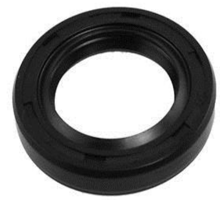


Rubber Oil Seals

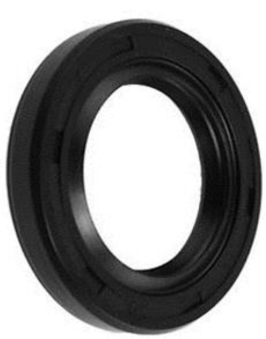
Our Oil Seals include the common metal OD construction for inch requirements and rubber covered OD construction for metric requirements. Single lip and double lip profiles are available as well as special profiles for applications with unique operating conditions. Our Oil Seal are designs offer solutions to virtually any rotary sealing challenge. Along with seals that retain oil, grease and other viscous fluids. We offers seal designs to accommodate: *High eccentricity *Separation of two fluids *Dry running *High pressure *Wiping and scraping *Contaminant exclusion (light dust, water splash, gravel, mud)

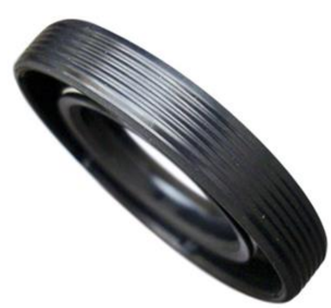
In precision bearings, oil seals help to prevent lubricants from escaping the bearings or a specific area. In machine components, oil seals help to prevent abrasives, corrosive moisture and other harmful contaminants from entering machinery. They also help stop intermixture of two different mediums, such as lubricating oil and water.

Other benefits of this seal include; reduced friction, longer service life, easier assembly, reduced weight and compact design.

The seals are used in a full range of equipment in thousands of applications, such as:

*Automotive *Manufacturing *Off-highway *Oil refineries *Power transmission And Many More



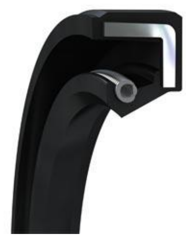


Application and Description Chart

Lip Design	Case Design / Application and Description	A2	B2	B	BR	C
	Application and Description	Metal O.D. design with an inner case for greater structural rigidity.	Most common and economical metal O.D. design.	Metal O.D. design with fluid side rubber covered.	Metal O.D. design with a nose gasket for face sealing and the fluid side is rubber covered.	Rubber covered O.D. design for excellent O.D. sealing.
S	Single lip spring loaded. Low pressure–fluid sealing applications and severe grease sealing conditions.	SA2	SB2	SB	SBR	SC
T	Double lip spring loaded. Low pressure–fluid sealing and severe grease sealing conditions with light dust exclusions.	TA2	TB2	TB	TBR	TC
V	Economical design, single lip for grease retention or sealing viscous fluids.	VA2	VB2	VB	VBR	VC
K	Double lip economical design, grease retention or sealing viscous fluids. Light dust exclusions.	KA2	KB2	KB	KBR	KC
WP	Dust wiper or scraper for hydraulic or pneumatic cylinder applications.			WPB		WPC

The typical fundamental components of a shaft seal are:

- The sealing lip, consisting of a flexible membrane ending in an edge, made of elastomeric material, designed to wrap around the shaft and thus exert a sealing action.
- The metal case, designed to provide the shaft seal with the necessary rigidity for a stable coupling with the relative housing bore.
- The Garter spring, acting as a complement to the fundamental action of the sealing lip.



The material used for the sealing lip is a mixture of one or more basic elastomers and a variety of ingredients, such as: reinforcing fillers, plasticizers, antioxidants, accelerators, etc. This is for the purpose of providing it with certain properties, such as:

*Compatibility with the fluid contacted *High degree of elasticity *Wear resistance *Low friction coefficient.

A familiarity with the materials is essential to help the designing specialist make the proper selection of the most suitable materials for the application of interest. The main qualities of the compounds for producing its shaft seals are:

NBR - Nitrile rubber

The most widely used elastomer in most current applications. It is particularly recommended in case of contact with: *Paraffin-based (aliphatic) oils *Mineral oils and fats (oils for engines, gearboxes, differentials, etc.) *Hydraulic oils *Water and aqueous solutions.
The temperature range varies from -30°C to + 120°C.

ACM - Polyacrylic rubber

This elastomer is recommended for use with: *Engine oils even if containing additives and sulfur *Transmission oils *Hydraulic oils.
The temperature range varies from -25°C to + 150°C.

