

KAYDON

TURNING IDEAS INTO ENGINEERED SOLUTIONS



Piston Rings & Seal Rings for:

- Railroad—Locomotive Engines & Components
- Aircraft—Turbines & Hydraulics
- Aircraft—Reciprocating Engines
- Compressors—Reciprocating
- Specialized Sealing Applications

Kaydon Piston Rings & Sealing Rings

Rings have a big job to do. Regardless of whether they are used in an aircraft, a locomotive, or a compressor, they are responsible for the performance standard of any system in which they are used. When the cost of the entire system is considered, rings are negligible in price; and yet, when a system needs to be pushed for performance, the performance of the rings makes them priceless!

With all of this performance on the line, the ring manufacturer you choose should be able to perform, too! If you are having a performance problem which requires a customized solution, you should be

talking with the people who have the experience, creativity, and manufacturing capability to respond. That's why you should be dealing with KAYDON.

Backed by over 100 years of material development experience, KAYDON's mechanical and metallurgical laboratories are constantly making innovations. New face geometries. New materials. New combination designs. All because new levels of performance are being specified by OEMs and users the world over.

If you have an application that you think may require a customized solution, you may be right; but KAYDON may have already solved a similar problem for someone else. It may even be part of KAYDON's standard offering! That's why you should consult a KAYDON sales engineer if you require a little extra performance. Whether you need a standard ring or a customized product, KAYDON offers effective solutions that other ring manufacturers just can't touch—for the value, for the quality, or for the delivery!

No matter how big; no matter how small, now you have one source for every ring application! Kaydon rings do their jobs better because every detail has been engineered and manufactured for performance.





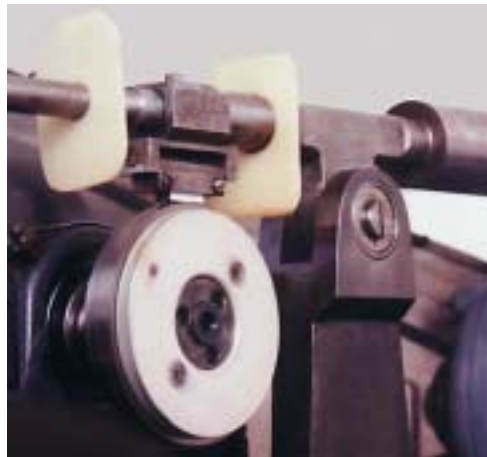
A key element in KAYDON's success as a precision manufacturer is the use of proprietary materials developed by KAYDON metallurgists. All Kaydon customers benefit from superior process control and the achievement of exacting metallurgical specifications.

KAYDON is unique in that we make piston rings and sealing rings completely under one roof. That lets us control quality—from the casting to the finished product! This internal foundry permits us to rapidly modify the material of products to match changes in your design criteria.

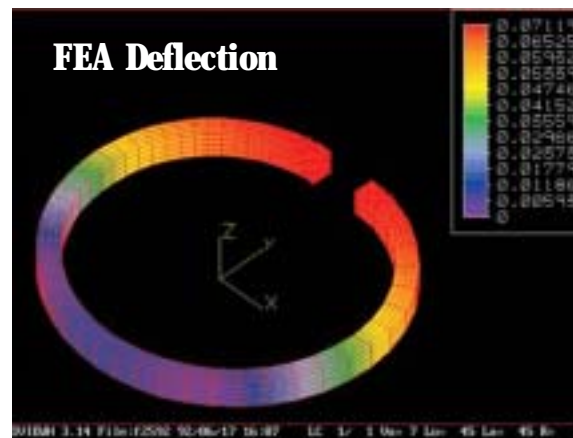
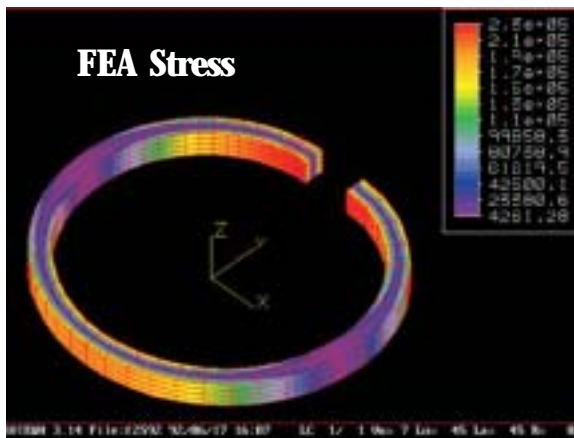


Comprehensive Analysis & Testing

KAYDON exhaustively tests its products. This list of tests are vigilantly performed and diligently scrutinized to ensure that every ring will perform to its specifications.



