Greene Tweed

Seal-Connect® Solutions

Why Greene, Tweed Seal-Connect®?

Greene, Tweed's Seal-Connect® product line has evolved over 30 years of experience, partnering with the largest oilfield service companies in the world to maximize downhole reliability. Seal-Connect® products move electrical signals while maintaining a seal in upstream operations, such as drilling, completions, and production.

Greene, Tweed pioneered the Seal-Connect® product line for the oil industry, and our connectors are in wide use with major oilfield service companies. When uptime matters, our customers trust Greene, Tweed for our high-quality electrical connectors manufactured from our best-in-class materials for reliable and consistent performance in critical applications.

Our Seal-Connect® solutions ensure measurement accuracy and maintain signal integrity during critical operations in challenging environments, even as operating parameters become more extreme. Seal-Connect® pressure-rated electrical connectors are rated to 232°C (450°F) and up to 35,000 psi, with specialized designs for 260°C (500°F) and 45,000 psi.

Our portfolio of Seal-Connect® solutions has been developed over decades in collaboration with equipment manufacturers, service providers, and operators. During our long history of research and development, we have commercialized hundreds of unique solutions leveraging elastomeric and thermoplastic materials and have been granted more than 80 U.S. and foreign patents.

Greene, Tweed pioneered the use of PEEK with its Arlon® family of materials to overcome the inherent weaknesses in glass-to-metal connectors. Our Advanced Technology Group focuses on new material development, and the team includes PhDs in diverse disciplines such as Polymer Science, Chemistry, Mechanical Engineering, and Coatings. We have in-house testing capabilities for material characterization, fluid aging, rapid gas decompression (RGD), high-pressure high-temperature (HPHT) cycling, vibration, and more.

We rigorously batch test our raw materials at our ISO 17025-certified materials lab before we manufacture those materials at our ISO 9001-accredited facilities using industry-leading compression and injection-molding capabilities. All of our products must pass strict quality inspection criteria prior to shipping.

Our applications engineering team has experience designing equipment at OEMs and service companies in the industries we serve. As such, Greene, Tweed's engineers understand the needs of the energy industry, as well as the failure modes of materials in a wide range of operating environments. We collaborate with our customers to select and provide the best solution for the application to keep operations running safely and reliably.

The Case for Seal-Connect®

Greene, Tweed's Seal-Connect® product line ensures consistent and reliable electrical connection and transmission in measurement while drilling (MWD), logging while drilling (LWD), directional drilling, and wireline applications. Other applications include electrical submersible pumps, production monitoring, flow meters, and similar critical equipment.

Our Seal-Connect® connectors offer superior performance over traditional glass-to-metal technology:

- Maintain electrical insulation resistance performance in high-temperature and high-moisture environments
- Extend additional power to applications due to greater selection of pin materials and pin density
- Provide reliable sealing
- Are less influenced by thermal fatigue, due to temperature cycling

Greene, Tweed keeps an extensive inventory of Seal-Connect® drop-in parts and can ship stocked parts within 48 hours. Non-stocked parts can be available as quickly as six weeks.

Materials

Seal-Connect® uses Greene, Tweed's proprietary Arlon® PEEK and PEK thermoplastics, which have excellent high-temperature insulation resistance and broad chemical compatibility. Arlon® may be used with a variety of metals to produce and maintain a hermetic seal throughout the operating temperature range.

The ability to injection-mold Arlon® PEEK and PEK enables close clustering of pins and greater insulation resistance. Greene, Tweed can custom-engineer small connectors with high pin densities to help maximize available space in critical downhole applications. Our robust designs are more resilient to vibration and shock than glass-to-metal and other lower-grade polymer connectors, while our molding and machining processes ensure a consistently high-quality product.

Traditionally, conductors have been made from a wide variety of materials, including beryllium copper, nickel silver, Inconel, and stainless steel. Greene, Tweed recommends beryllium copper and tellurium copper for Seal-Connect® contacts. Beryllium copper, a manufacturing standard, offers high strength and good conductivity. Tellurium copper provides higher conductivity and an improved current-carrying capacity. Custom options for pin materials are available when conditions dictate.

Seal-Connect® can be used in conjunction with other Greene, Tweed products, such as Chemraz® FFKM and Fusion™ FKM sealing solutions to match certain environmental conditions, such as temperature, pressure, and chemical compatibility. Geometries include o-rings, MSE® (metal spring energized) seals, G-T® rings, and more.

