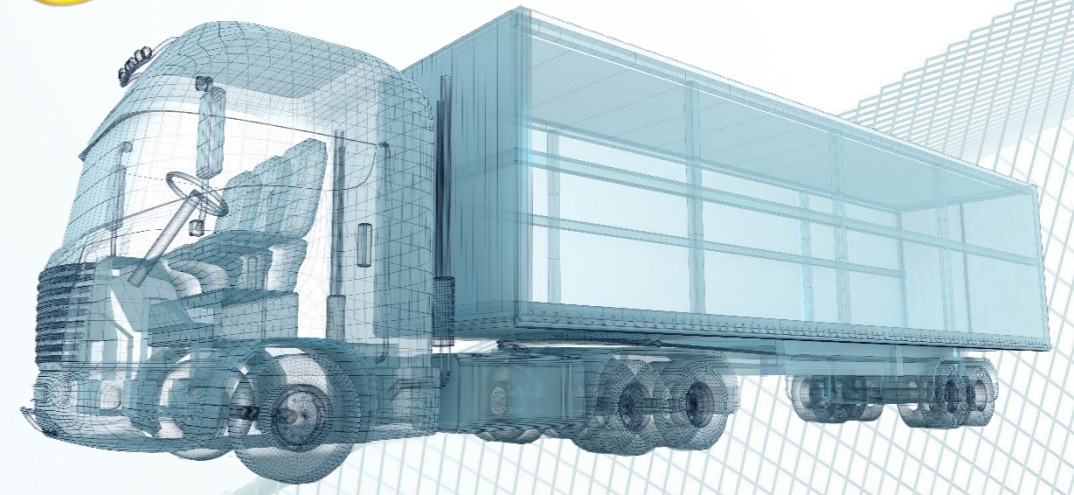




METAL SEALS

RELIABLE SEALING FOR CRITICAL ENVIRONMENTS



Challenge

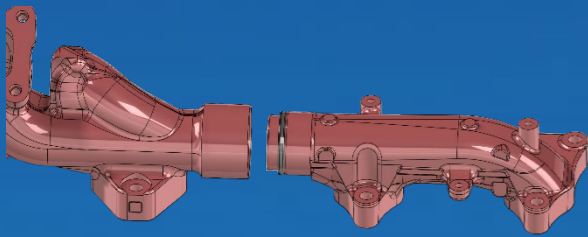
Solution

Features

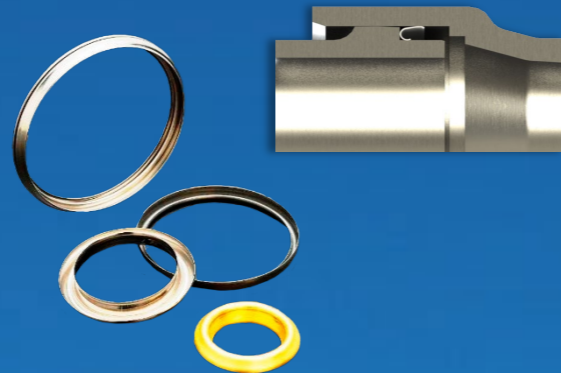
Benefits

Exhaust Manifold Slip Joint

Hot exhaust gas temperatures (>650°C)
Thermal Movement



External Dynamic Resilient
Metallic Lip Seals



- + 1 piece dimensionally stable solution
- + Thermal movement accommodated
- + Assembly stackups accommodated
- + 1,000,000 miles on road tested and passed
- + Expected Leak Rate:
<70 cc/min @ 6 Bar

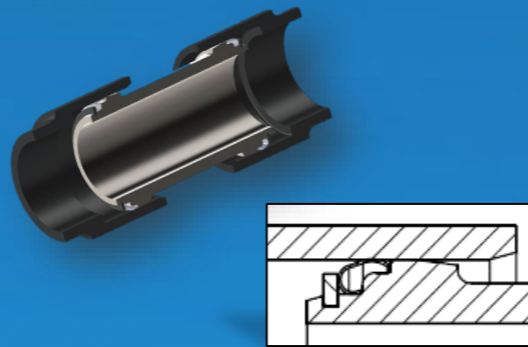
- ✓ Simple installation
- ✓ 2-5 degrees of misalignment
- ✓ Maintenance free during the lifecycle of exhaust manifold.
- ✓ Compliant with emission standards

Bellows Replacement

Thermal Movement
High Cost of welded bellows



Assembly of (2) Metallic Lip seal,
External Dynamic and (1) machined tube



- + Joint configuration creates ball joint
- + Thermal movement accommodated
- + Assembly stackups accommodated
- + No fasteners required to assemble
- + Expected Leak Rate:
<150 cc/min @ 6 Bar

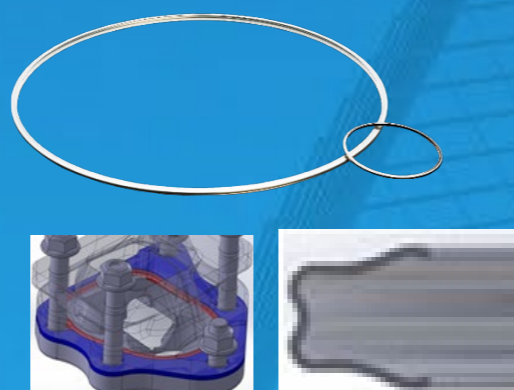
- ✓ No welding required and no fasteners 2-5 degrees of misalignment allowed
- ✓ Easier automation for the assembly

Turbo/Exhaust Manifold Interfaces

Non-uniform joint separation



Metallic turboseal, internal pressure
style, with or without retainer plate



- + Lowest load required: ~35 lbs/in circumference
- + 100% recover after 20% compression at room temperature
- + Assembly stackups accommodated
- + No fasteners required to assemble
- + Expected Leakage Rate:
<2 L/min @ 4 bar

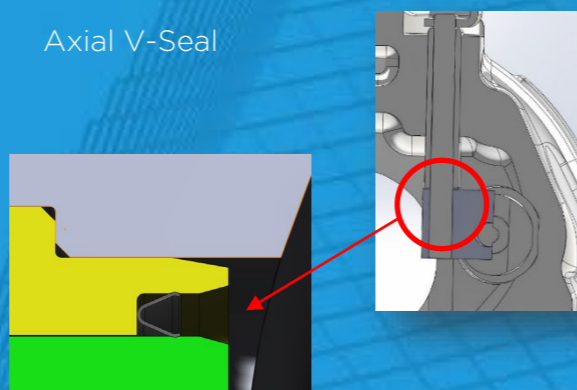
- ✓ Uneven joint separation accommodated
- ✓ Retainer option eliminates groove → less manufacturing cost!

Butterfly and wastegate Valves

Demanding location due to extreme
Temperature and movements



Axial V-Seal



- + Single piece solution
- + Allows for clearance between shaft and bushing arrangement
- + No external compression load required
- + Wear resistant coating to reduce wear
- + Expected leakage rate: <0.15 L/min @ 3 bar

- ✓ Prevents dirty exhaust gas leakage
- ✓ Improves turbo efficiency