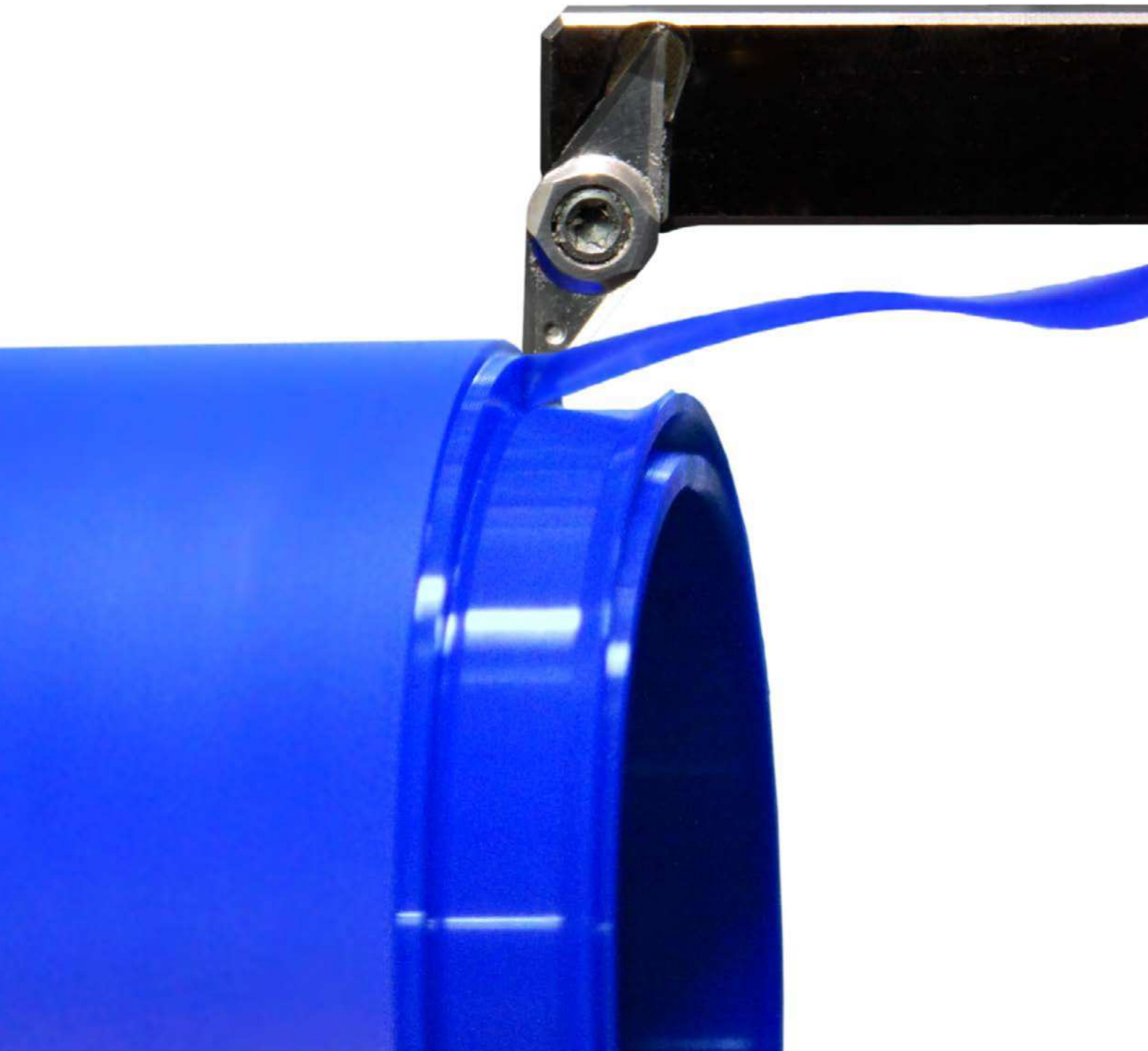
SKF SEAL JET DD

Seals product range

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Machined seals concept

Introduction

Seals have a crucial impact on system performance. Life and reliability of what is often considered a simple component can make all the difference to your product and operations. Increase productivity and process reliability as well as reduce total cost of ownership with innovative sealing solutions from SKF. We are the world's only bearing company with seal manufacturing capabilities and supply a wide range of sealing solutions for rotating, reciprocating and static applications to the whole industrial market worldwide.

With SKF you get support for all the key aspects of your sealing system.

With SKF's proven capabilities in seal design, materials, testing and manufacturing, we offer extensive support to help engineering teams worldwide make all the right choices during the entire product life cycle.

Meeting unique sealing demands, on-demand

Generally, the machined seals concept provides a fast and very flexible alternative to the moulded seal production. With a unique combination of machining capabilities, specially developed sealing materials and a pre-selection of seal profiles polymeric seals can be produced in virtually any dimension and any design, for virtually any industrial application.

The distribution business is more challenging than ever before. Customers are demanding more, faster, and they turn to distributors to deliver.

Seals in minutes – SKF SEAL JET DD

The SKF SEAL JET DD system is engineered with the distributor's challenges in mind:

- Enable faster machining of seals
- Offer more from a smaller inventory
- Reduce reliance on training

All in a machine the size of a coffee machine. It adds up to meeting the needs of the end-users and the market, faster.

Be ahead of your time when your customers need a seal fast. Get machined seals in minutes, offer greater stock from a smaller inventory, all without the need to rely on the availability of skilled machine operators.

The SKF SEAL JET DD system saves hours in your working day and space in your distribution warehouse. Instead of hoping your supplier has the seal your customer needs or waiting for them to deliver it, you simply make the seal yourself in minutes. All to the highest quality and precise specifications with the potential to save warehouse storage space. With the help of the SKF SEAL JET DD you are able to deliver best-in-class seal service to your customers and end-users.

Profile and materials selection

The SKF SEAL JET DD system offers proprietary machining software with 83 pre-programmed seal profiles, covering the majority of the industrial demand. By proper selection of the seals profile and definition of the main seal dimensions - together with the right material selection - machined standard seals in non-standard dimensions up to a diameter of 200 mm can be manufactured within minutes - to meet end-user's demands.

CNC manufacturing process

Featuring proprietary software and high-precision cutting tools, the SKF SEAL JET DD manufacturing system uses Computer Numerical Control (CNC) technology to machine polymer seals quickly. The system machines a seal from a semi-finished tube of our specially selected materials.

Industrial Sealing Solutions – optimizing your customer's applications

If the end-user's demands exceed the SKF SEAL JET DD system capabilities in size, material request or volume, the whole SKF Industrial Seals portfolio is available via the SKF network.

We offer industrial equipment OEMs and end-users a comprehensive selection of sealing options, whether you need a replacement seal or a highly engineered solution for an extremely demanding application. With both - moulded and machined seal - manufacturing capabilities available worldwide, you can serve your end-users with seals in quantities ranging from a few prototypes to large volume serial production.

Whenever you need machined standard or customized seals in e.g. larger diameters, special materials or with highly customized design, the SKF Machined Seals Centres provide those solutions.

When you face high demand of standard seals - e.g. for shaft seals for rotating equipment or hydraulic seals for reciprocating equipment - the SKF Industrial Seals standard range also is available.

Please ask your SKF speaking partner for more details.



Sealing materials

Introduction

Increasing performance requirements for sealing applications due to demanding operating conditions raise the importance of carefully selecting the appropriate sealing materials. These conditions can include high speeds, pressures and temperatures, often in combination with poor lubricating fluids. Fluids like HFA and HFB as well as biologically degradable hydraulic fluids (vegetable oils and synthetic esters) present additional challenges for the selection of the right sealing material, as chemical compatibility of sealing material and operating fluid must be ensured.

Different types of polymeric materials are available to meet all demands on the seal assembly in the best possible way.

In this brochure, we feature five different materials to be used with the SKF SEAL JET DD machine. All of these materials have been developed by SKF to meet typical customer requirements. Additionally, we offer machined seals made of 25 standard materials that are accessible via the SKF Machined Seals Centres. There we also have a vast range of special materials available to meet very specific application demands like for food and beverage, oil and gas or the hydro power industry, just to name some examples.

Thermoplastic elastomers – Polyurethanes

Thermoplastic elastomers are a class of copolymers that combine thermoplastic and elastomeric material properties. For sealing applications, polyurethanes are the most important material class of thermoplastic elastomers. They are processed at SKF as thermoplastic polyurethanes (TPUs) through injection moulding and for larger diameters as cast polyurethanes (CPUs). Polyurethanes provide elastomeric material behaviour in their operating temperature range, which is required to provide sealing functionality. They show excellent mechanical properties such as strength, ultimate elongation and abrasion resistance. Due to their thermoplastic material behaviour, they soften and eventually melt at high temperatures, which limits their upper service temperature.

Elastomers

Elastomers are flexible materials with a generally low modulus that are typically used for sealing and/or damping applications. Due to their chemically cross-linked structure, they can operate at higher temperatures compared to polyurethanes and show a very low compression set. Depending on the applied polymer, they can exhibit excellent chemical resistance. While reinforcing fillers improve their mechanical properties, the performance level does not reach the level of polyurethanes.

Thermoplastics

Thermoplastic materials show rigid behaviour in their operating temperature range. As they melt at temperatures above their service level, they can be processed through injection moulding. The selection of the polymer grade determines the chemical and morphological structure and thus chemical compatibility as well as mechanical properties (ductility, stiffness, strength). Engineering thermoplastics are generally used for back-up rings, guide rings, bushings, scrapers or other elements of a sealing assembly.

Thermoplastic elastomers – Polyurethanes

ECOPUR DD

ECOPUR DD is a thermoplastic polyurethane elastomer (TPU) with excellent abrasion resistance, low compression set and high tear strength. It is suitable for hydraulic, pneumatic and selected rotary seals. Products made from this material can be used in mineral oil, in water up to 40 °C. Depending on the seal design and housing, seals made of ECOPUR DD can be used up to 400 bar (for higher pressures anti-extrusion rings are required).

Elastomers

SKF Econbr

SKF Econbr is an elastomer based on acrylonitrile-butadiene rubber (NBR) and is used for U-cup seals, and rotary seals. The material has good resistance to mineral oils and greases and HFA, HFB and HFC pressure fluids.

