

KAYDON

TURNING IDEAS INTO ENGINEERED SOLUTIONS



Industrial Shaft Seals

Kaydon's High Performance Fluid Seals for
Petrochemical & Gas Line Compressors

KAYDON RING & SEAL, INC.

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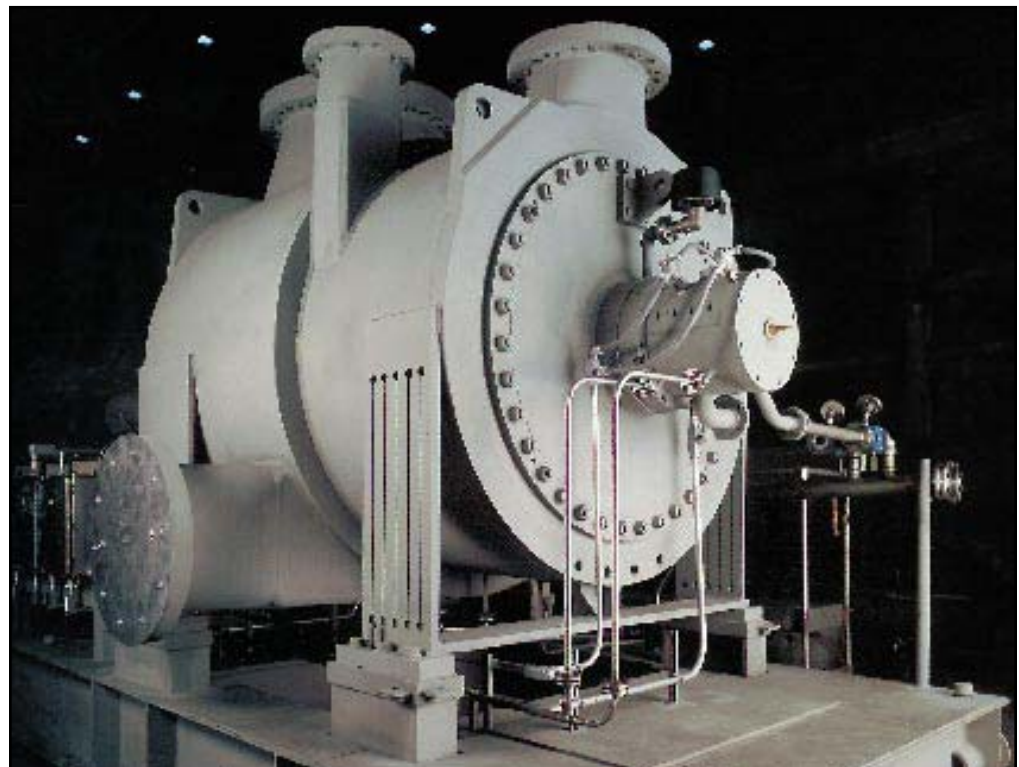
Industrial Shaft Seals

Custom Engineering Makes the Performance Difference!

Kaydon Ring and Seal, Inc. (formerly Koppers Company) continues our tradition of engineering seals to meet difficult and complex requirements as we have for over 40 years.

The following basic seal components can be applied in many arrangements and combinations to suit various sealing requirements, including sour or corrosive environments:

- Face Seal
- Circumferential
- Bushing
- Floating Ring
- Windback/Labyrinth
- Split assemblies are available for installation around shafts



Typical custom engineered seal configurations which were developed as solutions for particular operating conditions, are shown on the following pages — these configurations have been in trouble-free operation for many years. Designs based on the performance data described, have a minimum expected service life of several years.

Typical Performance Capabilities:

- Pressures to 3000 psi
- Speeds to 500 feet per second
- Temperature to 475°F

If your operating conditions are more severe, a Kaydon engineering evaluation will determine a viable sealing arrangement.

Material selection.

Based on application requirements and extensive history of material studies in Kaydon's Chemical and Metallurgical Laboratory, a wide spectrum of materials is available:

- Alloy Steels
- 300 and 400 Stainless
- NACE approved materials
- Corrosion resistant alloys:
Inconel® and Hastelloy®
- Cermets
- Ceramics

Prior to shipment, seals are extensively tested at full pressures and operating speeds to ensure performance characteristics. Kaydon test facilities include:

- Speeds to 35,000 RPM
- N₂ Pressures to 3,000 psig
- Oil Pressures to 4,500 psig
- Water Pressures to 450 psig

Consult Kaydon Engineering for your specific sealing needs. Advice and consultation are available on initial design and application. Written installation and maintenance instructions can be provided, as well as field engineering support.

