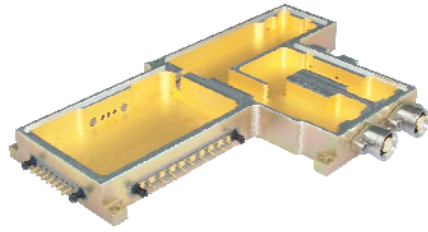


Hermetics For Extreme Environments

Integrated Packaging



Using technologies such as Kryoflex® and explosively bonded metals, SOURIAU PA&E designs and manufactures hermetic packaging for extreme environments — whether it's integrating components that protect satellites deep in space or connectors for oil-drilling tools that bore deep below the earth's surface. By pairing our Kryoflex and explosively bonded metal technologies, we can build hermetic packages using precision laser welding rather than solder joints, thus eliminating the two most common causes for hermetic package failure: solder joint fatigue and cracked glass.

Rectangular DC Connectors



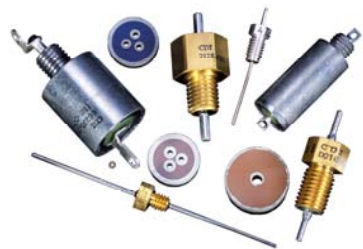
SOURIAU PA&E's hermetically-sealed rectangular DC connectors exceed most mil-spec requirements and are designed for use in military and commercial applications, where environmental conditions require an extremely rugged and reliable hermetic seal. The uniquely-controlled CTE characteristics, chemical bonding properties and polycrystalline structure of Kryoflex allows SOURIAU PA&E to manufacture these hermetic connectors with 304L stainless steel shells and gold-plated beryllium-copper contacts to maintain excellent electrical performance and environmental characteristics.

RF/Microwave Connectors



SOURIAU PA&E's 50 Ohm hermetic RF/Microwave connectors are designed for use in military and commercial applications where environmental conditions require an extremely rugged and reliable hermetic seal. Low-loss Corning 7070 glass is used for dependable electrical performance. SOURIAU PA&E manufactures these hermetic RF connectors from a variety of compatible shell and contact materials, in both laser weld and solder-in styles, which provide excellent electrical and environmental performance characteristics.

Ceramic EMI Filters



SOURIAU PA&E's military-qualified Filter Products Group specializes in the design and manufacture of high-reliability low-pass EMI filters. Utilizing multi-layer ceramic discoidal capacitors and ferrite inductors, SOURIAU PA&E's engineering staff are experts at designing EMI filtering solutions for electronic circuits operating in hostile EMI environments. In-house manufacture and testing, in accordance with MIL-PRF-28861, Class B (QPL) and SOURIAU PA&E class H, are standard practice.



SOURIAU PA&E

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ISO 9001:2008/AS9100

Kryoflex is a registered trademark of SOURIAU PA&E.