SKF Ecofkm

SKF Ecofkm is an elastomer based on fluoro rubber (FKM) and is used for lip seals, wipers and rotary seals. Its outstanding properties are high resistance to heat, weathering, ozone and many other chemicals.

Thermoplastics

SKF Ecoptfe

SKF Ecoptfe is a thermoplastic material based on polytetrafluoro-ethylene (PTFE) with 15% glass fibre and 5% graphite. It is mainly used for back-up rings, selected lip seals and buffer seals. It has outstanding chemical and temperature resistance. Thanks to the fillers, this material has optimized compression strength and sliding properties.

SKF Ecotal

SKF Ecotal is a semi-crystalline polyacetal-copolymer (POM) which is used for anti extrusion rings, guide rings, bushings and scrapers. This material has good mechanical properties, low water absorption and good chemical resistance. It can be used in mineral oils and in water-based, fire-resistant hydraulic fluids (HFA, HFB and HFC).

Special materials

All standard materials can be modified to meet specific application requirements. Contact SKF for more information.









Unit conversions

Unit conversions

Quantity	Unit	Conversion			
Length	inch	1 mm	0.03937 in.	1 in.	25,40 mm
	foot	1 m	3.281 ft.	1 ft.	0,3048 m
	yard	1 m	1.094 yd.	1 yd.	0,9144 m
	mile	1 km	0.6214 mi.	1 mi.	1,609 km
Speed, velocity	foot per second	1 m/s	3.28 ft/s	1 ft/s	0,30480 m/s
	foot per minute	1 m/s	196.8504 ft/min	1 ft/min	0,00508 m/s
	mile per hour	1 km/h	0.6214 mph	1 mph	1,609 km/h
Force	pound-force	1 N	0.225 lbf.	1 lbf.	4,4482 N
Pressure, stress	pounds per square inch	1 MPa	145 psi	1 psi	$6{,}8948 \times 10^3$ Pa
		1 N/mm^2	145 psi		
		1 bar	14.5 psi	1 psi	0,068948 bar
Temperature	degree	Celsius	$t_C = 0.555\ (t_F - 32)$	Fahrenheit	$t_F = 1{,}8\ t_C + 32$

Material properties

			Polyurethane	Elastomers		Thermoplastics	
Properties	**Standard**	**Unit**	**ECOPUR DD**	**SKF Econbr**	**SKF Ecofkm**	**SKF Ecoptfe**	**SKF Ecotal**
			TPU	NBR	FPM, FKM	PTFE	POM
Standard colour			Dark blue	Black	Black	Dark grey	Black
Durometer Hardness [1]	DIN ISO 7619	Shore A	93	85	85		
Durometer Hardness [1]	DIN ISO 7619	Shore D	45			58 [2]	82 [2]
Density	DIN EN ISO 1183-1	g/cm^3	1,18	1,32	1,84	2,22	1,41
Tensile strength/yield stress	DIN 53504	MPa	50	18	11	19 [3]	65 [4]
Elongation at yield	ISO 527-1/2	%					8-10
Elongation at break	DIN 53504	%	520	160	190	250 [3]	25 [4]
Tensile modulus	ISO 527-1/2	MPa					2 900
100% modulus	DIN 53504	MPa	12,7	13	7		
Compression set							
70 °C / 24 h 20% compression	DIN ISO 815	%	26				
100 °C / 24 h 20% compression	DIN ISO 815	%	30	13			
100 °C / 24 h	DIN ISO 815	%					
175 °C /24 h	DIN ISO 815	%			17		
Impact resistance, charpy							
at +23 °C	ISO 197-1	kJ/m^2					10
at -30 °C	ISO 197-1	kJ/m^2					8
Water absorption, 23 °C, saturation	ISO 62	%					0,65
Coefficient of sliding							0,25-0,32
Tear strength	DIN ISO 34-1	N/mm	85	19	20		
Minimum service temperature [5]		°C	-30	-30	-20	-200	-50
Maximum service temperature [5]		°C	+100	+100	+200	+260	+100

[1] testing time is 3 s
[2] ISO 868
[3] ASTM D-4745
[4] ISO 527-1/2
[5] Minimum and maximum service temperatures are material properties only. Deviations due to varying application parameters are mentioned/stated at each seal profile at the following pages.

Criteria for seal and material selection

The selection of the right seal profile and material for a given application requires consideration of many factors and strongly depends on the operating conditions of the application.

Furthermore, a sealing system may contain many components.

This catalogue supports the selection of the right machined seals including the appropriate sealing material for typical rotary, linear and static applications.

Generally spoken, the following application considerations are required to properly select seal profiles and sealing materials:

- Type of movement; linear, rotating, swivelling, spiral movement or static application
- Type of application
- Temperature range (fluid, housing, environment); all in operation and at rest
- Speed; either the stroking speed for linear applications or the circumferential and rotational speed for rotating or swivelling applications
- Pressure range of the fluid to be sealed; that might be the absolute pressure as well as pressure spikes or pressure differentials that the seals need to cope with
- Fluid media; the type and viscosity of the fluid used in the system
- Hardware dimensions; rod and bore resp. shaft and housing diameters, seal groove dimensions and gaps (if already specified), installation restrictions, limited space, etc.
- Surface specifications; material, hardness surface finish and tolerances of all surfaces that are in contact with the seals
- Environmental aspects like contaminants, external temperature etc.

Please also find more details in the respective introductory section to the different seal categories. There you also will find selection guides based on the above mentioned criteria.

Type of movement table head	**Recommended usage** (blue symbol)	**Optional usage** depending on the application parameters (grey symbol)
Linear		
Rotating		
Oscillating or swivelling		
Spiral		
Static		

In case you need to use a seal profile with a listed grey symbol, please contact SKF to clarify the application limitations.

General remarks for technical data

The stated operating parameters in the following tables represent general conditions. It is recommended NOT to use all maximum values simultaneously. The specified pressure limits apply for use in mineral oil with a maximum temperature of 60 °C and a maximum metal extrusion gap of 0,25 mm unless stated differently for selected seal profiles. The speed limits apply for adequate lubrication and running surface finishing as recommended. SKF also recommends testing material/media compatibility and sealing function for targeted performance under real working conditions. Depending on application details, higher pressures and speed limits can be attained in most cases. If any of the indicated limits do not meet specific requirements, please contact SKF.

Application symbols

The application symbols listed with each and every seals profile in the following tables show the usability of the specific seals profile for the main types of movement – linear, rotating, oscillating or swivelling, spiral or static.

The symbols are shown in two different colours – blue for recommended use and grey for optional use. Please refer to the table for more details. If a specific symbol is NOT listed at a selected seals profile, we strongly recommend not using it for such an application.

Scan to view video, about the machining process via a QR code

Scan to explore our Industrial Seals Expert Knowledge Hub

Piston seals

Introduction

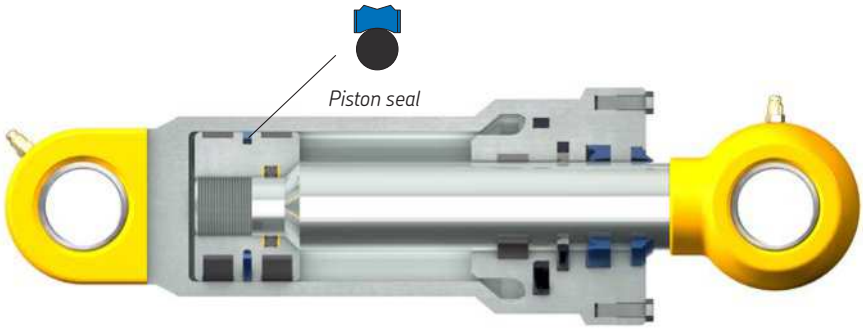
Piston seals provide the sealing function in sliding motion between the piston and the bore of a hydraulic or pneumatic cylinder. These seals need to cope with the differential pressures acting on the piston while extending or retracting the piston rod. These differential pressures can be more than 400 bar e.g. for heavy duty applications.

The pressure acting on the piston seal increases the contact forces and as a result of this also the friction between the piston seal and the cylinder surface. Therefore the dynamic sealing surface is critical to the sealing performance and significantly affects the seal's lifetime.

Selecting profiles and materials for a piston sealing system is a complex task, considering all possible cylinder designs and application criteria. SKF supplies standard piston seals in many different profiles and in a wide range of materials, series and sizes, which make them appropriate for a wide variety of operating conditions and applications.

On the following pages you will find all the available piston seal designs that are available as machined versions utilizing the SKF SEAL JET DD system.

Piston seals are typically classified into single-acting (pressure acting on one side only) and double-acting (pressure acting on both sides) seals.



Double-acting piston seal DK08-P pressurized from the system pressure in a hydraulic cylinder.

