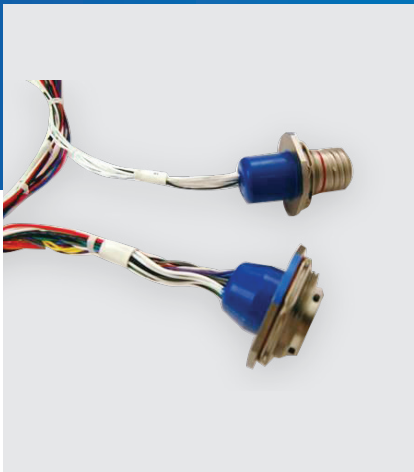




Douglas Electrical Components

FIVE REASONS TO DESIGN WITH A HERMETIC BACKPOTTED CONNECTOR



Engineers are frequently faces with environmental sealing challenges when designing connectivity solutions. An interconnect design might meet all electrical performance requirements, yet might not be capable of meeting the environmental demand of the equipment or systems. Fortunately, Douglas Electrical Components' backpotting process creates a better balance to meet design, signal performance, and availability challenges in the marketplace.



NOT ALL BACKPOTTING IS CREATED EQUAL

BACKPOTTING IS THE PROCESS OF SEALING THE BACKSIDE OF A CONNECTOR WITH EPOXY TO CREATE A WEATHER-PROOF OR HERMETIC SEAL.

Douglas Electrical converts traditionally non-hermetic connectors into a hermetic, moisture-tight electrical connection, beyond requirements for IP (ingress protection) ratings. A hermetic backpotted connector will not only seal against liquids, but also gases in vacuum and pressurized conditions. Backpotting connectors maintains backwards compatibility in an existing system while upgrading its hermeticity or gives flexibility to specify new, non-hermetic connectors in small and lightweight designs.

While the general concept of backpotting is relatively simple, Douglas Electrical Components uses proprietary materials and processes to ensure not only a weather-proof seal, but a hermetic seal capable of a leak rate of $< 1.0 \times 10^{-8}$ sccm He/second. Our engineering team factors in all component materials (housings, conductors, pins, jackets, etc.) the environmental conditions (pressure, temperature, media), and geometry to create the highest performing solution capable of meeting application demands. The team has extensive experience solving customer challenges and system failure modes across a range of industries and applications. While other companies can claim to meet hermetic standards, the Douglas Electrical process is nearly impossible to match.

VALUE ADDED CAPABILITIES

- Connectorized wire feedthrough assemblies.
- Full cable harnessing with hermetic properties for turn-key installation.
- Signal conditioning like filters
- Custom housing materials and machining, including unique geometries tailored to install, service, or constrained spaces.
- Directly integrate existing connectors, wires, cables, and termination boxes.

TECHNICAL ADVANTAGES

- Power solutions $> 30,000V$ AC.
- 100% quality control testing on all shipments, including Helium leak, pressure, and electrical tests.
- Robust, long-term sealing producing decades of reliable performance.
- Epoxy-based hermetic seals are chemically compatible with a variety of liquids and gases.
- Bulkhead fittings are available in standard off-the-shelf configurations or custom designed and utilize materials including brass, aluminum, plated steel, and stainless steel.
- Ability to use any cable materials, wire conductor types, AWG's, and lengths to customize to customer specifications.
- Integrate hermetic seals directly into active sensing elements, including sensors, filters, resistors/caps, and more.

INCREASE DESIGN OPTIONS



With backpotted connectors, engineers can customize materials, housings, and footprint to meet application demands. Epoxy-based hermetic feedthroughs are manufactured using a lower temperature than competing technologies such as glass-to-metal sealing. Doing so allows Douglas to use a variety and combination of materials including metals, aluminum, and plastics including plated connectors.

Our hermetic epoxy permits the sealing of standard, non-hermetic connectors, available with many insert configurations, mounting options, mating styles (bayonet, push-pull, metric, etc.) insert configurations, materials, contact types, and conductors to choose from.

Backpotted connectors can utilize the existing mounting options of the connector or engineers can partner with Douglas to integrate a sealed

mechanical assembly capable of an expanded pressure or temperature range allowed by a more robust mounting style in our RFW/RBTW technologies. This includes flanges and machined housings such as a jamnut/O-ring facesal or radial O-ring seal that can maintain a compact footprint and simplify installation.