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Liquid Buffered Face and Bushing Seals

Contact seals on the process side offer advantages over clearance seals. Liquid leakage to process (drain) is normally less than 5 GPD. They also maintain sealing at shutdown even with loss of buffer fluid.

Features:

- Steel-retained face seal and bushings for durability and stability
- Hard-faced mating surface
- Solid TFE secondaries
- Directional windback to discourage process contamination with buffer leakage
- Supplied in crossflow and non-crossflow versions
- Unitized assembly for ease of handling and installation
- Arrangements available up to 3,000 psig

Liquid Buffered Bushing Seals

Long the mainstay for sealing high-speed rotary process equipment, bushing seals from Kaydon are available in a wide variety of types and arrangements to control flows and contamination.

Features:

- Rugged carbon/steel retained assemblies
- Free floating rings with minimized hydraulic side loading for easier centering and reduced rotordynamic effects
- Hard-faced mating surfaces for durability
- Controlled liquid flows — typically less than 10 GPD to the sour oil drain
- Unitized assembly for ease of handling and installation

Multi-Ring Circumferential Barrier Seals

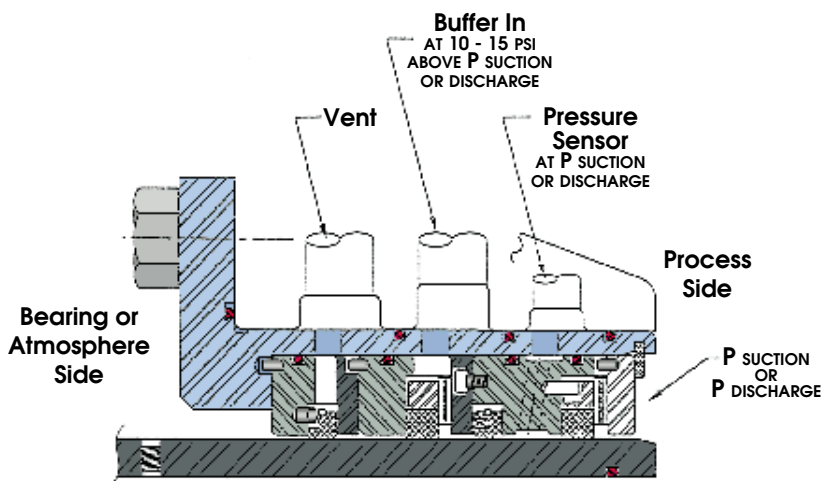
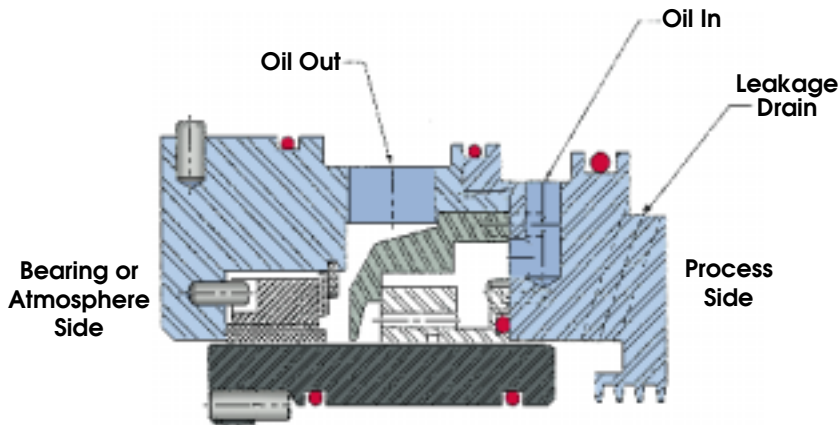
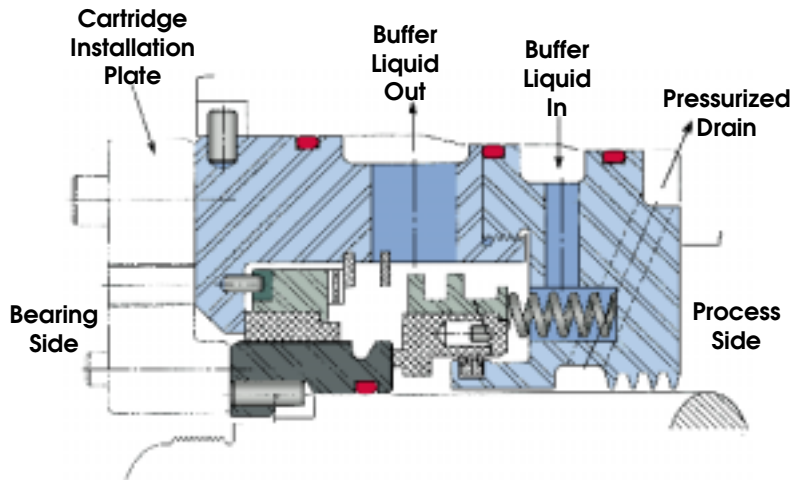
This versatile and innovative design configuration isolates both the process from bearing oil and prevents process leakage from escaping through the bearings.