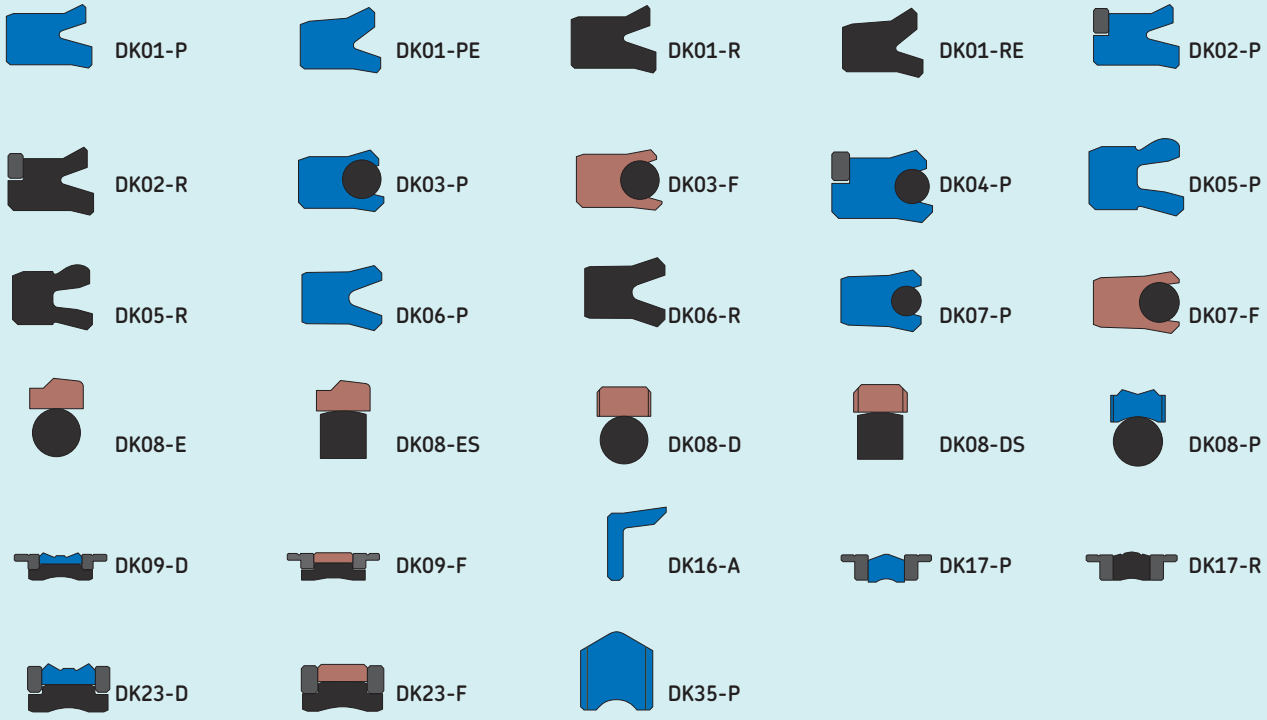


Double-acting O-ring loaded symmetric slide ring piston seal DK08-P made of ECOPUR DD and NBR 70

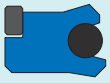


Energizer loaded double acting compact piston seal DK09-D made of ECOPUR DD and SKF Econbr with integrated guiding elements made of SKF Ecotal

Piston seals



Piston Seal selection guide

	Standard use	Symmetric design when usage as piston or rod seal is required	Backup designs for high pressures and large extrusion gaps	Special design variations
Unloaded lip seal designs Lip seals without compact compression to minimize friction. Especially in the low pressure ranges the contact force is increased by the system pressure when it is needed. Typically for applications with frequent movement; focus on low friction and leak tightness.	 **DK01-P** **DK01-R**	 **DK06-P** **DK06-R**	 **DK02-P** **DK02-R**	Pneumatics  **DK05-P** **DK05-R** Single lip  **DK16-A** Single acting  **DK01-PE** **DK01-RE**
Loaded lip seal designs Lip seals with a softer energizer in between (compact compressed) are typical for applications with increased sideloads and/or low temperatures; focus on leak tightness. Seals made of PTFE need energizer elements for operation.	 **DK03-P**  **DK03-F**	 **DK07-P**  **DK07-F**	 **DK04-P**	
Compact seal designs Traditional compact seal design typically used in hydraulic cylinders; simple design also often used as static seals; dynamic seals use slide elements for improved frictional behaviour.	TPU design  **DK35-P**		Rubber design  **DK23-D**	Seals with integrated guide rings  **DK09-D**  **DK17-P**

Activated slide ring designs

Mainly used in dynamic applications, allowing very good sliding properties and low break-away forces.

Single acting

Standard



DK08-E

Heavy duty



DK08-ES

Double acting

Standard



DK08-D

Heavy duty



DK08-DS

TPU-design



DK08-P

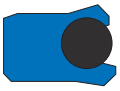
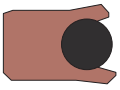
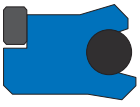
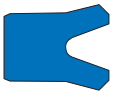
Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Application	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material	
			°C		m/s	bar	–	
	DK01-P	**Hydraulic, single-acting** Asymmetric piston seal for standard applications. Very good sealing effect over a wide range. Prevents extensive drag pressure. Back-to-back arrangement with slide ring in between for double-acting pistons. Design optimized for ECOPUR DD material.	–30	+100	0,5	400	ECOPUR DD	
	DK01-PE	**Hydraulic, single-acting** Asymmetric piston seal with increased contact force for single-acting pistons. Design optimized for ECOPUR DD material.	–30	+100	0,5	400	ECOPUR DD	
	DK01-R	**Hydraulic, single-acting** As profile DK01-P, but design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance.	–30 –20	+100 +200	0,5 0,5	160 160	SKF Econbr SKF Ecofkm	
	DK01-RE	**Hydraulic, single-acting** Asymmetric piston seal with increased contact force for single-acting pistons. Design optimized for SKF Econbr and SKF Ecofkm materials.	–30 –20	+100 +200	0,5 0,5	160 160	SKF Econbr SKF Ecofkm	
	DK02-P	**Hydraulic, single-acting** Asymmetric piston seal for standard applications based on the DK01-P design with an active rectangular back-up ring for larger extrusion gaps or higher pressure ranges.	–30	+100	0,5	700	**Seal** ECOPUR DD	**Back-up ring** SKF Ecotal
	DK02-R	**Hydraulic, single-acting** As profile DK02-P with rectangular back-up ring, but design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance.	–30 –20	+100 +200	0,5 0,5	250 250	**Seal** SKF Econbr SKF Ecofkm	**Back-up ring** SKF Ecotal SKF Ecoptfe

Linear moving · Rotating · Oscillating · Spiral moving · Static

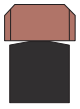
Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	DK03-P 	**Hydraulic, single-acting** Asymmetric O-ring loaded piston seal. Best sealing effect over a wide temperature range. Especially suitable for increased sideloads and holding functions. Design optimized for ECOPUR DD material.	–30	+100	0,5	400	**Seal** ECOPUR DD	**Energizer** NBR 70	
	DK03-F 	**PTFE-piston seal, single-acting** Asymmetric O-ring loaded piston seal. Design optimized for SKF Ecoptfe material to reduce friction and stick-slip effects. Very good sealing effect over a wide temperature range. Variation of O-ring materials to adapt to the application requirements. Almost no dead spots for easy cleaning.	–30 –20 –50 –55	+100 +200 +150 +200	1 1 1 1	400 400 400 400	**Seal** SKF Ecoptfe SKF Ecoptfe SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75 EPDM 70 MVQ 70	
	DK04-P 	**Hydraulic, single-acting** Asymmetric O-ring loaded piston seal for standard applications based on the DK01-P design with an active rectangular back-up ring for larger extrusion gaps or higher pressure ranges.	–30	+100	0,5	700	**Seal** ECOPUR DD	**Energizer** NBR 70	**Back-up ring** SKF Ecotal
	DK05-P 	**Pneumatic, single-acting** Asymmetric piston seal. Design optimized for ECOPUR DD material to benefit from high wear resistance. For use in lubricated or dry pneumatic applications. Special design of sealing lip allows retention of initial lubricating film.	–30	+100	1	25	ECOPUR DD		
	DK05-R 	**Pneumatic, single-acting** Asymmetric piston seal. Design optimized for SKF Econbr and SKF Ecofkm materials to benefit from increased chemical and thermal resistance. For use in lubricated and dry pneumatic applications. Special design of sealing lip allows retention of initial lubrication film.	–30 –20	+100 +200	1 1	25 25	SKF Econbr SKF Ecofkm		
	DK06-P 	**Hydraulic, single-acting** Symmetric unloaded lip seal for simple standard applications; not recommended for new designs. Universal usage for rod or piston applications. Design optimized for ECOPUR DD material.	–30	+100	0,5	400	ECOPUR DD		

Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material	
			°C		m/s	bar	–	
	DK06-R	**Hydraulic, single-acting** As profile DK06-P, but design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance.	–30 –20	+100 +200	0,5 0,5	160 160	SKF Econbr SKF Ecofkm	
	DK07-P	**Hydraulic, single-acting** Symmetric O-ring loaded lip seal for simple standard applications; not recommended for new designs. Especially suitable for increased sideloads and holding functions. Universal usage for rod or piston applications. Design optimized for ECOPUR DD material.	–30	+100	0,5	400	**Seal** ECOPUR DD	**Energizer** NBR 70
	DK07-F	**PTFE piston seal, single-acting** Symmetric O-ring loaded lip seal. Design optimized for SKF Ecoptfe material to reduce friction and stick-slip effects. Not recommended for new designs. Variation of O-ring materials to adapt to application requirements. Universal usage for rod or piston applications.	–30 –20 –50 –55	+100 +200 +150 +200	1 1 1 1	400 400 400 400	**Seal** SKF Ecoptfe SKF Ecoptfe SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75 EPDM 70 MVQ 70
	DK08-E	**Hydraulic, single-acting** O-ring loaded asymmetric slide ring piston seal. Design optimized for SKF Ecoptfe material to reduce friction and stick-slip effects. For extremely low and high speeds as well as positioning functions.	–30 –20	+100 +200	10 10	600 600	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75
	DK08-D	**Hydraulic, double acting** O-ring loaded symmetric slide ring piston seal. Design optimized for SKF Ecoptfe material to reduce friction and stick-slip effects. For extremely low and high speeds as well as positioning functions. Typical design for medium duty standard hydraulic pistons.	–30 –20	+100 +200	10 10	600 600	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75
	DK08-ES	**Hydraulic, single-acting** Energizer loaded asymmetric slide ring piston seal, similar to DK08-E, but special heavy duty design. Due to adaption possibilities of the energizer also applicable for special housing dimensions.	–30 –20	+100 +200	10 10	600 600	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** SKF Econbr SKF Ecofkm