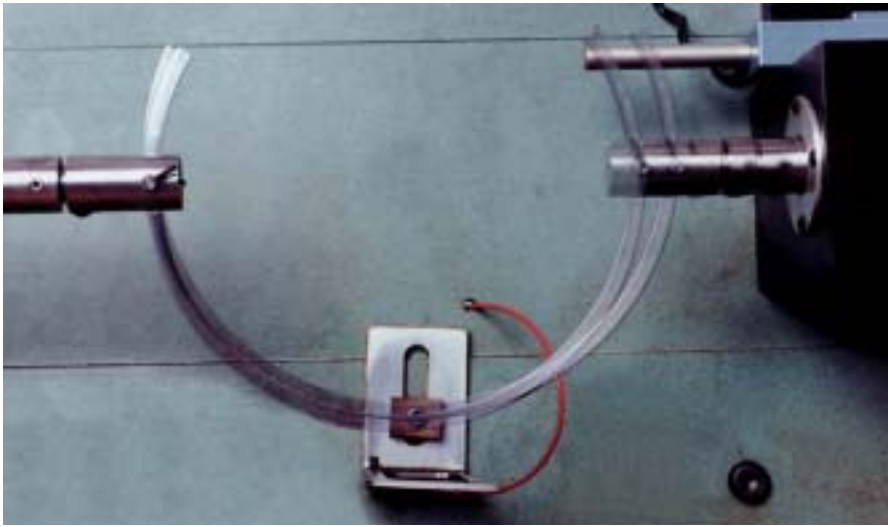
Wear testing: *This test rig is used to determine material compatibility. Through simulation of performance conditions, visual appearance and weight loss are used to analyze material combinations.*



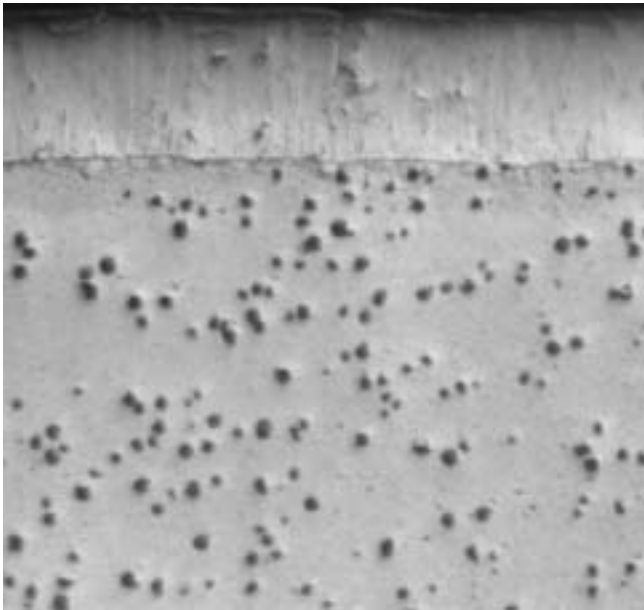
Finite Element Analysis—*FEA is a Computer Aided Design (CAD) tool which permits the study of components with math modeling to predict how material will react to specific environments.*

A combination of experience and CNC accuracy ensures that KAYDON rings consistently meet the exacting dimensional requirements of our customers.





Fatigue testing and failure analysis: *The dynamic deflection machine produces repeated stress reversals until it fractures. KAYDON engineers do the detective work to solve performance problems before they happen. The fracture and number of cycles are evaluated to determine the acceptability. This test also assures consistent product performance.*



Plating—internal controls

This photomicrograph shows the microstructure of the material at 100x magnification. On this example of a chrome plated ductile iron ring, it demonstrates the thickness of the chrome layer and the bonding of the interface.

Flow Leakage Testing
Pneumatic or hydraulic leakage testing of sealing rings using simulator rigs to duplicate actual operating conditions.



Value Added Services

As if providing a superior product is not enough (and these days it never is), KAYDON offers value added services to lower your costs and improve your bottom line even more!

On Time Delivery

In today's economy, you can't afford to stock more parts than you need in inventory. KAYDON has the solution with complete inventory monitoring and MRP reordering capabilities available. You won't be caught short, and your capital won't be tied up in inventory.