MVQ - Siliconic rubber

Due to its chemical composition (high molecular weight chains of appropriately modified polysiloxanes), this series is particularly resistant toward atmospheric agents, light and ozone. It also exhibits an excellent high- and low-temperature resistance, so that its field of application covers a broad range. Despite its less than fully satisfactory tear and abrasion strength, its low friction coefficient amply compensates for the relative effect. It is recommended for: *Resistance to atmospheric agents, ozone *Mineral oils *Glycol-based fluids.
The temperature range varies from -55°C to + 180°C.

FPM - Fluorinated rubber

This elastomer has exceptional heat and chemical resistance. Its properties remain indefinitely stable up to about 200°C. It offers excellent performances in contact with: *Aliphatic hydrocarbons *Aromatic hydrocarbons (toluene, benzene, xylene) *Vegetable and mineral oils and fats, even if containing additives *Chlorinated solvents *Ozone *Light and atmospheric agents.
The temperature range is from -30°C to + 200°C.

HNBR - Hydrogenated nitrile rubber

The chemical structure of this elastomer (obtained by hydrogenating an appropriate type of NBR nitrile rubber) allows achieving, especially if vulcanized with a peroxide system, an average heat resistance 30°C above that of nitrile rubber, and an excellent abrasion resistance.
Its resistance to oils and solvents is on average slightly superior to that of nitrile rubber, except for special cases. It is therefore recommended for: *Heat resistance *Ozone resistance *Abrasion resistance.
The temperature range is from -40°C to + 150°C.

EPDM - Ethylene-propylene rubber

This rubber is based on ethylene-propylene plus a third (diene) monomer which allows its reticulation with Sulphur. Due to its chemical structure, it has a peculiar resistance to fluids such as water and steam and environments such as ozone, which recommends its use for: *Water, up to boiling point *Steam *Particular hydraulic systems, such as braking systems *Ozone *Atmospheric agents *Bases *Polar solvents at ambient temperature.
The temperature range is from -50°C to + 150°C.

Thermal expansion of elastomers

The thermal expansion coefficients of elastomers are decidedly superior to those of metals. It is impossible, therefore, to merely consider the geometric shape of a shaft seal and its total radial load at ambient temperature, because it's operating conditions and lifetime may substantially vary, depending on the change of the modulus of elasticity induced by a temperature change.

Metal case

Its function is to offer the shaft seal the necessary rigidity to enable a stable coupling with its relative housing seating. With reference to the elastomer, it may be of an inner, an outer or part-coated type.

Inner metal case

This solution includes the following advantages: *It eliminates the risk of corrosion *It avoids damaging the seating, even if made of a light alloy, thus affording a better opportunity of substitutions without damages.

Outer metal case

This type of case was designed for applications requiring high pulling forces and automated motions based on magnetic systems. In time, it has also been shown that in order to achieve a reliable seal, a ground outer finish and a finely machined seating was needed in addition to the use of sealing materials. Its cost was considerably higher than that of a coated type. It was therefore decided to use it only in combination with high-quality compounds, where most of the cost increase is compensated by the savings in elastomer materials.

Part-coated metal case

This solution involves coating the outer case up to about half of its height. This coating is a result of vulcanization and can be plain or corrugated to better fit the assembly forces required by the customers. The resulting advantages are: *Excellent locking-in in the housing *Savings of high-quality materials *Ease of assembly *Safety in operation *This type of locking is advisable for projects requiring a particularly challenging application.

Nature of the materials used for the case

In its standard version the metal case consists of a medium/deep draw steel sheet according to the UNI EN10130 or DIN 1624 standards, of a thickness commensurate with the size of the shaft seal. Where a resistance to corrosive fluids is required, it can be supplied as made from: *Stainless steel, to DIN 17440/tab. 1.54401 or AFNOR Z6 CND 17.11 standards (ex AISI 316) *Brass, to UNI 4894 standards.

Spring

The spring has a function that is complementary to the fundamental action provided by the sealing lips. In fact, heat, mechanical deformation and chemical action of the fluids affect the original properties of the rubber. As a result, the original radial force exerted by the sealing element tends to decrease. The function of the spring is to counteract this tendency. The spring is a closely wound helical spring in toric form and possesses a calculated initial pre-loading force. This is supplemented by a stabilizing heat treatment performed at a higher temperature than the operating one, which makes it possible to achieve: *The most suitable radial force for the expected application *A guaranteed stability of the radial force itself. The temperature effect actually determines, in the course of time, not merely an alteration of the rubber's original characteristics, but also a decrease of the mechanical properties of the steel constituting the spring.

Nature of the materials constituting the spring

The choice of the materials constituting the spring depends on the type of fluid the Garter spring comes in contact with. In the standard version it consists of phosphatized, high strength piano wire steel. The standard springs undergo programmed bedding-in process which allows a precise evaluation of the radial force at the design stage. The use of springs of different material may be considered for particular applications. For instance, in cases requiring a seal against corrosive liquids such as seawater, detergent or acid solutions, a stainless steel spring can be employed