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	DK08-DS 	**Hydraulic, double-acting** Energizer loaded asymmetric slide ring piston seal similar to DK08-D, but with special heavy duty design. Due to adaption possibilities of the energizer also applicable for special housing dimensions.	–30 –20	+100 +200	10 10	600 600	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** SKF Econbr SKF Ecofkm	
	DK08-P 	**Hydraulic, double-acting** O-ring loaded symmetric slide ring piston seal. Design optimized for ECOPUR DD material for increased wear resistance and leak tightness. Typical design for light to medium duty hydraulic pistons.	–30	+100	1	250	**Seal** ECOPUR DD	**Energizer** NBR 70	
	DK09-D 	**Hydraulic, double-acting** Energizer loaded compact piston seal with integrated guiding elements. Design optimized for slide rings made of ECOPUR DD material for improved wear resistance, leak tightness and frequent movements. Typical design for medium to heavy duty standard hydraulic pistons.	–30	+100	0,5	400	**Seal** ECOPUR DD	**Energizer** SKF Econbr	**Guide rings** SKF Ecotal
	DK09-F 	**Hydraulic, double-acting** Energizer loaded compact piston seal with integrated guiding elements. Design optimized for slide rings made of SKF Ecoptfe material for reduced friction and stick-slip. Typical design for medium to heavy duty standard hydraulic pistons.	–30	+100	1,5	400	**Seal** SKF Ecoptfe	**Energizer** SKF Econbr	**Guide rings** SKF Ecotal
	DK16-A 	**Hydraulic/pneumatic, single-acting** Simple cup seal, usually fixed on the piston with a clamping plate. Mainly used for replacement in old hydraulic and pneumatic cylinders or for low–grade secondary applications.	–30 –30 –20	+100 +100 +200	0,5 0,5 0,5	160 160 160	ECOPUR DD SKF Econbr SKF Ecofkm		
	DK17-P 	**Hydraulic, double-acting** Compact piston seal with integrated guiding elements. Design optimized for sealing elements made of ECOPUR DD material for improved wear resistance and leak tightness. Typical design for light to medium duty standard hydraulic pistons.	–30	+100	0,5	250	**Seal** ECOPUR DD	**Guide rings** SKF Ecotal	

Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Application	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	DK17-R	**Hydraulic, double-acting** Compact piston seal with integrated guiding elements. Design optimized for sealing elements made of SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance. Typical design for light to medium duty standard hydraulic pistons.	–30 –20	+100 +200	0,5 0,5	250 250	**Seal** SKF Econbr SKF Ecofkm	**Guide rings** SKF Ecotal SKF Ecoptfe	
	DK23-D	**Hydraulic, double-acting** Energizer loaded compact piston seal with integrated back–up rings. Design optimized for slide rings made of ECOPUR DD material for improved wear resistance and frequent movements. Typical design for heavy duty standard hydraulic pistons. External guiding elements required.	–30	+100	0,5	400	**Seal** ECOPUR DD	**Energizer** SKF Econbr	**Back–up rings** SKF Ecotal
	DK23-F	**Hydraulic, double-acting** Energizer loaded compact piston seal with integrated back-up rings. Design optimized for slide rings made of SKF Ecoptfe material to reduce friction and stick-slip effects. Typical design for heavy duty standard hydraulic pistons. External guiding elements required.	–30	+100	1,5	400	**Seal** SKF Ecoptfe	**Energizer** SKF Econbr	**Back–up rings** SKF Ecotal
	DK35-P	**Hydraulic, double-acting** Space saving compact piston seal. Design optimized for ECOPUR DD material. Also commonly used as O-ring replacement to prevent twisting of the seal.	–30	+100	0,4	400	ECOPUR DD		

Rod seals

Introduction

Rod and buffer seals provide the sealing function in sliding motion between the cylinder head of a hydraulic or pneumatic cylinder and the piston rod. Depending on the application, a rod sealing system can consist of a rod seal and a buffer seal or a rod seal only, both in combination with a wiper seal that also has a strong influence on the system performance. Rod sealing systems for heavy duty applications typically consist of a combination of both seal types, whereas the buffer seal is arranged between the rod seal and the piston in the cylinder head.

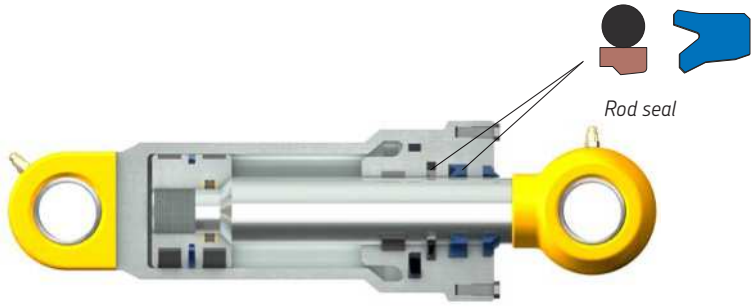
In addition to the sealing function, rod seals also provide a thin lubrication film on the piston rod that lubricates themselves and the wiper seals. The lubricant also inhibits corrosion of the piston rod surface. Well engineered seal designs allow this required thin lubrication film while utilizing hydrodynamics to create a so-called "back-pumping effect" during the return stroke to enable optimum sealing performance.

Selecting profiles and materials for a rod sealing system is a complex task, considering all possible cylinder designs and application criteria. SKF supplies standard rod and buffer seals in many different profiles and in a wide range of materials, series and sizes, which make them appropriate for a wide variety of operating conditions and applications. On the following pages you will find all the available rod and buffer seal designs that are available as machined versions utilizing the SKF SEALJET DD system.

Rod seals are typically single-acting seals, which means that the fluid pressure acts from inside the cylinder on one side of the seal only. Pressures acting on the rod side of the piston can be more than 400 bar. Pressure peaks can be even higher. The pressure acting on the rod seal increases the contact forces between the rod seal and the rod surface. Therefore, rod seal materials need to be wear resistant and the rod surface needs to be manufactured according to the recommended surface specifications.



Typical situation using a single rod seal DS01-P in a hydraulic cylinder



Tandem rod sealing system with DS09-E as primary seal (buffer seal) and DS01-P as secondary seal (rod seal)

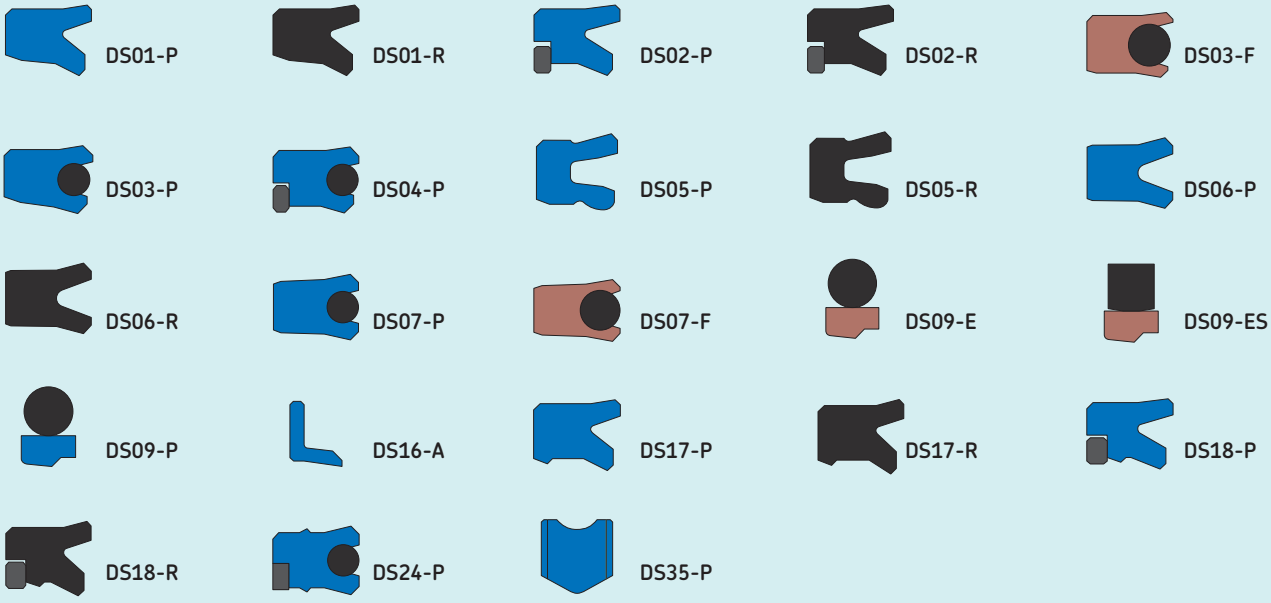


Single-acting asymmetric rod seal DS01-P made of ECOPUR DD



Single-acting O-ring loaded asymmetric slide ring rod seal DS09-E made of SKF Ecoptfe and FPM 75

Rod seals


DS01-P
DS01-R
DS02-P
DS02-R
DS03-F
DS03-P
DS04-P
DS05-P
DS05-R
DS06-P
DS06-R
DS07-P
DS07-F
DS09-E
DS09-ES
DS09-P
DS16-A
DS17-P
DS17-R
DS18-P
DS18-R
DS24-P
DS35-P

Rod Seal selection guide

	Standard use	Symmetric design when usage as piston or rod seal is required	Backup designs for high pressures and large extrusion gaps	Special design variations
Unloaded lip seal designs Lip seals without compact compression to minimize friction. Especially in the low pressure ranges the contact force is increased by the system pressure when it is needed. Typical for applications with frequent movement; focus on low friction and leak tightness.	 **DS01-P** **DS01-R**	 **DS06-P** **DS06-R**	 **DS02-P** **DS02-R** **DS18-P** **DS18-R**	Pneumatics  **DS05-P** **DS05-R** Stabilisation lip  **DS17-P** **DS17-R** Single lip  **S16-A**
Loaded lip seal designs Lip seals with a softer energizer in between (compact compressed) are typical for applications with increased side-loads and/or low temperatures; focus on leak tightness. Seals made of PTFE need energizer elements for operation.	 **DS03-P**  **DS03-F**	 **DS07-P**  **DS07-F**	 **DS04-P**  **DS24-P**	
Compact seal designs Traditional compact seal design typically used in hydraulic cylinders; simple design also often used as static seals; dynamic seals use slide elements for improved frictional behaviour.	TPU design  **DS35-P**			

	Single acting	
Activated slide rings & tandem seal designs Mainly used in dynamic applications, allowing very good sliding properties and low break-away forces.	Standard  **DS09-E** **DS09-P**	Heavy duty  **DS09-ES**