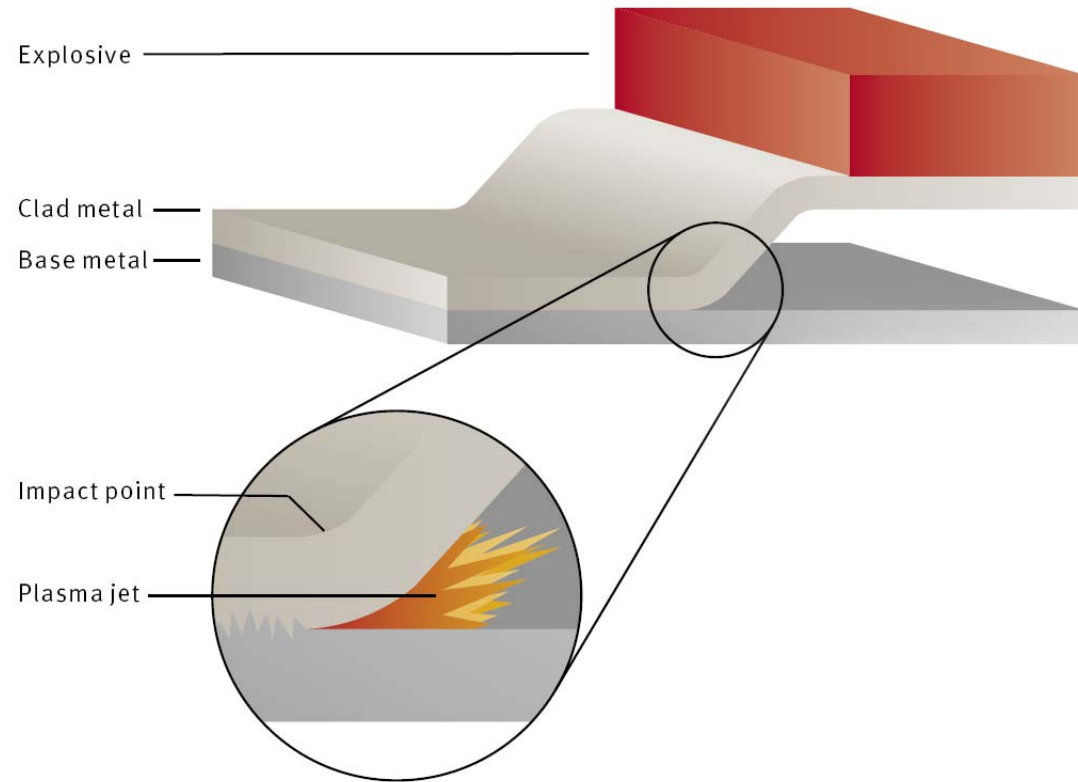
Explosion Bonding Prevents Galvanic Corrosion.



SOURIAU PA&E

Explosive Welding

Bi-Metallic Transitions are made with a solid-state welding process that uses controlled explosive energy to join two or more otherwise incompatible and exotic materials at the molecular level. This results in a permanent, solder-free metallurgical bond, and can create composites that are lightweight and have superior strength.



How It Works

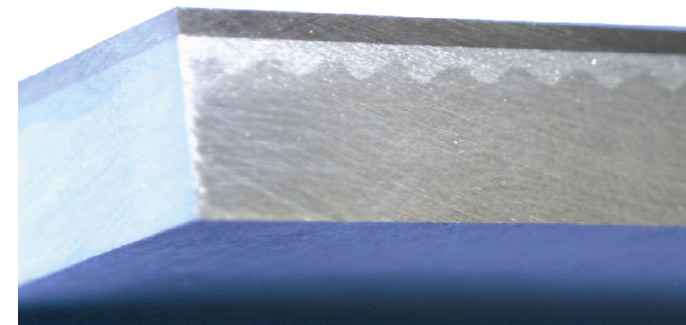
Plates are accelerated into one another with the forces generated by an explosive detonation. The "Flyer" plate yields to the force of the explosion as the detonation front moves across the surface of the plate. Forces at the collision point cause the first few atomic layers of each surface to become plasma. This leading plasma jet effectively scrubs both surfaces as the collision point accelerates across the plates creating a full metallurgical weld. Explosive metal bonding is considered a cold joining process because the materials remain at or near ambient temperature and retain their original characteristics.