Electronic Data Interchange (EDI)

Let us team with you in managing your inventory. Through EDI, we can help you automate the purchasing function, driven by your actual demand and your forecasts. If you order certain sets of products, we can package those parts any way you'd like to facilitate handling and assign them one part number instead of several.



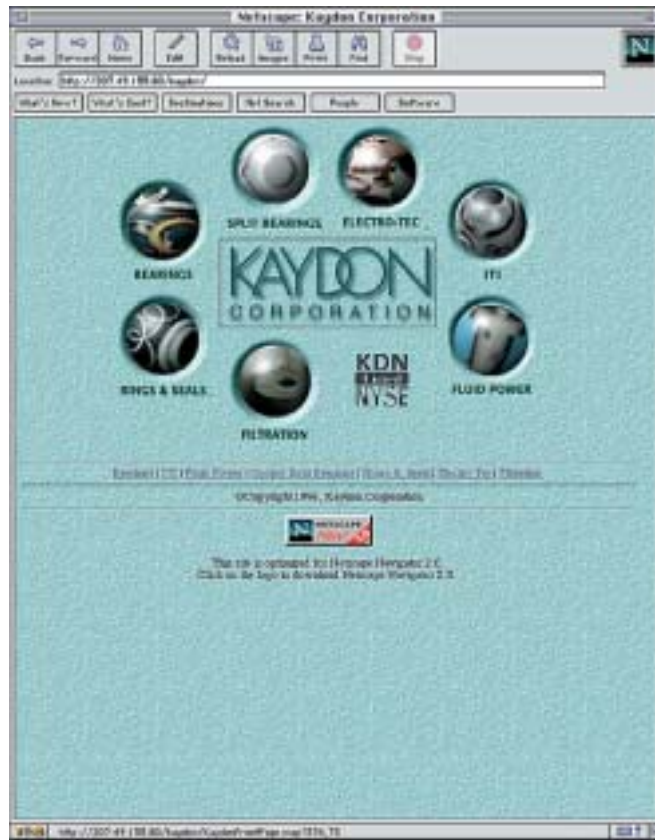
Custom Packaging: We provide individual packaging per customer specifications, impact resistant protective packaging for sealing rings and heat sealed packaging. Special set packaging assures that all parts are present for rapid assembly. Bar coding is also available.

Export Packaging: Kaydon exports parts around the globe. When we do, parts are packaged so they arrive ready to do their job in structurally sound, waterproof containers.



Kaydon Technical Support

Technical support from KAYDON is only a phone call away. We'll work with you to generate a design proposal, then work closely with you in developing a prototype. Our engineers follow up during the field testing phase to assure performance meets your expectations.



Our Web page URL: <http://www.kaydoncorp.com> is a place that changes regularly with new products being offered to solve common industry problems. E-mail is with your application. We may already have an engineering team on it! We'd be only too happy to keep you in the loop.

Technical seminars:
In this time of downsizing and technical staff reductions, your engineers can benefit from Kaydon's experience and knowledge in ring technology. Seminars are available for various class sizes in locomotive, aircraft, compressor, and other mechanical engineering fields.



RAILROADS



Since the inception of the Diesel electric locomotive in the 1940s, Kaydon has designed and produced power piston rings for the OEM and the major railroads worldwide. Through engineering evolution, Kaydon's specialty designs are the most effective in suppressing oil consumption, blow-by and souping. This leadership position in solving the performance problems of the industry is why Kaydon continues to be a source for innovation in the face of ever-changing requirements for power and sealing rings.

Railroad Applications



EMD Emission Control Power Ring Set

The chromium plated oil rings in this set maintain their dimensional integrity for 5 years. During their entire service life, they will control smoke emissions for unquestioned compliance with even the most demanding EPA standards. Their design is a KAYDON exclusive.



Turbocharger Sealing Assemblies Keep Locomotives Running Clean

KAYDON engineers designed a specialized assembly that seals the expansion cavity of a two-piece turbocharger housing. Thermal expansion caused leakage where the housing was joined. Kaydon's 21" (533mm) and 25.5" (648mm) diameter assemblies includes a wave spring to maintain the seal at temperatures up to 1200°F (649°C). The assembly reduces exhaust leaks, improves turbo efficiency, and can improve fuel economy. Plus, it brings locomotives equipped with this turbocharger seal assembly into FRA compliance, eliminating costly downtime. Let us manufacture and assemble multiple parts into higher level components for you to reduce your overall costs.