Linear moving | Rotating | Oscillating | Spiral moving | Static

Grey symbols: contact SKF for application limitations

Application	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material	
			°C		m/s	bar	–	
	DS01-P	**Hydraulic, single-acting** Asymmetric rod seal with very good sealing effect over a wide temperature range and good back pumping ability. Design optimized for ECOPUR DD material. Also used as rod seal in combination with buffer seals DS09.	–30	+100	0,5	400	ECOPUR DD	
	DS01-R	**Hydraulic, single-acting** As profile DS01-P, but design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance.	–30 –20	+100 +200	0,5 0,5	160 160	SKF Econbr SKF Ecofkm	
	DS02-P	**Hydraulic, single-acting** Asymmetric rod seal for standard applications based on the DS01-P design with an active rectangular back-up ring for larger extrusion gaps or higher pressure ranges.	–30	+100	0,5	700	**Seal** ECOPUR DD	**Back–up ring** SKF Ecotal
	DS02-R	**Hydraulic, single-acting** As profile DS02-P with an active rectangular back-up ring, but design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance.	–30 –20	+100 +200	0,5 0,5	250 250	**Seal** SKF Econbr SKF Ecofkm	**Back–up ring** SKF Ecotal SKF Ecoptfe
	DS03-P	**Hydraulic, single-acting** Asymmetric O-ring loaded rod seal. Best sealing effect over a wide temperature range. Especially suitable for increased sideloads and holding functions. Design optimized for ECOPUR DD material.	–30	+100	0,5	400	**Seal** ECOPUR DD	**Energizer** NBR 70
	DS03-F	**PTFE rod seal, single-acting** Asymmetric O-ring loaded rod seal. Design optimized for SKF Ecoptfe material to reduce friction and stick-slip effects. Very good sealing effect over a wide temperature range. Variation of O-ring materials to adapt to the application requirements. Almost no dead spots for easy cleaning.	–30 –20 –50 –55	+100 +200 +150 +200	1 1 1 1	400 400 400 200	**Seal** SKF Ecoptfe SKF Ecoptfe SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75 EPDM 70 MVQ 70

Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	DS04-P	**Hydraulic, single-acting** Asymmetric O-ring loaded rod seal for standard applications based on the DS01-P design with an active rectangular back-up ring for larger extrusion gaps or higher pressure ranges.	–30	+100	0,5	700	**Seal** ECOPUR DD	**Energizer** NBR 70	**Back-up ring** SKF Ecotal
	DS05-P	**Pneumatic, single-acting** Asymmetric rod seal. Design optimized for ECOPUR DD material to benefit from high wear resistance. For use in lubricated or dry pneumatic applications. Special design of sealing lip allows retention of initial lubricating film.	–30	+100	1	25	ECOPUR DD		
	DS05-R	**Pneumatic, single-acting** Asymmetric rod seal. Design optimized for SKF Econbr and SKF Ecofkm materials to benefit from increased chemical and thermal resistance. For use in lubricated and dry pneumatic applications. Special design of sealing lip allows retention of initial lubricating film.	–30 –20	+100 +200	1 1	25 25	SKF Econbr SKF Ecofkm		
	DS06-P	**Hydraulic, single-acting** Symmetric unloaded lip seal for simple standard applications; not recommended for new designs. Universal usage for rod or piston applications. Design optimized for ECOPUR DD material.	–30	+100	0,5	400	ECOPUR DD		
	DS06-R	**Hydraulic, single-acting** As profile DS06-P, but design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance.	–30 –20	+100 +200	0,5 0,5	160 160	SKF Econbr SKF Ecofkm		
	DS07-P	**Hydraulic, single-acting** Symmetric O-ring loaded lip seal for simple standard applications; not recommended for new designs. Especially suitable for increased sideloads and holding functions. Universal usage for rod or piston applications. Design optimized for ECOPUR DD material.	–30	+100	0,5	400	**Seal** ECOPUR DD	**Energizer** NBR 70	

Linear moving | Rotating | Oscillating | Spiral moving | Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material	
			°C		m/s	bar	–	
	DS07-F	**PTFE rod seal, single-acting** Symmetric O-ring loaded lip seal. Design optimized for SKF Ecoptfe material to reduce friction and stick-slip effects. Not recommended for new designs. Variation of O-ring materials to adapt to application requirements. Universal usage for rod or piston applications.	–30 –20 –50 –55	+100 +200 +150 +200	1 1 1 1	400 400 400 200	**Seal** SKF Ecoptfe SKF Ecoptfe SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75 EPDM 70 MVQ 70
	DS09-E	**Hydraulic, single-acting** O-ring loaded asymmetric slide ring rod seal. Design optimized for SKF Ecoptfe material to reduce friction and stick-slip effects. For extremely low and high speeds as well as positioning functions. Typically in tandem design or as a buffer seal in combination with DS01-P as a rod seal.	–30 –20	+100 +200	10 10	600 600	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75
	DS09-P	**Hydraulic, single-acting** O-ring loaded asymmetric slide ring rod seal. Design optimized for ECOPUR DD material for increased wear resistance and leak tightness. Typical design for light to medium duty hydraulic rods.	–30	+100	1	250	**Seal** ECOPUR DD	**Energizer** NBR 70
	DS09-ES	**Hydraulic, single-acting** Energizer loaded asymmetric slide ring rod seal, similar to DS09-E, but special heavy duty design. Due to adaption possibilities of the energizer also applicable for special housing dimensions.	–30 –20	+100 +200	10 10	600 600	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** SKF Econbr SKF Ecofkm
	DS16-A	**Hydraulic/pneumatic, single-acting** Simple hat seal, usually fixed in housing with clamp flange. Mainly used for replacement in old hydraulic and pneumatic cylinders or for secondary applications.	–30 –30 –20	+100 +100 +200	0,5 0,5 0,5	160 160 160	ECOPUR DD SKF Econbr SKF Ecofkm	
	DS17-P	**Hydraulic, single-acting** Asymmetric rod seal with additional stabilization lip. Very good sealing effect over a wide temperature range and good back pumping ability. Design optimized for ECOPUR DD material. Also used in telescopic cylinders with low CS/L-ratio.	–30	+100	0,5	400	ECOPUR DD	

Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	DS17-R	**Hydraulic, single-acting** As profile DS17-P, but design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance.	–30 –20	+100 +200	0,5 0,5	160 160	SKF Econbr SKF Ecofkm		
	DS18-P	**Hydraulic, single-acting** Asymmetric rod seal for standard applications based on DS17-P with additional rectangular active back-up ring for lager extrusion gaps or higher pressure ranges.	–30	+100	0,5	600	**Seal** ECOPUR DD	**Back–up ring** SKF Ecotal	
	DS18-R	**Hydraulic, single-acting** As profile DS18-P, but design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance.	–30 –20	+100 +200	0,5 0,5	250 250	**Seal** SKF Econbr SKF Ecofkm	**Back–up ring** SKF Ecotal SKF Ecoptfe	
	DS24-P	**Hydraulic, single-acting** Asymmetric O-ring loaded rod seal with additional stabilization lips and a rectangular active back-up ring for larger extrusion gaps or higher pressure ranges. Very good sealing effect over a wide temperature range and good back pumping ability. Design optimized for ECOPUR DD material.	–30	+100	0,5	700	**Seal** ECOPUR DD	**Energizer** NBR 70	**Back-up ring** SKF Ecotal
	DS35-P	**Hydraulic, double-acting** Space saving compact rod seal. Design optimized for ECOPUR DD material. Also commonly used as O-ring replacement to prevent twisting of the seal.	–30	+100	0,4	400	ECOPUR DD		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SKF SEAL JET DD

Wiper seals

Introduction

Hydraulic cylinders operate in a variety of applications and environmental conditions, including exposure to dust, debris or outside weather conditions. To prevent these contaminants from entering the cylinder assembly and hydraulic or pneumatic system, wiper seals (also known as scrapers, excluders or dust seals) are fitted on the external side of the cylinder head.

Wiper seals prevent the ingress of contamination during static and dynamic conditions. Without a good working wiper seal, particles can get trapped and transported into the cylinder, which can damage the seals as well as other components in the hydraulic system.

In addition to the sealing function, also wiper seals need to keep a thin lubrication film on the piston rod that lubricates themselves and the rod and buffer seals. The lubricant also inhibits corrosion of the piston rod surface. However, the lubrication film must be thin enough so that it returns to the cylinder during the return stroke. This is called back pumping performance of the whole rod sealing system.

Selecting profiles and materials for a wiper seal is a complex task, considering all possible cylinder designs and application criteria. SKF supplies standard wiper seals in many different profiles and in a wide range of materials, series and sizes, which make them appropriate for a wide variety of operating conditions and applications. On the following pages you will find all the available wiper seal designs that are available as machined versions utilizing the SKF SEAL JET DD system.



Typical situation for a wiper in a hydraulic cylinder, to protect the internal parts from contamination



Single-acting snap-in wiper seal DA01-P made of ECOPUR DD for hydraulic applications

Wiper seals


DA01-B


DA02-B


DA04-B


DA05-B


DA06-A


DA08-A


DA09-A


DA10-A


DA13-A


DA25-F


DA26-F


DA27-F

Wiper selection guide

Housings according to ISO 6195
Type A Type B Type C Type D

Special design variations
No standard for housings, but still commonly used

Single-acting design Hydraulic

Single-acting wiper seals for hydraulics are typically used in light to medium duty applications, where the rod sealing system has very good leak tightness and the back pumping effect is not disturbed by the presence of back-up rings. The different variations are typically based on the housing types.

With back support



DA01-B



DA02-B

Special ANSI housings for angled housings



DA10-A



DA09-A

Single lip



DA08-A



DA05-B

Single-acting design Pneumatic

Single-acting wiper seals for pneumatics are typically used in light to medium duty applications, where the sealing system requires a separate rod seal. The different variations are typically based on the housing types.

With back support



DA04-B



DA06-A



DA25-F

Double-acting design Hydraulic & Pneumatic

Double-acting wiper seals for hydraulics are typically used in medium to heavy duty applications, where the rod sealing system could have small leakage and/or the back-pumping effect is disturbed by a back-up ring. Double-acting wiper seals for pneumatics are used as a complete solution for light duty applications, where the function of the rod and the wiper seals can be combined.

