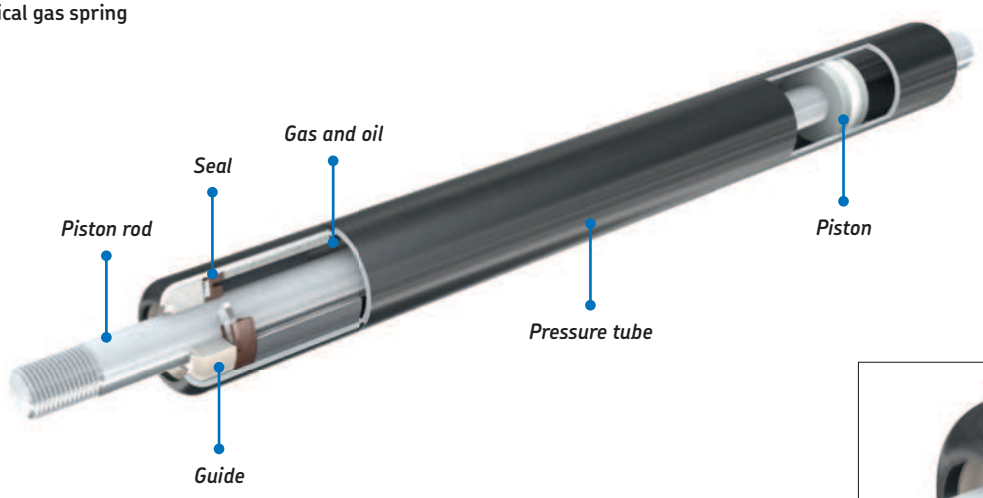
Gas spring seals

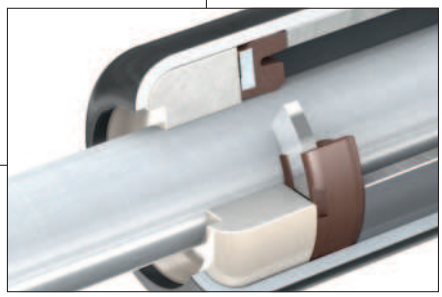
Solutions for automotive and general industrial applications

Optimize the performance and service life of gas springs

Gas springs are hydropneumatic devices that lift, lower and position equipment of all types. A gas spring seal is a critical component that affects the functioning of these devices. It provides the dynamic seal to the piston rod and the static seal to the tube. Our gas spring seals improve the performance and service life of the gas spring and are engineered to operate reliably, with filling pressures of up to 180 bar.

A typical gas spring





Superior seal design for optimum service life

Gas spring seals need to offer a high degree of flexibility, working effectively in a wide range of operation conditions but producing the lowest possible friction. Our innovative design and use of specially formulated materials:

- **Prolongs service life** by retaining maximum pressure
- **Allows smooth operation** by minimizing breakaway force
- **Enables the balanced operation of the entire application** by minimizing static and dynamic friction.

Our gas spring seal designs are based on a rubber seal bonded permanently onto a steel reinforcement ring. This provides several advantages over other concepts, as such it is the most popular solution applied in the majority of gas springs. These advantages include:

- **Easy installation** due to stabilizing metal insert
- **Eliminated influences** from the static outer diameter lip on the dynamic inner diameter lip with independent sealing lips on both the inner and outer diameter
- **Reduced friction** as the inner dynamic sealing lip is supported under high pressure
- **Minimized creeping** under pressure as a reliable barrier is provided to the rubber material
- **Maximized pressure retention** and therefore service life, thanks to a metal insert that keeps leakage of the gas through the seal to an absolute minimum.

Choose the right seal for the right application

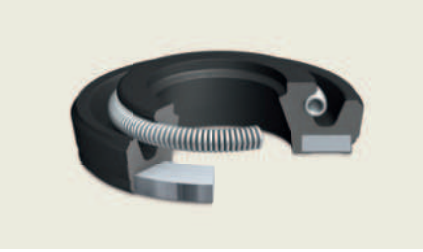
To cover a broad range of applications, we offer three gas spring seal designs. These cater for typical piston rod diameters in the range of 4 to 20 mm but we are able to develop different sizes for other applications on request.

Gas spring seal – standard design

This seal design is the most commonly used in automotive applications. The height of the static sealing lip on the outer diameter is greater than that of the inner lip, which is dynamically loaded. The outer sealing lip is designed for use without axial preloading.