Features:

- Compact, self-contained, cartridge design flanged for bolting as a primary seal
 - Constructed to withstand settle-out pressure during emergencies
 - Contact carbon seal rings segmented with over-lapping positive sealing joints
 - Leakages during normal operation less than 1 SCFM at pressure differentials less than 25 psig
 - Usually seals against hard faced shaft or sleeve
 - Normally air/gas buffered to 5-15 psi over vent pressure
 - Direct-sealing (non-buffered) designs available
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KB-56 Barrier Seals



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Industrial Shaft Seals

Kaydon Application List For Industrial Shaft Seals

Kaydon Designs and Manufactures Seals For The Most Demanding Compressor Applications

DEMAG DELAVAL TURBOMACHINERY / DELAVAL STORK / IMO INDUSTRIES COMPRESSORS

A-C COMPRESSOR / BELOIT POWER / FAIRBANKS MORSE CENTRIFUGAL & SCREW COMPRESSORS

DRESSER-RAND CENTRIFUGAL & SCREW COMPRESSORS

ELLIOTT TURBOMACHINERY COMPRESSORS

All the above systems are LIQUID BUFFERED FACE OR BUSHING SEAL applications.

Kaydon OIL SEAL applications are not limited to the compressors registered above, this is a representative sample. We produce O.E.M. compressor seals for *COOPER, SOLAR, NUOVO-PIGNONE, BHARAT HEAVY ELECTRICALS, EBARA* and others.

Kaydon Provides Service For Our Seals

KAYDON STANDARD REPAIR WORK SCOPE:

- Inspect seal parts and identify what parts can be reclaimed and what parts need to be repaired.
- Inspect parts and identify what caused the seal(s) to fail or leak in the compressor.
- Inspect sleeve/shoulder and metal parts for cracks. Furnish an NDT report on all metal parts if requested.
- Inspect threads on seal parts. Repair as necessary.
- Inspect hard faces for cracks. Replace as necessary.
- Check and record existing seal materials. Record Material on all new parts including O-rings.
- Inspect carbon faces and identify what caused the faces to chip.
- Inspect buffer gas bushings and clearances. Record findings, retain on file at Kaydon for that part history.
- Inspect oil bushings and clearances. Record findings, retain on file at Kaydon for that part history.
- Dimensional check all wear items against specifications.
- Replace all O-rings.
- Replace all springs.
- Replace all retainer rings.
- Re-spray, grind and lap hard coated faces as required.
- Reassemble and test seals to operating conditions.
- Furnish written report on seal failure and documentation on seal repair.

DYNAMICALLY TESTS ALL SEALS AT OPERATING SPEED AND PRESSURE.

Standard repair procedure for industrial shaft seals at Kaydon includes certification testing to OEM standards; test reports are included with shipments.

Full explanations and recommendations on seal wear and environmental conditionals are provided. Seal failure causes are analyzed and explained as necessary.

All costs are quoted at time of evaluation and any upgrades to designs are proposed and incorporated if approved by the customer.

Dynamic Seal Testing Beyond Performance Conditions

Kaydon's industrial seal customers enjoy highly reliable products; products that perform with extremely low leakage, even during machine transients. They probably think that highly advanced engineering and manufacturing techniques are responsible. They are right in part; however, another significant factor in providing high quality products is Kaydon's Dynamic Seal Testing Facility.

We test everything we make!

Kaydon's oil, water and gas seal products are manufactured to very close tolerances. They are assembled with utmost skill and attention to detail. Still, there is the chance that these precision components, when assembled into a seal, may not provide the expected performance. That's why, since its beginning, Kaydon has always tested each and every oil, water and gas seal made.



Testing is done on rigs capable of replicating actual field operating conditions... and beyond. This added margin of safety to contain and control becomes a known quantity, right along with the performance spec. That's important to customers.