O-Ring loaded



DA26-F

O-Ring loaded



DA27-F

Special wiper

Sometimes it is not enough to keep dust, dirt and contamination out of the the sealing system. Therefore scrapers or a rod seal oriented outside the cylinder need to be used as a wiper seal.

Scraper



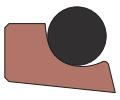
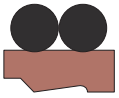
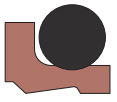
DA13-A

Linear moving · Rotating · Oscillating · Spiral moving · Static
Grey symbols: contact SKF for application limitations

Application	Profile	Description	Temperature min.	Temperature max.	Speed max.	Material	Casing
			°C		m/s	–	
	DA01-B	**Hydraulic, single-acting** Single-acting snap-in wiper seal providing a technical accurate closure at the cylinder. Designed for housings according to ISO 6195-Type A.	–30 –30 –20	+100 +100 +200	4 4 4	ECOPUR DD SKF Econbr SKF Ecofkm	
	DA02-B	**Hydraulic, single-acting** Single-acting snap-in wiper seal for housings with a larger step groove for more stable retention of the wiper seal.	–30 –30 –20	+100 +100 +200	4 4 4	ECOPUR DD SKF Econbr SKF Ecofkm	
	DA04-B	**Pneumatic, single-acting** Single-acting snap-in wiper seal providing a technical accurate closure at the cylinder. Designed for housings according to ISO 6195-Type A.	–30 -30 –20	+100 +100 +200	4 4 4	ECOPUR DD SKF Econbr SKF Ecofkm	
	DA05-B	**Pneumatic, single-acting** Single-acting snap-in wiper seal for housings with a larger step groove for more stable retention of the wiper seal.	–30 -30 -20	+100 +100 +200	4 4 4	ECOPUR DD SKF Econbr SKF Ecofkm	
	DA06-A	**Pneumatic, single-acting** Single-acting press-in wiper seal providing a technical accurate closure at the cylinder. The use of thermoplastic casings avoids corrosion in the press-fit. Designed for housings according to ISO 6195-Type B.	–30 –30	+80 +80	4 4	**Seal** ECOPUR DD SKF Econbr	**Casing** SKF Ecotal SKF Ecotal
	DA08-A	**Hydraulic/pneumatic, single-acting** Single-acting wiper seal usually fixed in housings with clamping flange. Mainly used for replacement in old hydraulic and pneumatic cylinders or for secondary applications. DA08-A with chamfer on the inside edge.	–30 –30 –20	+100 +100 +200	4 4 4	ECOPUR DD SKF Econbr SKF Ecofkm	
	DA09-A	**Hydraulic, single-acting** Single-acting wiper seal with dimensioning according to common types used in USA. For housings according AN 6231, ANSI/B93.35. Please refer to the seal data sheet for further information.	–30 –30 –20	+100 +100 +200	4 4 4	ECOPUR DD SKF Econbr SKF Ecofkm	

Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material	
			°C		m/s	bar	–	
	DA10-A 	**Hydraulic, single-acting** Single-acting wiper seal with dimensioning according to common types used in USA. Fixed relation between cross-section and height of wiper. For housings according AN 6231, ANSI/B93.35. Please refer to the seal data sheet for further information.	–30 –30 –20	+100 +100 +200	4 4 4	– – –	ECOPUR DD SKF Econbr SKF Ecofkm	
	DA13-A 	**Hydraulic/pneumatic, single-acting** Scraper ring, mainly used in combination with wiper DA02 or DA01. Firmly clinging dirt and extremely heavy soiling (mud, tar, ice) is wiped off, following elastomeric wiper is protected from damage. SKF Ecotal provides good dry running properties, high stiffness and breaking strength.	–50	+80	4	–	SKF Ecotal	
	DA25-F 	**Hydraulic/pneumatic, single-acting** Single-acting O-ring loaded snap-in wiper seal designed for SKF Ecoptfe material to reduce friction and stick-slip effects. The O-ring ensures static sealing and loads the wiping lip, radial misalignments can be compensated and the wiping lip follows the rod. Designed for housings according to ISO 6195-Type D.	–30 –20	+100 +200	10 10	– –	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75
	DA26-F 	**Hydraulic/pneumatic, double-acting** Double-acting O-ring loaded snap-in wiper seal designed for SKF Ecoptfe material to reduce friction and stick-slip effects. The O-rings ensure static sealing and load the wiping lip. Radial misalignments can be compensated and the wiping lip follows the rod. The inside wiping lip reduces the residual oil film.	–30 –20	+100 +200	10 10	16 16	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75
	DA27-F 	**Hydraulic/pneumatic, double-acting** Double-acting O-ring loaded snap-in wiper seal designed for SKF Ecoptfe material to reduce friction and stick-slip effects. The O-ring ensures static sealing and loads the wiping lip. Radial misalignments can be compensated and the wiping lip follows the rod. The inside wiping lip reduces the residual oil film.	–30 –20	+100 +200	10 10	16 16	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75



Rotary seals

Introduction

Rotary seals or power transmission seals cover a wider range of radial and axial seals that keep contaminants out and lubricants in the system or separate fluids and – in some cases – also withstand differences in pressure.

These seals are used between rotating and stationary machine components or between two components in relative motion.

To be effective, rotary seals should operate with a minimum of friction and wear, even under unfavourable operating conditions. To meet the requirements of a variety of different applications and operating conditions, seals for rotating machine components are manufactured from many different designs, materials and executions. Each of these designs and material combinations has specific properties, making them suitable for a particular application.

Rotary seals are used to seal against a wide variety of media statically and dynamically. Typical fields of applications include agricultural and construction machinery, wind turbines, ship building and other areas of application in the manufacture of machines and devices.

Some radial shaft seal designs have an auxiliary lip that protects the primary sealing lip from dust and other contaminants. A suitable lubricant in the space between the primary sealing lip and the auxiliary lip can reduce wear and delay corrosion.
Contaminants that have passed the auxiliary lip will eventually cause damage in the counterface surface area. A build-up of heat can also occur between the two lips, resulting in premature wear.

On the following pages you will find all the rotary seal designs that are available as machined versions utilizing the SKF SEALJET DD system.



Basic function of a rotary shaft seal - keep lubricant in and contamination out of the system and protect the lubricated bearing