Lower Liner Insert Is A Reliable Fit

If you use any other lower liner insert for your routine rebuilds, you are playing the odds. And the odds of the engine going together properly the first time are completely unpredictable.

KAYDON's precise lower liner inserts are cast and machined right in our factory to the tightest tolerances which are required for a perfect fit the first time and every time.

Save the countless sessions of rework and the frustration of never knowing if you've done the job right. With KAYDON inserts, you'll do the job right the first time.



*For EMD model 645
and 710 engines.*

Anti-Shock Cushioning Devices

KAYDON's quality and knowledge of sealing, in conjunction with the cushioning device manufacturers, produced product modifications that helped a railroad line keep a major customer. When this major orange juice manufacturer shipped glass bottles of its product by rail, much of the product was destroyed from the shock of cars coupling.

For the ever changing demands of the cushioning devices, use KAYDON products and knowledge for the best results.



AIRCRAFT—SEALING RINGS



Sealing rings are highly engineered, intricate and precise products. Since 1955, we have been major suppliers to both commercial aviation and military aircraft manufacturers. We offer depth of experience, solid, reliable design and zero defect quality control to an industry that can ill afford anything less.

Applications for Sealing Rings

- Turbine Engines
- Valves
- Environmental Control Units
- Auxiliary Power Units
- Actuators

Aircraft Applications

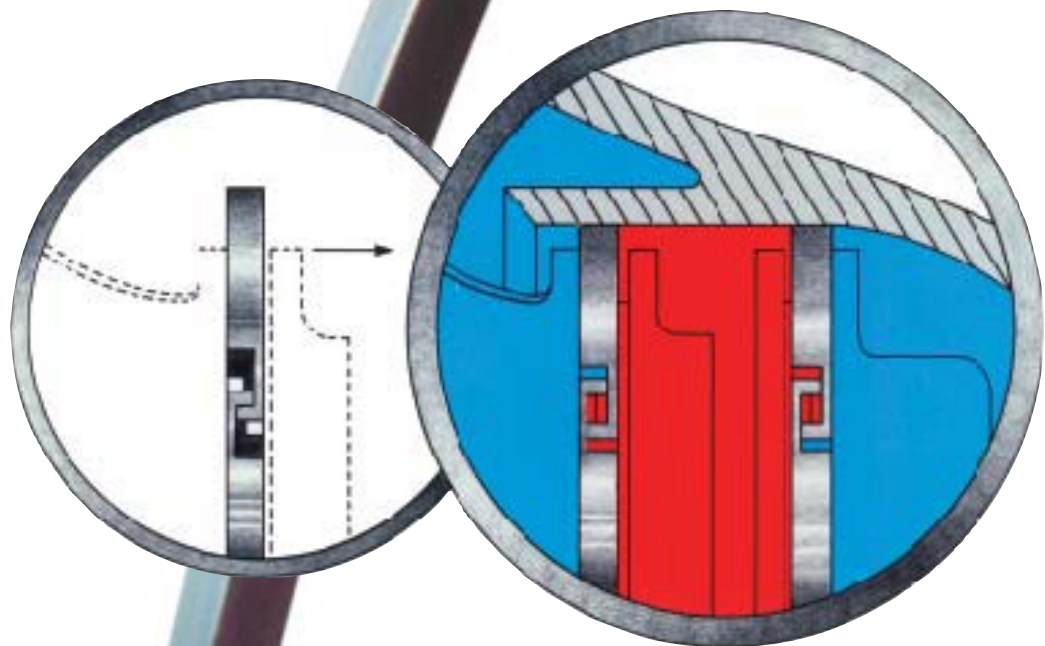
Blind Assembly Solved

Are you still using costly manhours to tape and super glue your rings for blind assembly? KAYDON's E-Kon performs like a step seal, but it also gives you locking capability for easy blind assembly.

This creative design was engineered in our own R&D laboratory in response to a common problem throughout the industry. The E-Kon sealing ring incorporation into gas turbines, transmissions and hydraulic cylinders proves the E-Kon design concept. E-Kon rings are available in practically any material. We will help you specify the right material and configuration for your application. Just call us.