MATERIAL COMBINATIONS

	Zirconium	Vanadium	Tungsten	Titanium	Tantalum	Steel alloy	Steel, mild	Steel, Stain	Silver	Rhenium	Platinum	Palladium	Niobium	Ni alloy	Nickel	Molly alloy	Molybdenum	Magnesium	Kovar	Indium	Hafnium	Gold	Copper alloy	Copper	Beryllium Cu	Al Bronze	Al alloy	Aluminum
Aluminum	X	X	X	X	X	O	X	O	X	X	X	O	X	O	O	X	X	O	O	O	X	X	X	X	O	O	X	X
Al alloy	X	X	X	X	X	O	O	O	X	X	X	O	X	O	O	X	X	O	O	O	X	X	X	X	O	O	X	
Al Bronze	O	X	O	O	X	X	X	O	O	O	X	O	X	O	O	X	X	O	X	X	O	X	X	X	O	X		
Beryllium Cu	O	X	O	O	X	O	X	O	X	O	X	O	X	O	O	X	X	O	O	O	O	X	X	X	O			
Copper	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X				
Copper alloy	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X				
Gold	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X					
Hafnium	O	X	X	O	X	X	X	X	X	X	X	X	X	O	O	X	X	O	X	O	X							
Indium	X	X	X	O	X	O	O	O	X	O	O	O	X	O	O	X	X	O	X	X								
Kovar	O	X	X	O	X	X	X	X	X	O	X	O	X	X	X	X	X	O	X									
Magnesium	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X										
Molybdenum	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X											
Molly alloy	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												
Nickel	X	X	X	X	X	X	X	X	O	X	O	O	X	X	X													
Ni alloy	O	X	X	O	X	X	X	X	X	O	X	O	X	X														
Niobium	X	X	X	X	X	X	X	X	X	X	X	X	X															
Palladium	O	O	O	O	O	X	O	O	O	O	O	X																
Platinum	X	X	X	X	X	X	X	X	X	X	X																	
Rhenium	O	X	X	O	X	O	O	O	O	X																		
Silver	X	X	X	X	X	X	X	X	X																			
Steel, Stain	X	X	X	X	X	X	X	X																				
Steel, mild	X	X	X	X	X	X	X																					
Steel alloy	X	X	X	X	X	X																						
Tantalum	X	X	X	X	X																							
Titanium	X	X	X	X																								
Tungsten	X	X	X																									
Vanadium	X	X																										
Zirconium	X																											

METAL COMPATIBILITY CHART

- X Direct Bond, No Interlayer
- O May Require Interlayer



Maritime products manufactured from explosively bonded dissimilar metals prevent galvanic corrosion



P/N: **None**
 Nomenclature: Deck Socket
 Material: Cres 316L w/ Tri-Metallic Weld Transition Ring
 P/N 98008-1

This product allows for welding a high strength stainless steel deck socket or Baxter-bolt fitting directly to an aluminum deck. Baxter Bolt for installation in Aluminum decks on Navy, CG, NOAA and commercial vessels and small boats.



P/N: **98001-1 = Type XVII & 98001-2 = Type XVIII**
 NAVSEA: 803-1916300
 Nomenclature: Tie-Down, Aircraft Securing Fitting

Shown with the Tri-metallic Weld Transition Ring.



P/N: **98007-1**
 NAVSEA: 803-1385828
 Nomenclature: Nozzle, Sprinkler
 Material: Stainless Steel

Available with tri-Metallic Weld Transition Ring P/N: 98008-1 and Aluminum Weld Apron P/N: 98010-1
 Complete welded assembly P/N: 98154-1



P/N: **None**
 NAVSEA: 803-1385789 Rev G
 Nomenclature: Naval Ship Deck Drain

Copper Nickel (CuNi) Deck Drain with "TM"-Transition Metal Ring. Rev H currently proposed to include a CuNi 70-30 Deck Drain with a Transition Ring and a 5456 AL deck apron.



P/N: **98008-1 & 98008-2**
 Nomenclature: Weld Transition Ring, Tri-metallic

P/N: 98008-1 manufactured IAW NAVSEA DWG #803-1385828
 P/N: 98008-2 manufactured IAW NAVSEA DWG #803-1916300



RAST Track/Trough post for the CG-47, DDG-963 ships in accordance with DWG 807-7,622,611. Explosive bonded support posts (Aluminum-titanium) and blocks (aluminum-steel). In accordance with the approved for RAST Repair Procedure 7622611 sheets 8, 18 and 20 these are the new preferred posts and blocks.



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ISO 9001:2000
 ISO 9001:2000/AS9100

Applications

Design engineers often face the dilemma of material selection. Frequently, the material that would work the best for one specific element of a design lacks properties required by other elements of the design. For example, a material may exhibit good corrosion resistance, electrical conductivity, or thermal conductivity, yet lack the strength, hardness, weldability, or wear resistance required in the final design. Utilizing explosion welded materials can be a powerful solution to this dilemma.

Explosively welded materials allow design engineers to specifically place a certain material exactly where the design requires it, without compromising other critical elements. The correct application of explosion welded materials can yield significant gains in strength, reliability, and cost-effectiveness throughout the product's lifetime.