Rating	Compound	Material	Benefits
Good	Arlon® 1000 Arlon® 1160	Virgin and glass-filled PEEK	• Compatible with most wellbore fluids • A strong insulator
Better	Arlon® 2000 Arlon® 2400	Virgin and glass-filled PEK	• Higher Tg than Arlon® 1000 • Most extreme temperature applications to 232°C (450°F)
Best	Arlon® 3000 XT	Cross-linked PEEK	• Tg temperature is approximately 30°C higher than virgin PEEK • Enhanced performance in HPHT environments for even more extreme applications

Types

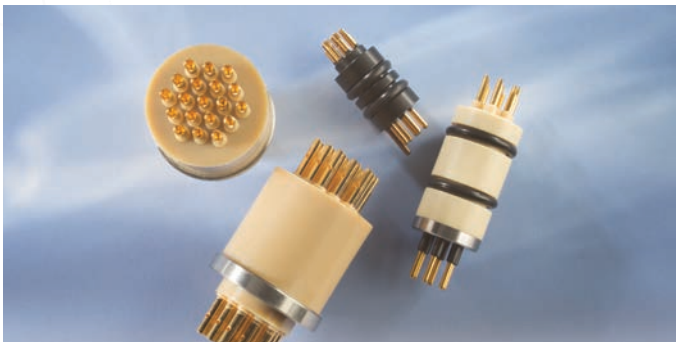
Single-Pin and Coaxial

Single-pin and coaxial Seal-Connect® designs provide secure, reliable power and signal transmission in rugged environments. They are most commonly offered in Arlon® 2000 or 3000 XT materials, with copper alloy contacts, unless otherwise specified.

Our Greene, Tweed connectors can operate in environments to 35,000 psi and 260°C (500°F).

We offer hundreds of single-pin designs with a variety of termination options, which can be engineered to match customer specifications or purchased from existing designs.

Multi-Pin



Seal-Connect® multi-pin connectors are injection-molded and designed to maximize electrical reliability and withstand continuous conditions up to 35,000 psi and 232°C (450°F). Multi-pin connectors are available in a variety of body types and pin counts, and our engineers can custom-design a solution to meet specific needs. Filled grades of Arlon® are also available.

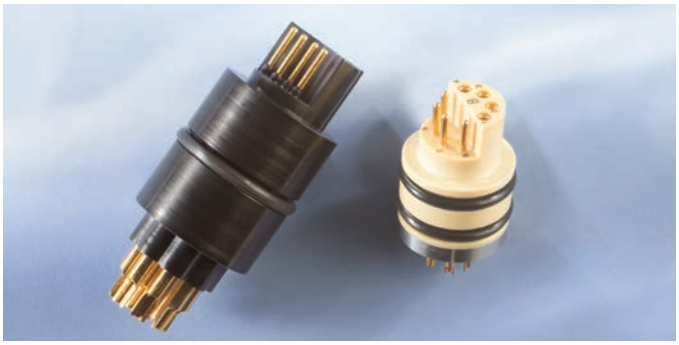
Rotatables

Greene, Tweed pioneered the use of PEEK-based rotatable connectors for downhole drilling applications. Today, we continue to offer standard and custom designs backed by decades of materials and application knowledge and validated by extensive field use.

Rotatable connectors are used at the threaded joint on downhole tool strings and work as a swivel connection as they mate. Greene, Tweed's rotatables offer superior corrosion resistance when exposed to wellbore fluids, including drilling mud, and can be integrated with bulkhead connectors to protect the electronics behind them.

Both male and female rotatable connectors are available with temperature capabilities to 232°C (450°F) and pressure ratings to 35,000 psi. We offer rotatable connectors in standard designs with up to 10 contact bands. Specialized designs of 11 to 13 contact bands can be engineered upon request.

Hermaphrodites



Hermaphrodite connectors have mating surfaces with both male and female contacts that are mated into identical opposite fittings for a keyed (fail-proof) installation. Our hermaphrodite connectors are rated to 204°C (399°F) and 20,000 psi. Multiple pin counts are available on request.

Boots

Seal-Connect® electrical connectors often require an elastomeric connector boot to seal against pressure and conductive fluids.

Connector boots are available in various styles to allow interchangeability with existing connector systems or the exclusive use of a Seal-Connect® system. We offer single-pin and multi-pin boots and can create assemblies to suit specific needs.

Boot designs leverage Greene, Tweed's non-conductive grades of Chemraz® FFKM and Fusion™ FKM elastomers, some of which are qualified under ISO 23936-2 and NORSOK M-710 standards for RGD resistance.

Contact Blocks

Contact blocks are often required as part of the Seal-Connect® connection system, and can be custom-designed to match existing connector configurations.

Contact blocks are available in male and female versions and single-pin, coaxial, and multi-pin configurations. They are also available with pin number identification, removable contacts, moisture barrier seals, or booted arrangements.

Custom Needs

When a standard design falls short of meeting the specifications of an extreme application, Greene, Tweed's industry-experienced design and application engineers collaborate to meet the challenge with their deep understanding of materials, equipment, and customer requirements.

We evaluate and offer solutions to critical industry challenges such as HPHT and shock and vibration through the innovative use of Greene, Tweed's best-in-class materials portfolio. Our in-house design capabilities include 3D modeling, rapid prototyping, and finite element analysis (FEA), including thermal-electrical analysis; dynamic, thermal, and thermo-mechanical analysis; and material flow modeling.

