Hermetic Solutions for Extreme Environments

Integrated Packaging
Using technologies such as Kryoflex® and explosively bonded metals, 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.

DC Connectors
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 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
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. 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
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, 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 PA&E class H, are standard practice.

For further information contact us at sales@pacaero.com or visit our web site www.pacaero.com
PA&E’s Bonded Metals division produces a number of standard components, including: aircraft tie-downs, deck drains, sprinkler nozzles and other components for the military and commercial maritime industries.

- **Innovative** - Joins ferrous, non-ferrous metals
- **Reliable** - Bonded at the molecular level
- **Permanent Bond** - No galvanic corrosion
- **Flexible Solution** - Variety of metal combinations available
Explosively Welded Metals

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.
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Items with an “X” do not require an interlayer.
Items with an “O” require an interlayer.
Explosively Welded Metals

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 Welded Metals

**P/N:** 98154-3  
**Nomenclature:** Deck Socket  
**Material:** Al/Steel Tri-met Ring and Al Weld Apron with 1”-8 UNC Stainless Steel Threaded Insert.

This product allows for welding a high-strength stainless steel deck socket/tiedown fitting directly to an aluminum deck on Navy, CG, NOAA, commercial vessels and small boats. 1-8” threaded center for eye bolts is standard, with custom metric threads available.

**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:** 4665-1  
**Nomenclature:** 500-13 STANCHION  
**Material:** 2” O.D. Aluminum/Stainless Steel

Transition material with 1/2-13 threaded hole 1 1/4” deep.

**P/N:** 33777  
**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

**P/N:** 98154-1  
**NAVSEA:** 803 1385828 Rev. P Pc. # 31  
**Nomenclature:** NSS Type SB Countermeasure Wash-down Nozzle  
**Material:** Aluminum/Steel Transition Collar Aluminum Deck Apron
Explosively Welded Metals

P/N: 98053-1
Material: Aluminum/Steel

3/4” total thickness
.125” AL 5086, .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 5086, .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: 98036-3
Material: AL/NB/SS door material (Marine Al/ CRESS Clad Plate)

3/4” total thickness
.187” AL 5086, .125” AL 1100/.020 NB, .375 SS 316L
Cut To Spec.
YIELD 22” x 42” = 924 SI

P/N: 98082-3
Material: AL/SS clad boss plate

1 3/4” total thickness
.750” AL 5086, .38” AL 1100, .020” NB, .75” 316L SS
YIELD 22” x 42” = 924 SI
Explosively Welded Metals

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

**Boss, Cres**

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

**Boss, “TM” - Transition Metal/Aluminum / Stainless Steel**

- P/N: 98015-1
- NSN: 5310-01-423-1330
- Material: Aluminum / Stainless Steel
- Size: 3/4" dia. X 1-1/2" long, 3/8-16 UNC X 5/8" DP

**Bond Strap Assembly, Type I**

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

**Bond Strap Assembly, “TM” - Transition Metal**

- P/N: 98091-1-**
- Material: None
- Nomenclature: Bond Strap Assembly, “TM” - Transition Metal
  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

**Bond Strap Assembly, Cres/Cres**

- P/N: 98083-1-**
- Material: None
- Nomenclature: Bond Strap Assembly, Cres/Cres
  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