Marine Shipbuilding Components

High-strength bi-metallic transitions join dissimilar metals together, reducing the need for mechanical joints and preventing **GALVANIC CORROSION**. High-strength, critical parts can be manufactured incorporating stainless steel/aluminum bi-metallic transitions and welded directly to an aluminum structure without generating galvanic corrosion.

Because of these galvanic corrosion prevention characteristics, explosion welded transition materials have become prevalent throughout the shipbuilding industry. Cylindrically bonded aluminum-to-steel transition rings enable shipbuilders to securely weld forged steel cup-and-cross tie-down elements into the aluminum deck of aircraft carriers.



Explosively bonded metals provide weldable transitions that eliminate galvanic corrosion and the need for mechanical joints.



P/N: **98038-1**
 Material: CuNi/Ti/Al
 3/4" total thickness
 .188" CuNi alloy C71500, .078" gr. 1 Ti, .125" AL 1100, & .375" AL 5456
 Available 48" x 96" or cut to order



P/N: **98053-1**
 Material: Aluminum/Steel
 3/4" total thickness
 .125" AL 5456, .250" AL 1100, .375" SA 516 grade 55 steel
 Available 48" x 144" or cut to order
 Standard strips (P/N 98046-1) —1" wide, random lengths up to 12'



P/N: **98056-1**
 Material: Aluminum/Steel
 1 3/8" total thickness
 .250" AL 5456, .375" AL 1100, .75" SA 516 grade 55 steel
 Available 48" x 144" or cut to order
 Standard strips (P/N 98049-1) —1 1/2" wide, random lengths up to 12'



P/N: **98036-2**
 Material: AL/Ti/CuNi/SS
 3/4" total thickness
 .125" AL 5086, .125" AL 1100, .060" gr. 1 Ti, .060" CuNi, .500" 316L Stainless Steel
 Available 10" x 30" or cut to order



P/N: **98082-2**
 Material: AL/Ti/CuNi/SS
 1 1/2" total thickness
 .500" AL 5086, .125" AL 1100, .060" gr. 1 Ti, .060" CuNi, .750" 316L Stainless Steel
 Available 36" x 72" or cut to order

Electrical bonding components and bond strap assemblies are manufactured in accordance with MIL-DTL-24749A.



P/N: **98016-1** (Ref. P/N: NTI-714)
 NSN: 5310-01-423-1667
 Nomenclature: Boss, Cres
 Material: Cres 316L Stainless Steel
 Size: 3/4" dia. X 1-1/4" long, 3/8-16 UNC X 5/8" DP



P/N: **98015-1** (Ref. P/N: NTI-713)
 NSN: 5310-01-423-1330
 Nomenclature: Boss, "TM" - Transition Metal/
 Material: Aluminum / Stainless Steel
 Size: 3/4" dia. X 1-1/2" long, 3/8-16 UNC X 5/8" DP



P/N: **98020-1-**** (Ref. P/N: NTI-716)
 MilSpec: MS24749-I
 NSN: 5999-01-343-8666 (6" Length)
 5999-01-343-8667 (12" Length)
 5999-01-343-8668 (18" Length)
 Nomenclature: Bond Strap Assembly, Type I
 Material: Stainless Steel 316
 ** Indicates length in Inches



P/N: **98091-1-**** (Ref. P/N: NTI-718)
 NSN: None
 Nomenclature: Bond Strap Assembly, "TM" - Transition Metal
 Material: (1) Bond Strap P/N: 98020-1
 (2) Bi-Metallic Bosses P/N: 98015-1
 (2) Self Locking Bolts, SS 3/8-16 UNC, P/N: 98019-1
 (2) Flat Washers, SS 3/8, P/N 98017-1
 ** Indicates length in Inches



P/N: **98083-1-**** (Ref. P/N: NTI-720)
 NSN: None
 Nomenclature: Bond Strap Assembly, Cres/Cres
 Material: (1) Bond Strap P/N: 98020-1
 (2) Cres Bosses P/N: 98016-1
 (2) Self Locking Bolts, SS 3/8-16 UNC, P/N: 98019-1
 (2) Flat Washers, SS 3/8, P/N 98017-1
 ** Indicates length in Inches