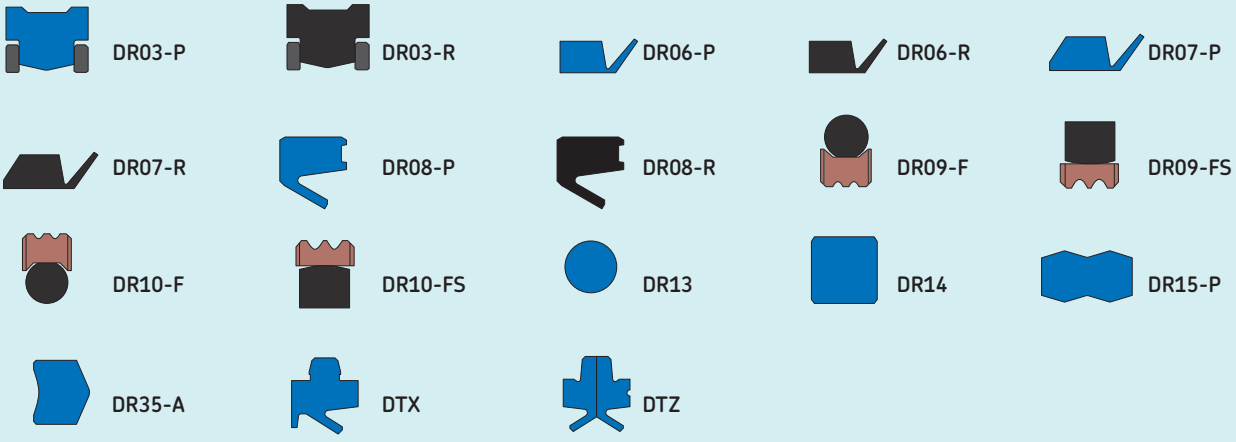


Axially acting rotary lip seal DR06-P made of ECOPUR DD

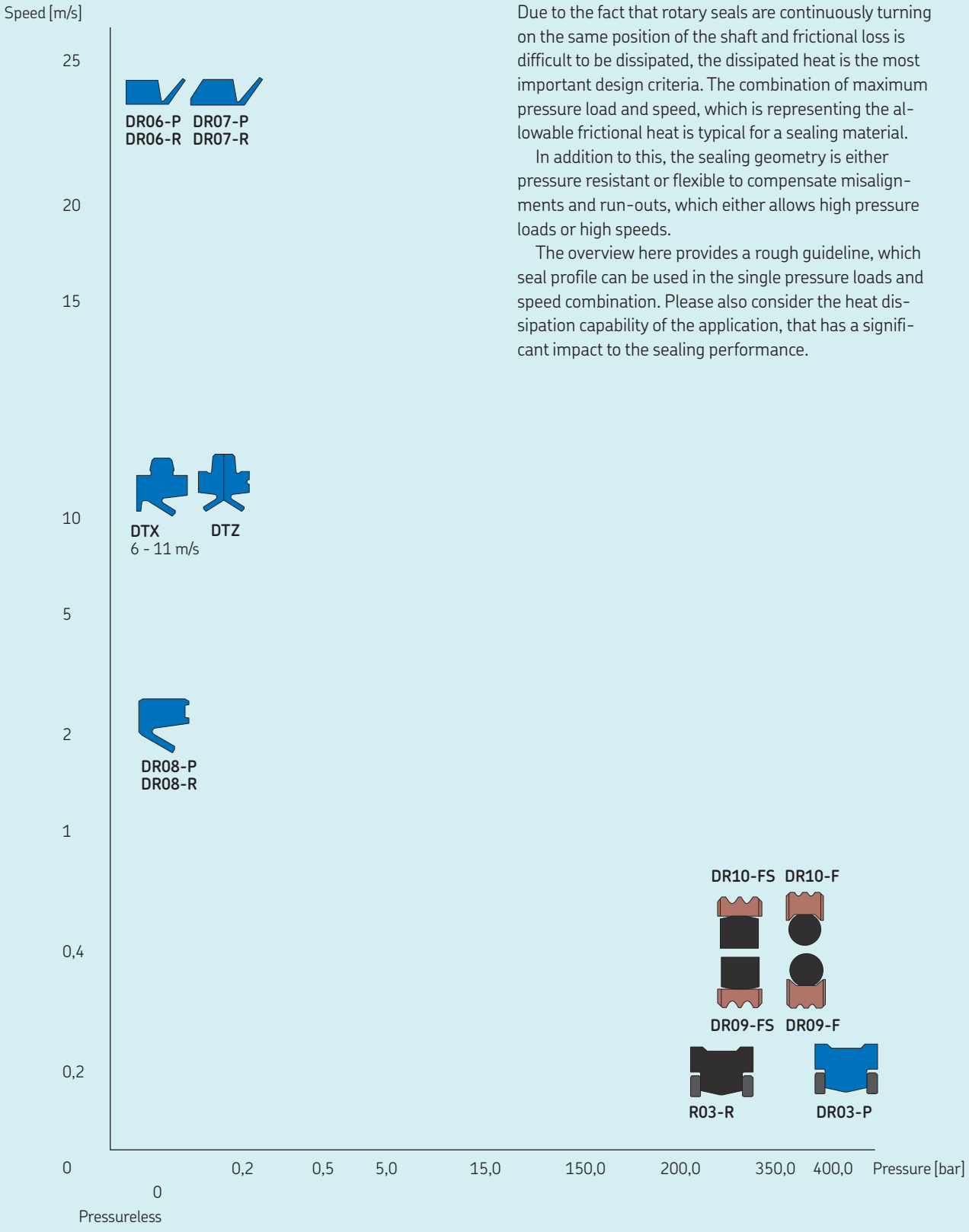


Double-acting O-Ring loaded symmetric slide ring rotary swivel seal DR09-F made of SKF Ecoptfe and SKF Ecofkm

Rotary seals



Rotary seal selection guide



Due to the fact that rotary seals are continuously turning on the same position of the shaft and frictional loss is difficult to be dissipated, the dissipated heat is the most important design criteria. The combination of maximum pressure load and speed, which is representing the allowable frictional heat is typical for a sealing material.

In addition to this, the sealing geometry is either pressure resistant or flexible to compensate misalignments and run-outs, which either allows high pressure loads or high speeds.

The overview here provides a rough guideline, which seal profile can be used in the single pressure loads and speed combination. Please also consider the heat dissipation capability of the application, that has a significant impact to the sealing performance.

Linear moving | Rotating | Oscillating | Spiral moving | Static

Grey symbols: contact SKF for application limitations

Application	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material	
			°C		m/s	bar	–	
	DR03-P	**Double-acting rotary seal** Symmetric rotary compact swivel seal with an active back-up ring for larger extrusion gaps or higher pressure ranges. Design optimized for ECOPUR DD material for increased wear resistance. Mainly used in rotary joints (mobile hydraulic) to separate different fluid channels.	–30	+100	0,2	400	**Seal** ECOPUR DD	**Back-up rings** SKF Ecotal
	DR03-R	**Double-acting rotary seal** Symmetric rotary compact swivel seal with an active back-up ring for larger extrusion gaps or higher pressure ranges. Design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance. Mainly used in rotary joints (mobile hydraulic) to separate different fluid channels.	–30 –20	+100 +200	0,2 0,2	250 250	**Seal** SKF Econbr SKF Ecofkm	**Back-up rings** SKF Ecotal SKF Ecoptfe
	DR06-P	**Axially acting rotary seal** Axially acting rotary lip seal installed by interference fit on the shaft. Design optimized for ECOPUR DD material with increased wear resistance. Typically rotates with the shaft and acts at higher speeds as a flinger ring (max. speed only valid for rotating seals and requires axial support). Mainly used for contamination exclusion.	–30	+100	25	–	ECOPUR DD	
	DR06-R	**Axially acting rotary seal** As profile DR06-P, but design optimized for SKF Econbr materials with increased chemical and thermal resistance.	–30 –20	+100 +200	25 25	– –	SKF Econbr SKF Ecofkm	
	DR07-P	**Axially acting rotary seal** Axially acting rotary lip seal installed by interference fit on the shaft. Design optimized for ECOPUR DD materials with increased wear resistance. Typically rotates with the shaft and acts at higher speeds as a flinger ring (max. speed only valid for rotating seals and requires axial support). Mainly used for contamination exclusion.	–30	+100	25	–	ECOPUR DD	
	DR07-R	**Axially acting rotary seal** As profile DR07-P, but design optimized for SKF Econbr and SKF Ecofkm materials with increased chemical and thermal resistance.	–30 –20	+100 +200	25 25	– –	SKF Econbr SKF Ecofkm	

Linear moving · Rotating · Oscillating · Spiral moving · Static
Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material	
			°C		m/s	bar	–	
	DR08-P	**Single-acting rotary seal** Single-acting spring-less rotary lip seal for axially open housings with clamping plate. Design optimized for ECOPUR DD material for increased wear resistance. Mainly used for grease retention or contamination exclusion.	–30	+100	2,5	–	ECOPUR DD	
	DR08-R	**Single-acting rotary seal** Single-acting spring-less rotary lip seal for axially open housings with clamping plate. Design optimized for SKF Econbr and SKF Ecofkm materials for increased chemical and thermal resistance. Mainly used for grease retention or contamination exclusion.	–30 –20	+100 +200	2,5 7,5	– –	SKF Econbr SKF Ecofkm	
	DR09-F	**Double-acting rotary seal** O-ring loaded symmetric slide ring rotary swivel seal. Design optimized for SKF Ecoptfe material to reduce friction and stick-slip effects. Mainly used in rotary joints (mobile hydraulics and machine tools) to separate different channels. Inside dynamic sealing surface.	–30 –20	+100 +200	0,4 0,4	350 350	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75
	DR09-FS	**Double-acting rotary seal** As profile DR09-F, but with a profile ring energizer instead of the O-ring. For heavy duty applications and non-standard housings.	–30 –20	+100 +200	0,4 0,4	350 350	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** SKF Econbr SKF Ecofkm
	DR10-F	**Double-acting rotary seal** O-ring loaded symmetric slide ring rotary swivel seal. Design optimized for SKF Ecoptfe material to reduce friction and stick-slip effects. Mainly used in rotary joints (mobile hydraulics and machine tools) to separate different channels. Outside dynamic sealing surface.	–30 –20	+100 +200	0,4 0,4	350 350	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** NBR 70 FPM 75
	DR10-FS	**Double-acting rotary seal** As profile DR10-F, but with a profile ring energizer instead of the O-ring. For heavy duty applications and non-standard housings.	–30 –20	+100 +200	0,4 0,4	350 350	**Seal** SKF Ecoptfe SKF Ecoptfe	**Energizer** SKF Econbr SKF Ecofkm

Linear moving | Rotating | Oscillating | Spiral moving | Static

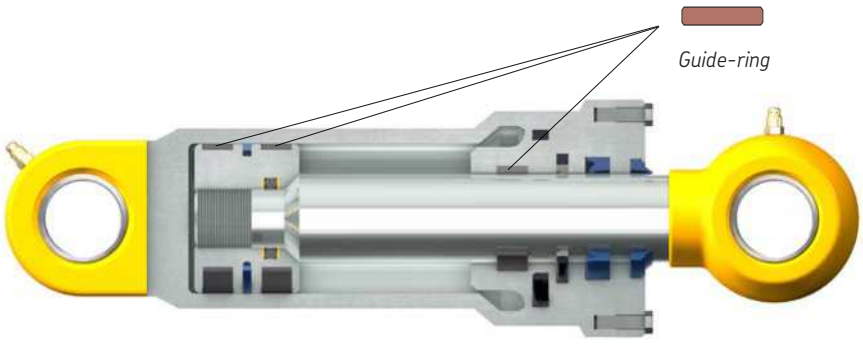
Grey symbols: contact SKF for application limitations

Application	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material
			°C		m/s	bar	–
	DTX 	**SNL plummer block housing seal; single-acting** Single-acting springless shaft seal for grease applications to be mounted into SKF SNL plummer block housings; seals are "pre-cut" at 0° and 180° to possibly break the seal in two halves for easier installation.	–30 –30	+100 +100	6 11	– –	ECOPUR DD SKF Econbr
	DTZ 	**SNL plummer block housing seal; double-acting, split version** Double-acting springless shaft seal for grease applications to be mounted into SKF SNL plummer block housings; the seals are manufactured in two pieces (back to back) and "pre-cut" at 0° and 180° to possibly break the seal in two halves for easier installation.	–30 –30	+100 +100	11 11	– –	ECOPUR DD SKF Econbr

Guide rings

Introduction

The function of guide elements or wear rings is to guide the piston and the rod of a hydraulic or pneumatic cylinder, as well as to withstand arising side loads. At the same time, it prevents any metal-to-metal contact, which will damage and score the surfaces and eventually cause seal damage, leakage and component damage.



Guide elements used in hydraulic cylinders.



Guide ring DF01 made of SKF Ecoptfe

Guide rings

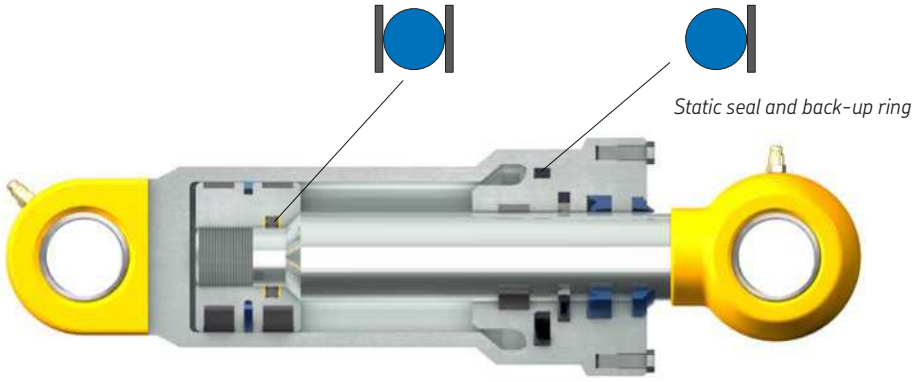
Linear moving · Rotating · Oscillating · Spiral moving · Static
Grey symbols: contact SKF for application limitations

Application	Profile	Description	Temperature min.	Temperature max.	Speed max.	Specific load[3] max.	Material
			°C		m/s	N/mm²	–
	DF01	**Guide ring** Most common guide ring for rod or piston application. Used in many standard cylinders, majority of applications require split version for installation into closed housings, non split design available (bushings).	–200 –50	+200 +100	4 1	3 25	SKF Ecoptfe SKF Ecotal

Back-up rings

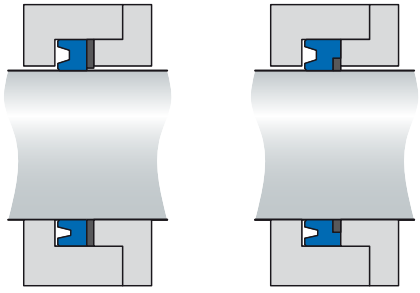
Introduction

Back-up rings prevent gap extrusion of the seal or a static O-Ring. The standard machined hydraulic seals normally have active back-up rings, which allow the back-up ring to adjust on the dynamic counter surface to optimize the extrusion resistance.