The Power of the Portfolio

The diverse portfolio Greene, Tweed has developed over the years makes it possible to provide reliable electrical connection technology for applications across a range of temperatures and pressures. These connectors ensure reliable communication and power in operating conditions to 232°C (450°F) and 35,000 psi.

Greene, Tweed's engineering and materials science expertise are behind our diverse Seal-Connect® portfolio. While Greene, Tweed does keep an extensive inventory of Seal-Connect® drop-in parts available, we specialize in in-house design, prototyping, testing, and manufacturing services for custom solutions to meet any application requirement.

Our engineers understand the problems our customers face. Our team of experienced design and field application engineers can work with you to recommend and provide solutions to your problems.

Greene Tweed

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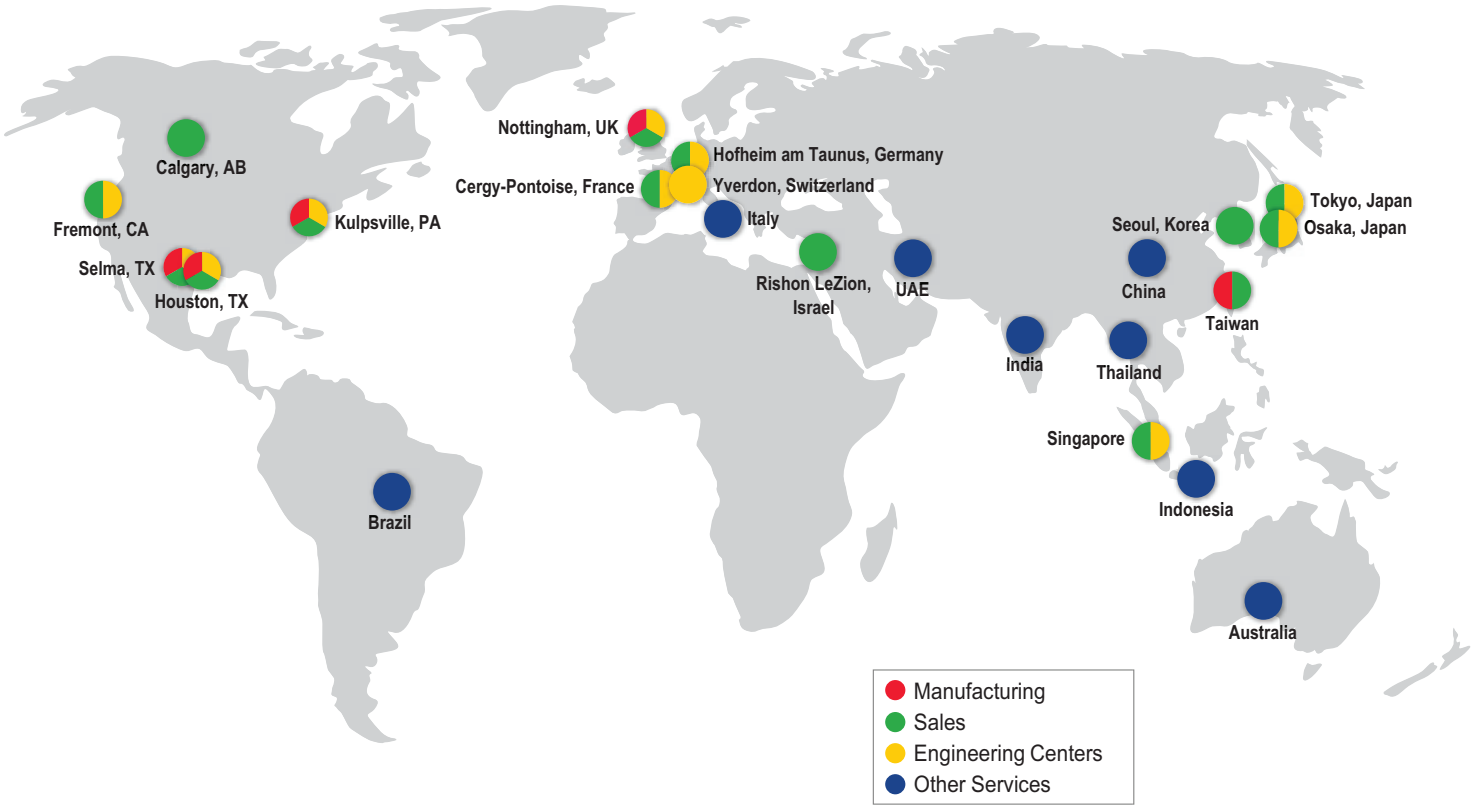
Where We Play

Global Presence, Local Service.

With more than 1,600 employees across 11 countries, Greene, Tweed offers material, design, engineering, and manufacturing expertise worldwide, collaborating with customers to meet their critical challenges through the development of custom-designed, leading-edge components.



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