Gas spring seal – flat design

For lockable gas springs, e.g. for office chairs and applications with low pressure. The seal height of the static sealing lip on the outer diameter is reduced. This flat sealing pad allows for axial preloading without having a negative influence on the sealing function of the dynamic sealing lip.



Gas spring seal with garter spring

This design is used in damping applications. The addition of a spring on the dynamic sealing lip supports the sealing function when the pressure is very low, or even for an intermittent slight vacuum.

Considerations for the seal selection

- Oil composition
- Viscosity of the oil
- Surface treatment of the piston rod
- Surface finish of the piston rod
- Gas pressure

Typical application parameters

- Surface treatment: Nitrided or chrome plated
- The recommended surface roughness, based on a nitrided rod surface is:
  R_a < 0,15 µm
  R_z < 1,2 µm
  R_{max} < 1,8 µm

Have a bespoke application with a specific need?
Complete the designated product questionnaire on
› www.skf.com/gas-spring-seals
to outline your requirements and our experts will help to deliver the solution you need.

The relationship between friction, pressure and material

Applied pressure has a direct impact on friction produced by the gas spring. For high pressures (150 bar and above) you need a durable solution, so a rubber compound with high hardness is ideal. However, such a material used at lower pressures increases the friction, so a lower material hardness is required for this use. Every application has its own friction and pressure requirements and we can provide suitable rubber compounds for these.

Material selection depends on the application temperature:

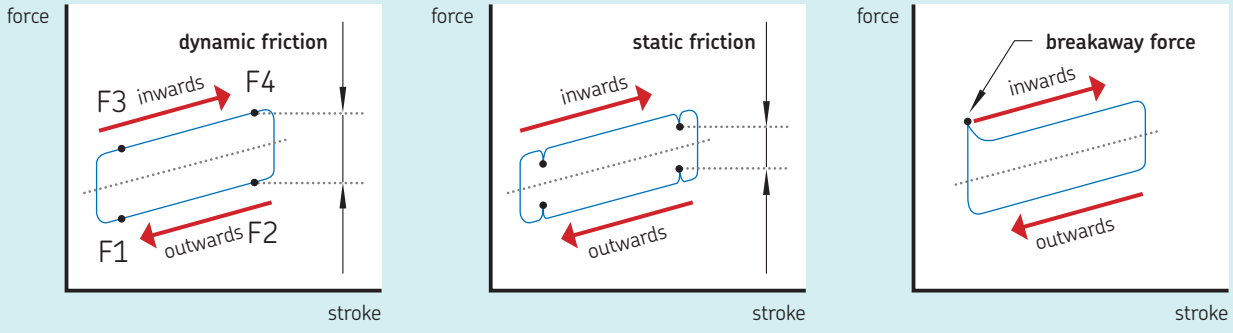
- NBR materials typically allow a temperature ranging from –40 to +80 °C / short term 100 °C
- FKM materials typically allow a temperature ranging from –30 to +180 °C / short term over 200 °C

The friction is defined in a hysteresis curve, which is determined from a given stroke with the piston rod moving slowly. It is the difference between the forces F3 and F1, or additionally F4 and F2 (see **diagram** below – *dynamic friction*).

There is a differentiation between dynamic and static friction. The dynamic friction is measured during the rod motion. For the static friction, the piston rod must be stationary at defined positions for a small period (see **diagram** below – *static friction*). The static friction is lower than the dynamic friction.

The peak when pushing the rod into the gas spring for the first time after a long stationary period is called the breakaway force (see **diagram** below – *breakaway force*).

Hysteresis curve



Testing

We have fully equipped testing facilities to validate the performance of the seal inside the gas spring. Tests are conducted to simulate real-world applications and to reflect working conditions.

Typical tests include:

- Cold and hot durability test (–30 to +80 °C)
- Linear or swivel durability test
- Hatchback test

Value added solutions

The success of a seal depends on more than the seal itself. From years of experience we have evolved into a complete sealing solutions provider, offering systems for rotating, reciprocating and static applications to both OEM (Original Equipment Manufacturers) and aftermarket customers across all applications and industries.

Gain optimum value by taking advantage of the inclusive services that we are able to offer:

- **Complete sealing solutions** rather than just a product, with our technical service to analyze your application
- **Best quality** thanks to our unique manufacturing technology that includes the automatic visual inspection of all parts as well as extensive real-world validation and testing capabilities
- **High flexibility** with our ability to design customized solutions or use a seal from our standard collection
- **Superior performance** as our compounds can cover the full pressure range
- **Maximum return** as our seals can be kept in storage longer than alternative seals, while retaining superior performance and service life.

For further information, please contact:
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