

# ORD Problem Solved!

## Compression Set

### O-Ring Failure

Compression set is a term referring to the flattening or loss of the original, circular shape on all contact surfaces of an elastomeric seal. As one of the most common causes of o-ring failure, compression set can be attributed to various conditions, such as excessive squeeze, incompatible fluid, improper gland design and gland overfill (see Failure Analysis table below). However, the most common cause is a low quality elastomer with poor set resistance.

There are several ways you can correct leakage due to compression set in your application. Whenever possible, it is best to use a “low-set” o-ring material that is compatible with the application’s environment. In addition, review test reports for best compression set properties, reduce system operating temperature when application and check frictional heat build-up at seal interface and reduce if excessive. For more information, refer to the Parker O-Ring Handbook (ORD 5700) to help determine proper gland dimensions.

## Application Success Story

### Application:

Hot air heat exchanger piping

### Problem:

The customer was experiencing premature o-ring failure with a competitor’s FFKM. A combination of high pressure, severe vibration and temperatures reaching up to 600°F caused compression set and mechanical tearing of the o-ring.

The o-ring was only lasting for about 600 thermal cycles in the customer’s application. To accommodate the current preventive maintenance schedule, the o-ring needed to reach 2,000 cycles. Because of the time and cost of the existing ring, the customer was hoping to even getting to 1,000 cycles. Even though this was not the ideal solution, finding an o-ring to last at 1,000 cycles would be a much needed improvement.

### Parker Solution:

Parker worked with the customer to find both a short and long term solution. In addition to the compression set failure, the customer could not change their gland design. Parker recommended using FF200-75 to improve compression set resistance and a custom made o-ring to fit within the application itself.

### Outcome:

Matching the customer’s existing design with Parker compound FF200-75 provided a life expectancy of an average of 4,000 thermal cycles. In addition to the extended life of the o-ring, Parker’s custom-designed seals exceeded 30,000 cycles!



Characteristic compression set - high deformation seen as flattening on all contact surfaces.

Failure Analysis - Top Causes for Compression Set Leakage	
1.	Selection of O-ring material with inherently poor compression set properties.
2.	Improper gland design, particularly gland overfill condition
3.	Excessive temperature causing the o-ring to lose its elastic properties. (High temperatures may be caused by system fluids, external environmental factors or frictional heat build-up).
4.	Volume swell of the o-ring due to system fluid.
5.	Excessive squeeze due to over tightening of adjustable glands.
6.	Introduction of fluid incompatible with o-ring material.