Seal-Connect®
Mechanical Characteristics

Connector Components

For decades, single-pin connectors have been indispensable in sealing off electronics from the abusive downhole environments. Often these connectors are the last line of defense against flooding extremely expensive and vital electronic assemblies.

In a less catastrophic context, the ability of a connector to seal reliably and not introduce unanticipated current drain is important with respect to power consumption and accurate data collection. Therefore, the mechanical integrity of the connector system has a significant impact on downhole tool performance.

The booted bulkhead single-pin connector assembly has four critical sealing elements. The first is the Arlon®-to- metal interface around the conductive pin. The injection-molded thermoplastic doesn't chemically bond to most of the conductor materials. Instead, what is created is a homogeneous molding whose viscosity and shrinkage allow it to conform to specially designed pins. Post-molding annealing cycles proprietary to Greene Tweed relieve excess stress levels without corrupting this plastic to metal "bond."

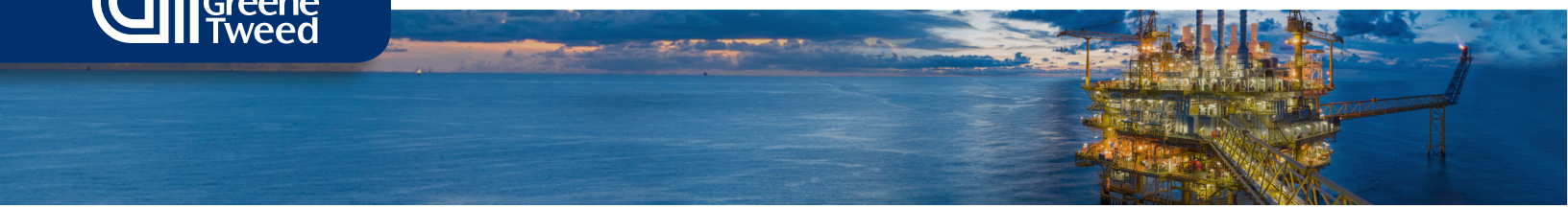
Other sealing elements include the standard o-ring glands, and two critical areas of the connector boot. Seal-Connect® o-ring glands are typically held to 0.001 in. (0.0025 cm) total tolerance and are slightly modified to ensure high-pressure sealing and proper loading on the Arlon® connector body. Excellent surface finishes of 32 RMS or better are obtained both in the o-ring area and on the Arlon® at the boot interface.

Mechanically, thermoplastic connectors are not as robust as their metal counterparts. However, in most applications the benefits of electrical isolation far outweigh the reduction in total strength. As mentioned in the testing section of this guide, Greene Tweed stands behind the mechanical integrity of these connectors. Each relevant mechanical parameter is addressed as follows.

The main load induced in a pressurized environment is that transferred by the o-ring to compression on the load bearing shoulder. For example, a 0.312 in. (0.794 cm) diameter o-ring in a 20,000-psi differential pressure environment will impart an ultimate force of 1,530 lb onto the shoulder. This could mean compressive stress levels as high as 55,000 psi on the small bearing area. Of course, no grade of Arlon® exhibits compressive strength values of this magnitude, as defined by ASTM D695. However, when the Arlon® connector bodies are contained in a properly machined mounting bore they survive stress levels that far exceed this value. The material's excellent elongation allows it to move somewhat to absorb these stress levels without substantial permanent deformation. This movement, usually referred to in a negative context as creep, is actually beneficial in a properly designed Seal-Connect® connector system.

Contact Us
Greene Tweed
Houston, TX, USA
Tel: +1.281.765.4500
Fax: +1.281.821.2696

EN-DS043-US-08-18-2016



Other loading prevalent in many connectors is the installation torque. As expected, Arlon® connectors cannot be stressed highly during installation. Typically, seating torque of 8 to 10 lb is specified for a 1/4-28 UNF class 2 thread form. Over-torquing these connectors will cause the Arlon® threads to strip. This failure, while rendering the connector scrap, is much better than installation torque damage on a comparable glass-to-metal part. Over-torquing a glass-to-metal part could cause a small crack in the brittle internal seals that would not be detected until in-service, when enough moisture infiltrates this crack and causes electrical leakage.

Similarly, slightly bent pins during the installation or use of a glass-to-metal part can cause a failure. Not only does the Seal-Connect® manufacturing method enable higher strength conductor pin materials, but if a bending load is imparted to the pin, the Arlon® again responds with enough elongation to preserve a hermetic seal. This, coupled with the fact that the Arlon®-to-metal bond extends along the entire length of the pin, ensures that a bent-exposed pin is no reason to discard the part. If possible, the pin could be realigned adequately to mate with its socket and used repeatedly.

Contact Us
Greene Tweed
Houston, TX, USA
Tel: +1.281.765.4500
Fax: +1.281.821.2696

EN-DS043-US-08-18-2016