O ₂), bromine (Br), chlorine (Cl), nitration, and various cleaning chemistries	Glass lined reactor vessel connection, process piping, valves
Semiconductor	Strong HCl etchants, corrosive Nital (alcohol + nitric acid), byproducts of Silicon deposition process	Components of etching and deposition systems, vacuum pipe connections, fittings and exhaust gas treatment systems
Mining	High Pressure Acid Leach (HPAL), Partial Oxidation (POX), Extraction	Metal bellows seals, pusher seals, valve trim, process piping

Key Technical Information

Hastelloy^{®*}, Inconel^{®**}, Zirconium and Titanium bellows are susceptible to Stress Corrosion Cracking (SCC) and pitting especially in hot acids.

Tantaline[®] treated bellows offers the following beneficial characteristics:

- ✓ Chemically resistant to SCC and pitting in many aggressive media and environments.
- ✓ Tantalum layer remains passivated and inert to corrosion under high temperature (>200° C) acidic conditions including concentrated HCl and H₂SO₄.***
- ✓ Superior corrosion resistance against wet, dry chlorine atmospheres, and other chlorinated environments.

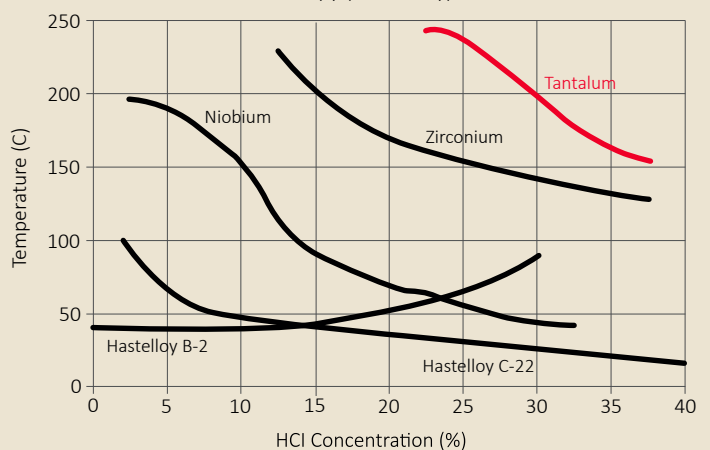
*Hastelloy[®] is a registered trademark of Haynes International.

**Inconel[®] is a trademark of Special Metals Wiggin Limited.

***FJ, H. (n.d.). Properties of Tantalum for Applications in the Chemical Process Industry.

HCl Corrosion Resistance

5mpy (0.13mm/y)



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