Douglas hermetic connectors are available with various conductor material types including copper for higher conductivity ratings. Competing technologies are challenged by the temperature processing of the seal are limited to PCB pins or solder cups and particular conductor materials. Douglas also possesses the experience to hermetically seal with epoxy various conductor types to make a hermetic, moisture-tight seal, where a cable harness manufacturer might only seal to minimal IP-rated levels.

COMMON ELECTRICAL CONNECTION TYPES

- Solder Cups
- PCB Tails
- Flex / Rigid Circuits
- Wires / Cables
- Optical Fibers
- And More

**Note: Conductors can also integrate an inline connector for further plug-and-play integration.*

COMMON BACKPOTTED CONNECTORS

- MIL-Spec (including but not limited to 38999, 26482, 5015)
- Metric (M8, M12, M23)
- Circular Plastic Connectors (CPC)
- Push-pull
- High Power
- High Voltage
- USB
- RJ-45 / Ethernet
- Coaxial (including but not limited to BNC, MCX, SMA, SMC, TNC, 10-32)
- Thermocouple
- D-Sub / Micro-D
- And more!

**Note: Hermetically seal virtually any connector. This is simply a reference to commonly specified connectors.*

FUNCTIONAL INTEGRATION



Backpotted connectors first and foremost create a hermetic, moisture-tight seal at the bulkhead electrical connection. This protects power and/or signal connections from even the most difficult and challenging environmental conditions. Hermetic connections ensure the enclosure contents and electronics are protected against liquids and gases, from water vapor to fuels. Douglas does 100% inspection on all assemblies using Helium mass spectrometry leak detection to an allowable leak rate of $< 1.0 \times 10^{-8}$ sccm He/second, electrical hi-pot tests beyond 15Kv and electrical continuity testing.

Backpotted connectors can increase quality while decreasing production and assembly time. Douglas can pre-wire and create a turnkey assembly for drop-in installation. Backpotting also has the functional benefit of acting as a strain relief at the connection point between the cable and wires. With wire, cable, or optical fiber directly integrated into the backpotted assembly, the design benefits from strain relief between the conductors and the connector since the epoxy encapsulates the electrical connection; this decreases the risk of damage during installation and maintenance or electrical failure due to exposed

solder cups on glass-to-metal seals. Starting with a non-hermetic connector may allow you to use plastic or plated-steel connectors if they meet the application requirements. In certain cases, design engineers are looking to enhance an existing design where the connector is only available in a non-hermetic form. Our backpotting process bridges the gap to maintain backwards compatibility with previous designs and keep the same fit and form with enhanced function. Epoxy sealing increases dielectric strength at the backside of the connector by encapsulating the electrical connection completely.

The mechanical interface can also be customized. Backpotted connectors typically integrate the standard mechanical interface as the non-hermetic connector specified. This maintains a small, lightweight footprint in connectors without an off-the-shelf wall-mount configuration. Douglas also offers the PotCon Series to integrate bulkhead housings or customized flanges for mounting. This also helps the mechanical interface meet the same hermetic, moisture-tight seal as the backpotted connector itself. This also helps the mechanical interface meet the same hermetic, moisture-tight seal as the backpotted connector itself.



Hermetic M12 connector assembly with integral cable harnessing.



Hermetic push-pull connector with integral wires with water-blocking bond added to Teflon wire insulation.

REDUCE LEAD TIMES AND WEIGHT / SAVE MONEY

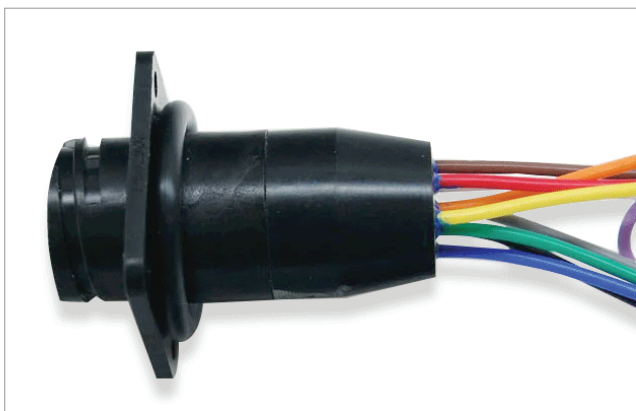


REDUCE LEAD TIMES

Non-hermetic connectors usually ship from stock, eliminating lead time delays that can occur with some standard hermetic connectors. Douglas Electrical can convert non-hermetic connectors into hermetic connectors using our backpotting process. Each connector is factory tested to ensure hermeticity.