Materials:

- Austenitic stainless steel
- Bronze
- High silicon irons
- Inconel
- Investment cast material
- Plastics
- Rene 41
- Stelite
- Waspaloy



Top Gun Worthy Control

Combat aircraft like the F-15 need fast response hydraulics to maneuver with split-second timing. That was the problem. The ailerons were not responding and the aircraft were not performing to specifications. The design that worked on paper was not working in the air.

KAYDON was given the challenge of solving this problem. A unique splitting design and a proprietary use of material now keeps our fighting force second to none in maneuverability.



Safety in the Heat of Battle

These metallic sealing rings are used in F-16 actuators to provide both low leakage and high temperature capabilities. In the event of a direct hit and an on-board hydraulic fire, these seals won't melt like PTFE seals. Our rings are designed to bring these birds home from the heat of battle—and live to fight again!

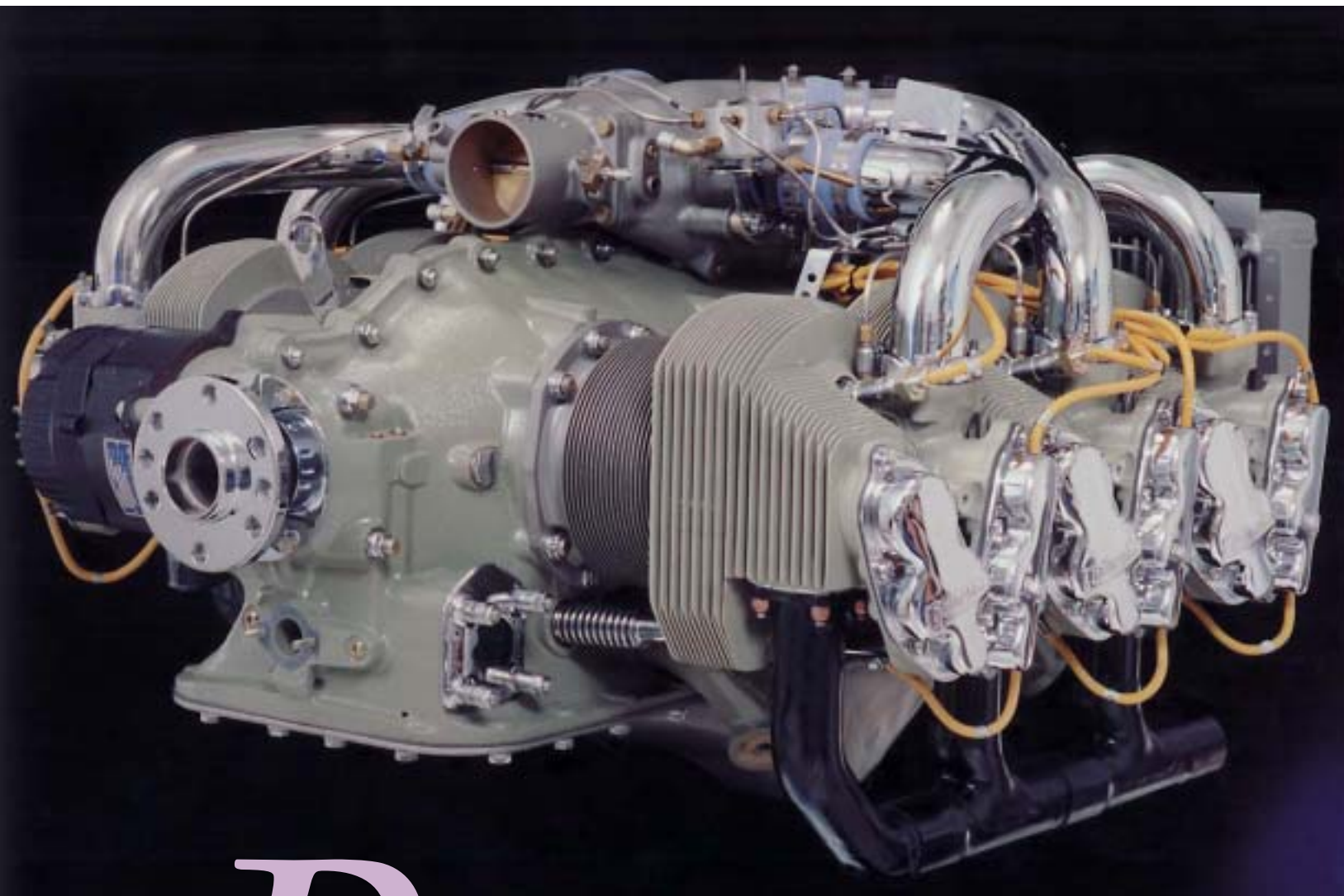


Not your standard gearbox seal!

