Rod Seals
for Hydraulic and Electromechanical Actuators in Aviation
(MIL-G-5514 / AS4716)
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Hydraulic sealing systems used in aviation technology applications are exposed to particularly challenging ambient influences such as extreme temperature fluctuations and aggressive pressure media. Major temperature fluctuations and aggressive media cause sealing materials to age faster than those used in conventional applications, resulting in impaired seal performance. Consequently, these application conditions and special mating surfaces require sealing systems that meet the required range of performance at high levels of reliability.

Rod seals for cylinders and actuators seal the applied system pressure toward the atmospheric side. They perform a critical function in preventing external leakage that may contaminate the immediate environment. A wide range of compound and profile configurations is available to meet the specific application profile.

The rod seals LB and LS have been specially developed for the safety-critical applications in aviation and offer high reliability and wear resistance due to their seal geometry and material selection.
Flight Control Systems

Flight control systems such as the landing flaps, the aileron, the rudder and the elevator ensure a safe and controlled flight and affect an aircraft’s lift and aerodynamic drag. In relevant flight attitudes, new technologies such as control electronics used in fly-by-wire systems keep the flight control systems in continuous motion and thus the actuators as well. These conditions require particularly wear-resistant sealing materials, as well as specifically optimized designs. Due to optimal matching of seal design and material, the LB and LS rod seals from Parker Prädifa combine robustness with enhanced wear behavior.

Propeller Engines

During the hydraulic adjustment of the rotor blades in propeller engines to set the desired pitch angle by means of the pitch cylinders reliable sealing performance in both low and high temperatures is crucial.

Landing Gear Systems

For comfortable takeoffs and safe landings, the landing gear components, and thus their sealing systems, have to resist high pressures and changing lateral forces. Taxiing in particular describes a critical stage during which heavy vibrations lead to high frequencies on the piston rod. This results in short-term high temperatures on the sealing edges which may lead to increased wear of the sealing material, among other things.

Due to suitable material selection, the LB and LS rod seals ensure highly stable sealing performance. In addition, the back-up rings protect the seals against extrusion in the event of pressure peaks occurring during the landing process.

Aircraft doors, Engine Nacelles

The hydraulic actuation of movable components on engine nacelles and aircraft doors is another key application. It includes the actuators for the cargo and passenger doors where the safety aspect is particularly important. Furthermore, the hydraulically movable components on the engine nacelle are important compensatory elements during maintenance work and as thrust reverser systems. Here the LB rod seal stands out particularly in terms of its insensitivity to pressure peaks and its exceptionally high static and dynamic sealing performance. The PTFE material of the LS rod seal is characterized by low breakaway and sliding friction. This reduces the stick-slip tendency at low sliding speeds and ensures uniform motion.
The LB rod seal is a lip seal with interference fit at the outer diameter. It is designed for installation in market-specific grooves according to MIL-G-5514 / AS4716 and used in hydraulic actuators in aviation applications, primarily where particularly high sealing performance and wear resistance are required and conventional compact seals do not satisfy the specific demands of the aviation industry.

The LB rod seal consists of an NBR lip ring and a PTFE anti-extrusion ring. Among other things, it is characterized by exceptionally high static and dynamic sealing performance which is achieved by optimized seal geometry on the static and on the dynamic side of the seal.

A back-up ring on the back of the seal provides improved extrusion resistance. When appropriate materials are selected, the LB rod seal is suitable for wide temperature ranges. If required, its wear resistance can also be further enhanced significantly by selecting suitable materials.

**Product Features**

- Exceptionally high static and dynamic sealing performance.
- Good wear resistance.
- Robust seal profile for harshest operating conditions.
- Insensitive to pressure peaks.
- High extrusion resistance.
- High temperature resistance in case of suitable compound selection.
- Dimensions according to MIL-G-5514 / AS4716.
**Range of Application**

Hydraulic actuators in aviation applications. The range of dimensions is oriented toward grooves according to MIL-G-5514 / AS4716.

- Operating pressure: ≤ 350 bar
- Operating temperature: -55 °C to +125 °C
- Sliding speed: ≤ 0.5 m/s

**Media**

- Synthetic-based lubricants, e.g. MIL-PRF-23699, MIL-PRF-7808
- Ester-based lubricants, e.g. Skydrol® LD4 and Skydrol® 500B
- Synthetic hydrocarbon-based hydraulic fluids, e.g. MIL-PRF-83282 and MIL-PRF-87257
- Mineral oil-based hydraulic fluids, e.g. MIL-H-5606

**Compounds**

- Rubber element: N4771, NBR-Compound (≈ 70 Shore A).
- Anti-extrusion ring: Polon® 074, modified PTFE + 10 % carbon fiber.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.