Douglas Electrical Components manufactures backpotted connector assemblies with a typical lead time of 4-6 weeks AAO (After Acceptance of Order) with expedite options available. Even designs that are newly created can be manufactured within this timeframe.

Creating a backpotted assembly can also consolidate the need for multiple components within the assembly, thus reducing the time to source, receive, and inspect. Douglas' backpotted connector can integrate wires and integral (in-line) connectors that are functionally tested within our standard lead time by our IPC-620 certified manufacturing technicians and ISO 9001 quality system.



Hermetic circular plastic connector wires integrated into the assembly.

REDUCE WEIGHT

As referenced above in design options, epoxy is not limited by the manufacturing process temperature and coefficient of thermal expansion (CTE) like glass-to-metal hermetic connectors. It can bond directly to lightweight materials to create a hermetic seal at the connector while also encapsulating the electrical connection such as the solder joint between the connector pins and wire.

SAVE MONEY

Let Douglas Electrical create a connector assembly with pins, sockets, wires and cables that's both hermetic and creates a plug-and-play assembly to save you time and effort while increasing quality. This is particularly true in OEM applications, where customers are building assemblies; a robust electrical connection that is pre-tested increases manufacturing efficiency and thus saves time and money to deliver the final product. Douglas Electrical employs a LEAN manufacturing model capable of quick manufacturing turnaround even on custom assemblies. Our unique manufacturing model allows us to provide competitively priced solutions in the R&D phase through regular production and even support legacy system needs while reducing leadtimes and lowering the risks of shutting down critical production lines.



Hermetic backpotted MIL-spec connector with PCB interface designed to simplify installation and reduce lead time.

CONCLUSION



Douglas Electrical Components designs and manufactures hermetic, moisture-tight back-potted connector solutions for a variety of applications and industries. Take commercial, non-hermetic MIL-spec and industrial connectors, and create turkey, drop-in hermetic assemblies in competitive lead times. Design a plug-and-play solution with integrated wires, cables, connectors, circuits, or optical fibers to decrease your assembly time and components while increasing quality, electrical isolation, and strain relief. Increase design flexibility by choosing lightweight, compact connectors traditionally not available as hermetic for applications where weight and size are critical factors. Manufactured in our ISO 9001/14001 and ITAR/DFARS-compliant facility, hermetically sealed back-potted connectors are available for a variety of military and aerospace applications.

ADVANTAGES

- Material and assembly traceability
- Engineering expertise in variety of industries and applications
- LEAN manufacturing for cost competitive solutions
- ISO 9001 / 14001
- ITAR/DFARS
- Designed and Made in US
- Lead time
- Customization capabilities



Hermetic MIL-spec connector with integral PCB pins.



Hermetic MIL-DTL-38999 USB assembly

SPECIFICATIONS



Specifications	
Leak Rate	< 1x10 ⁻⁸ cc He/sec. Contact factory for more options.
Operating Temperature	-40°F to 275°F (-40°C to 135°C) Consult factory for expanded thermal range assemblies
Pressure Rating	Up to 100 PSI standard; higher pressures available upon request
Current Rating	
Voltage Resistance	Connector dependent; contact factory.
Hipot	Assembly is hipot tested at connector rating
Radiation	@ 1.5 x 10 ⁶ Rads/hr for 200 x 10 ⁶ Rads total. Leakage to He < 3.0 x 10 ⁻⁸ Std cc He/sec, Pin-Pin resistance > 1x10 ¹² Ω (AECL 29-63174-300-000)
Flame Resistance	UL File No. E92366 rated UL-94HB; Also tested at White Sands by NASA: WSTF 79-11713, JSC #0945, NASA NHB 8060.1A. Passed. Self-extinguished and no ignition @ 130 amps on a #12 AWG wire.
Water Vapor Transmission	0.7 0.2 gms/m ² day, 0.125 mil sample thickness
Outgassing	In accordance with NASA ASTM E-595-93

ISO CERTIFIED

ISO9001:2015
ISO 14001: 2015

ITAR REGISTERED

ITAR, DDTC, and DFARS
compliant assemblies

RoHS

Conflict Materials-
and ROHS-compliant
assemblies

IPC-620

IPC/WHMA-A-620
Certified Trainers and
Application Specialists



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