Three basic test machines used for oil, water and gas seal testing are essentially identical, with minor, but important, differences. Each has a variable-speed prime mover (125, 150 and 200 HP). Two are directly coupled to a 10:1 speed-increasing gearbox. The 200 HP machine is connected to its 10:1 gearbox through a belt/jack shaft arrangement for low-speed testing. Each gearbox is coupled to

a test casing, which is very similar in construction to an overhung centrifugal compressor with oil lubricated, tilting pad, radial and thrust bearings.

The "front ends" of the three units are identical. Each has a 2.75" diameter by 7.50" long shaft protruding from a stationary faceplate. We simulate the seal area of a customer's compressor by mounting a stationary fixture to the faceplate, and a hub to the shaft.

For small diameter seals which operate at relatively low speeds (less than 17,000 RPM), we have a 1.06" shaft extension with its own faceplate and internal seal. This small-diameter unit is interchangeable on the three test rigs.

With the three "workhorse" test machines, we have the following mechanical test capabilities:

- Speed: 0 to 17,000 RPM
- Shaft Diameter: 1.50" to 12.0"

Because the three test machines have identical front ends, flexibility to suit production requirements is maintained.

Test Oil

- ISO VG 32 Turbine Oil with no metallic additives (Mobil DTE 797)
- Oil Pump capacity to 4,500 PSIG (40 GPM) and 750 PSIG (75 GPM)

Test Water

- Baltimore City water, filtered through 5-micron high-flow filters
- Water pump capacity to 450 PSIG (40 GPM)

Test Gas

- 36-bottle manifold nitrogen cache, supplied from in-house liquid nitrogen
- Pressures to 3000 PSIG
- Customizes gas mixtures available per order

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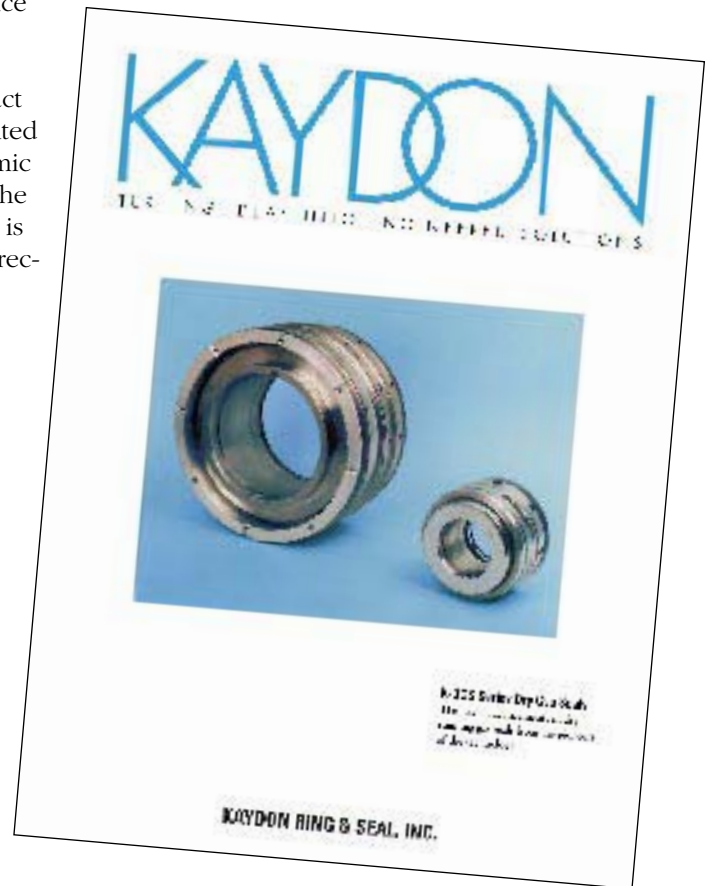
K-DGS Dry Gas Seals

Are you considering a switch to Dry Gas Seals?

If you are, you should call us and ask for information on our K-DGS Dry Gas Seals. We are the pioneers in dry gas seal technology. Since the early 1950s, Kaydon engineers have designed, manufactured and dynamically tested advanced seal designs for the compressor industry. Our first — and the original — dry gas seal went into service in 1951 and continues to operate today! One compressor manufacturer reports that the Kaydon dry gas seals, in operation since the early 1980s, continue to perform with over 1.5 million service hours so far.

The K-DGS is a non-contact seal which relies on patented Tapered Land hydrodynamic lift geometry to establish the DGS sealing face. K-DGS is available in uni- and bi-directional configurations.

For performance data which relates to your specific application, please call Kaydon today.



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