**Ordering Example**

Rod diameter 38.0 mm / Dash-Nummer #325 (MIL-G-5514 / AS4716)

<table>
<thead>
<tr>
<th>Order code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB 0325 00771</td>
<td>38.0 x 47.5 x 7.25</td>
</tr>
<tr>
<td>LB 0325 00772</td>
<td>38.0 x 47.5 x 8.60</td>
</tr>
<tr>
<td>LB 0325 00773</td>
<td>38.0 x 47.5 x 10.90</td>
</tr>
</tbody>
</table>

LB 0325 00771 / 38.0 x 47.5 x 7.25

LB Profile

0325 Dash number according to groove dimension #325

00771 Serial no. for short groove width
The LS rod seal is a rod sealing set featuring a Slipper Seal® design. It is designed for installation in market-specific grooves according to MIL-G-5514 / AS4716 and used in hydraulic and electromechanical actuators in aviation applications. It is particularly well-suited for high temperatures.

The LS rod seal consists of a PTFE rod sealing ring, a PTFE anti-extrusion ring and an elastomer O-ring as a preloading element. Due to its wide variety of material combinations, it is characterized by a diverse range of applications – particularly in use with aggressive media and in wide temperature fields, both in the low- and high-temperature ranges. The additional back-up ring at the back of the seal enhances extrusion resistance when pressure peaks occur and thus significantly increases the service life of the sealing system. The width of the back-up ring can be adjusted according to the groove so that in many cases there is no need for modification of an existing groove.

Product Features

- Exceptionally high static and dynamic sealing performance.
- Good wear resistance.
- Minimal break-away and dynamic friction and no stick-slip tendency ensures uniform motion even at low speeds.
- Insensitive to pressure peaks.
- High extrusion resistance.
- Adaptable to nearly all media thanks to high chemical resistance of the sealing ring and large O-ring compound selection.
- High temperature resistance in case of suitable compound selection.
- Dimensions according to MIL-G-5514 / AS4716.
Range of Application

Hydraulic or electromechanical actuators in aviation applications.
The range of dimensions is oriented toward grooves according to MIL-G-5514 / AS4716.

Operating pressure ≤ 400 bar
Operating temperature -55 °C to +200 °C
Sliding speed ≤ 4.0 m/s

Media
- Synthetic-based lubricants, e.g. MIL-PRF-23699, MIL-PRF-7808
- Ester-based lubricants, e.g. Skydrol® LD4 and Skydrol® 500B
- Synthetic hydrocarbon-based hydraulic fluids, e.g. MIL-PRF-83282 and MIL-PRF-87257
- Mineral oil-based hydraulic fluids, e.g. MIL-H-5606

Compounds

Sealing ring: Polon® 063, modified PTFE with carbon fiber.
O-ring: N4771, NBR elastomer with approx. 70 Shore A.
Anti-extrusion ring: Polon® 074, modified PTFE + 10% carbon fiber.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.

Ordering example

Rod diameter 38.0 mm / dash number #325 (MIL-G-5514 / AS4716)

<table>
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<tr>
<th>Order code</th>
<th>Description</th>
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<tbody>
<tr>
<td>LS 0325 00881 / 38.0 x 47.5 x 7.25</td>
<td>Short groove width</td>
</tr>
<tr>
<td>LS 0325 00882 / 38.0 x 47.5 x 8.60</td>
<td>Medium groove width</td>
</tr>
<tr>
<td>LS 0325 00883 / 38.0 x 47.5 x 10.90</td>
<td>Long groove width</td>
</tr>
</tbody>
</table>

LS 0325 00881 / 38.0 x 47.5 x 7.25
LB    Profile
0325   Dash number according to groove dimension #325
00881  Serial no. for short groove width
These products can expose you to chemicals including carbon black (airborne and extracts), antimony trioxide, titanium dioxide, silica (crystalline), di(2-ethylhexyl)phthalate, ethylene thiourea, acrylonitrile, 1,3-butadiene, epichlorohydrin, toluenediisocyanate, tetrafluoroethylene, ethylbenzene, formaldehyde, furfuryl alcohol, glass fibers, methyl isobutyl ketone, nickel (metallic and compounds), lead and lead compounds which are known to the State of California to cause cancer; and 1,3-butadiene, epichlorohydrin, di(2-ethylhexyl)phthalate, di-isodecyl phthalate, ethylene thiourea, methyl isobutyl ketone, methanol, toluene, lead and lead compounds which are known to the State of California to cause birth defects and other reproductive harm. For more information go to www.P65Warnings.ca.gov.