40PC Building Block Manifold Mount Application – Note #5

HEATING EFFECTS ON SEALING INTERFACE

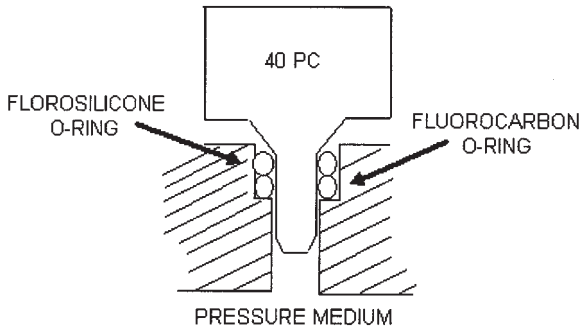
Careful consideration must be given to the design of the sealing interface between the second level package and the 40PC. Specifically, care must be taken to select a seal material that will withstand the specified temperature extremes while maintaining sealing capabilities when exposed to the application's pressure media. In the past, finding a seal material that satisfied these two requirements had been extremely difficult. One approach is the use of two O-rings, each made of a different material, placed in series. In this approach, one material has exceptional sealing capabilities within the specified temperature range and the other material provides resistance against the pressure media.

FUEL PRESSURE APPLICATIONS

For example, in an automotive fuel pressure application where temperature ranges are often specified at −50°C to 150°C, a fluorosilicone O-ring may be used. The fluorosilicone material provides superior sealing performance at this temperature range, especially at the lower temperatures. However, it will not maintain its sealing when exposed to automotive fuels. A fluorocarbon O-ring provides excellent resistance to automotive fuels, aliphatic hydrocarbons, and aromatic hydrocarbons, but it does not possess the low temperature sealing capabilities of fluorosilicone. While each material alone will not meet the sealing requirements of this application individually, assembling two O-rings, one of fluorosilicone and one of fluorocarbon provides both temperature and pressure media sealing performance.

The O-ring materials are important to the sealing performance of the second level package. The order in which they are assembled in relation to the pressure medium is also important. The O-ring that is resistant to the pressure medium should be placed first, closest to the medium. Referring back to the automotive fuel pressure example, the fluorocarbon O-ring should be closest to the pressure medium. See Figure 1.

Figure 1. Fluorosilicone, fluorocarbon O-ring sealing



The intended sealing of the 40PC is a radial seal along the surface of the small diameter of the stainless steel port, before the taper feature of the large diameter. Using the small diameter as the sealing surface provides a large radial surface for both O-rings to seal against, and accommodates the extra room needed when the O-rings are squeezed upon assembly. The second level O-ring pocket should be designed to yield a minimum and maximum O-ring squeeze of about 16 to 30% respectively, to ensure proper sealing.

Place the O-rings into the second level O-ring pocket. Then insert the 40PC port into the O-rings. Proper position of the O-rings on the port and their position in the pocket are better controlled. Care should be taken not to tear or rip the O-rings with the 40PC port tip during assembly. Even the slightest damage can result in a insufficient seal and cause a failure. A polytetrafluoroethylene coating may be applied to the O-rings before assembly to create a slippery surface that will aid the insertion of the port into the O-rings.