Turboprop engine gearboxes, which transmit the entire torque into the propellers, are subjected to very high loads and speeds. In an attempt to reduce weight in many applications, the use of titanium is becoming more prevalent. Specific blends of PTFE and special balancing features were incorporated by Kaydon engineers to improve both sealing performance and life expectancy in this demanding application.



AIRCRAFT—RECIPROCATING ENGINES



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ack in 1912, Albert Wenzel developed a machine to hammer the inside of piston rings to provide tension which resulted in better sealing and longer engine life. By 1918, he made 250,000 rings per month—the American Hammered Piston Ring. In 1927, Koppers acquired this company and concentrated on aircraft applications, retaining the “American Hammered” trademark. KAYDON acquired Koppers in 1986, retaining the facility and engineering that revolutionized the industry. In the mid 80s, turbocharging created an operating environment that exceeded the strength limitations of malleable iron and AMS-7310. KAYDON developed the answer: the high strength alloyed grey iron known as K14D. Today, it remains the most reliable choice for long life in either steel or coated barrels.

Aircraft Power Rings

Whichever way you want to rebuild your engine, Kaydon has the rings.

When using new nitrided barrels, KAYDON plasma coated and chromium plated piston rings have been the industry standard for years in Teledyne Continental and Textron Lycoming engines. KAYDON rings consistently provide the 2000 hour TBO requirements of FAA and the industry.

When using channel chrome or other chromium coated remanufactured barrels, the Kaydon K-14D material has been—and continues to be—the industry standard for over 15 years. This material provides excellent compatibility and performance with chromium plated barrels.

K-14D has superior strength and breakage resistance as compared to AMS-7310 material.

With the influx of new cylinder coatings entering the market, consult KAYDON engineers and metallurgists for proper ring materials and designs.



COMPRESSORS—RECIPROCATING



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AYDON is the industry source for power rings for all of the reciprocating compressors in the natural gas and petrochemical industries, regardless of the liner coatings being used. Plus, KAYDON also produces a full line of PTFE sealing and rider rings which perform regardless of the type of gas being compressed. A ready source of engineered solutions, KAYDON's depth of experience is why they are the first to be called when a sealing application is being discussed.

Compressor Applications

Universal ring set—

One ring set that works for both iron or chrome liners!

For large bore integral compressors.

Materials selection to provide excellent compatibility for both iron or chromium plated bore surfaces. These ring sets also include state-of-the-art design features that provide the following: wear resistance, oil control, and blow-by control. Other value-added features: the ability to stock one part number for a given engine, regardless of cylinder configuration.



Non-metallic sealing and rider rings for non-lubricated compressors.

KAYDON produces the full line of PTFE filled materials, such as carbon, bronze, glass, moly, etc. These proprietary materials have been developed over the years for the most demanding applications. Stringent quality control procedures are implemented to assure consistent performance time after time.

SPECIALIZED APPLICATIONS



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AYDON provides metallic or non-metallic sealing rings for hydraulic and pneumatic cylinders, transmissions and other mechanical devices.



Transmission sealing rings for earth moving equipment.

The large spring-loaded joint is used in clutch assemblies. The PTFE step-joint rings are used in transmission sealing applications. Kaydon also provides a full line of PTFE and cast iron seals for all the hydraulic systems for industrial equipment.

These particular rings provide optimum leakage control, high pressure extrusion resistance. They can be provided in either solid or split configurations. If you're looking for a higher level of performance in the most demanding applications, call a KAYDON engineer for the right choice.





Low temperature sealing

Extrremely low temperatures in the area of -400°F (-240°C) can be difficult to obtain. In many applications, reciprocating pumps pull a vacuum that produces a low temperature cold head. Because even a minor loss in efficiency makes this impossible to do, KAYDON supplies a family of non-metallic seal rings with superior low friction and sealing characteristics.





Keystone Guide Rings for Spherical Roller Bearings

KAYDON not only provides products for all your sealing needs, but also provides precision machine components, such as guide

rings for spherical roller bearings. When you think of Kaydon, think also of precision machining capability of a non-sealing nature.

In this application, the rollers are in at an angle. The design tolerates a great latitude of shaft misalignment without creating exces-

sive loads on the roller. The guide rings keep the roller bearings in the proper position.



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