Static seal and back-up ring

Cylinder with static seals and back-up rings



Inactive back-up ring (left) vs. active back-up ring (right).

Back-up rings

Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Application	Profile	Description	Temperature min.	Temperature max.	Material
			°C		–
	DST08	**Back-up ring** Common inactive back-up ring, mainly used with O-rings to avoid gap extrusion. Split and non split design available.	–70 –200 –50	+100 +260 +100	ECOPUR DD SKF Ecoptfe SKF Ecotal
	DST09	**Back-up ring** Common inactive back-up ring especially for O-rings to avoid gap extrusion. Split and non split design available.	–70 –200 –50	+100 +260 +100	ECOPUR DD SKF Ecoptfe SKF Ecotal

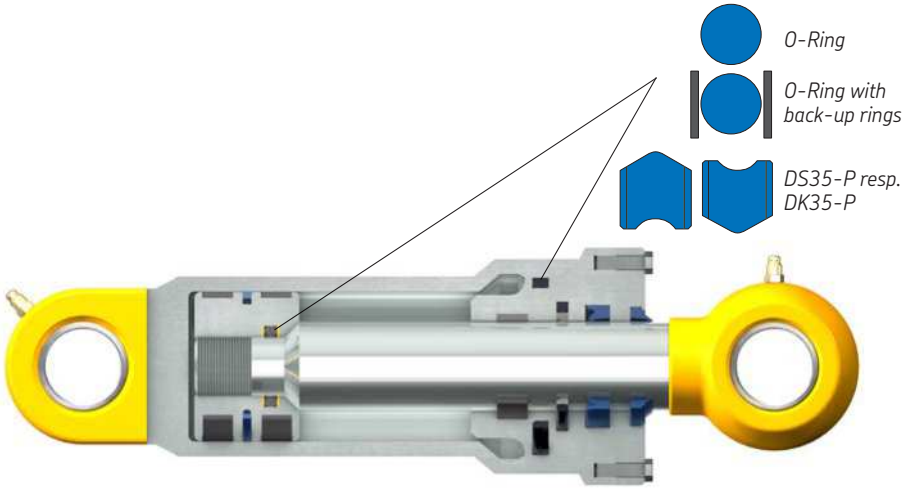
Static seals

Introduction

Besides the conventional O-rings and square rings, SKF offers a standard range of specialized seals for static applications. Most of profiles listed below fit in standard O-ring grooves (housings) and can be substituted easily without any rework of housing dimensions.

Those seals are mainly designed for increased stability in the housing to avoid twisting during the mounting process, which can occur when using simple O-rings. Twisting of O-rings might damage the seal during installation already before they are to be used as sealing element.

The Illustration shows different static seals used in hydraulic cylinders. O-rings might do the job for standard applications. For heavy duty applications additional back-up rings might be applicable. For tricky situations regarding mounting also DS35-P resp. DK35-P seals might be the best solution to avoid twisting.



Typical situation for different static seals used in hydraulic cylinders.



Static seal DS35-P in ECOPUR DD

Static seals



Beside the conventional O-rings and square-rings, SKF offers a standard range of specialized seals for static applications. Most of the profiles listed below fit in standard O-ring-grooves (housings) and can be substituted easily without any rework of housing dimensions.

Profile		Description
DR13 	**DR14** 	**Universal type** Most common and simple seal profiles with proven reliability in a wide range of different applications and industries.
DS35-P 	**DR15-P** 	**Inside sealing type** Interference fit on outside diameter[1] provides stable fit in the housing and reliable performance at all pressures.
DK35-P 	**DR15-P** 	**Outside sealing type** Interference fit on inside diameter[1] provides stable fit in the housing and reliable performance at all pressures.
DR35-A 		**Axial sealing type** Robust profiles mainly used as flange seals, inside or outside pressurizsation possible. Direction of pressurization (from inside or outside) must be indicated when ordering the seal.

[1] DR15-P is a symmetric profile and has no defined interference fit to inner or outer diameter.

Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material
			°C		m/s	bar	–
	DR13	**O-ring** Simple O-ring mainly used for static applications and energizing functions (e.g. for slide ring seals). In case of dynamic pressurisation or minor dynamic movements we recommend to use DS35-P, DK35-P or DR35-A.	–30 –30 –20 –200	+100 +100 +200 +260	– – – –	600 160 160 160	ECOPUR DD SKF Econbr SKF Ecofkm SKF Ecoptfe
	DR14	**Square ring** Simple square ring mainly used for static applications or as gasket. Axial or radial, inside or outside sealing possible. Design not optimized to a material class. All materials can be selected, but preload in the application has to be adapted individually. Therefore no pressure range is stated. Can also be used as a spacer ring. Please choose DST08 for back-up rings and DF01 for guide rings to ensure correct manufacturing tolerances, cutting gaps and chamfers.	–30 –30 –20 –200	+100 +100 +200 +260	– – – –	– – – –	ECOPUR DD SKF Econbr SKF Ecofkm SKF Ecoptfe
	DR15-P	**Double-acting static seal** For static applications as an O-ring replacement to avoid drilling in the housing, simple installation and higher extrusion resistance.	–30	+100	–	400	ECOPUR DD
	DR35-A	**Single-acting flange seal** Flange seal for static applications, suitable for high pressure range. Direction of pressurization (from inside or outside) must be indicated when ordering the seal.	–30 –30 –20	+100 +100 +200	– – –	800 250 250	ECOPUR DD SKF Econbr SKF Ecofkm

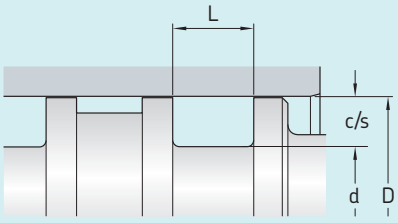

SKF TU.PUDD.82079
162/206
ECOPUR DD
SKF TU.PUDD.82073
66/110
ECOPUR DD
SKF TU.PUDD.82068
0/31
ECOPUR DD

Piston seal housing details and recommendations

The table on the right shows an example of standard housing measurements for piston seals.

Please note that SKF can produce these profiles to application specific requirements or any non-standard housing.

Suggested standard housing dimension



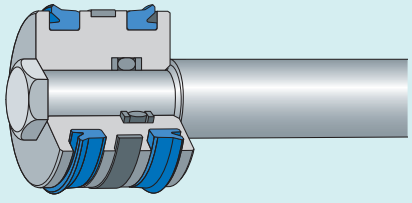
Indicated dimensions are required to process an order

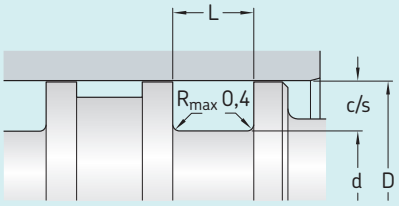
D	bore diameter
d, d_1 [2]	housing groove diameter
L, L_1 [2]	housing groove length
c/s	cross section

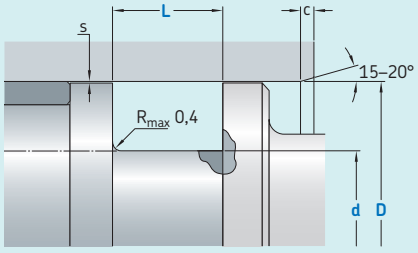
	Surface properties $R_{t\,max}$	R_a
	µm	
Sliding surface for		
TPU/rubber seals	≤ 2,5	≤ 0,05–0,2
PTFE seals	≤ 2	≤ 0,05–0,2
Groove bottom	≤ 6,3	≤ 1,6
Groove face	≤ 15	≤ 3
Bearing area T_p	50–95%[1]	

Seal housing tolerances
Depending on the seal profiles

[1] at a cutting depth of 0,5 R_z based on C_{ref} = 0%
[2] d_1 and L_1 only valid for K09, please refer to the image in the related section







Drawing for DK03-F and DK07-F profiles



DK01-P
DK01-PE
DK01-R
DK01-RE

DK02-P
DK02-R

DK03-P
DK03-F[1]

DK04-P

DK05-P
DK05-R

DK06-P
DK06-R

DK07-P
DK07-F[1]

Main function
Single-acting piston seals lip type (U-cup) seals compact seals

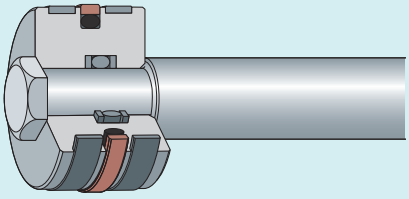
Main applications
Support and retaining cylinders
Standard cylinders

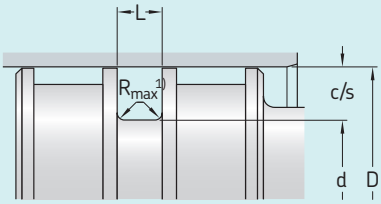
Advantages
Stable fit in the housing
Ultimate sealing effect
Wide temperature range

Standard materials
ECOPUR DD
SKF Econbr
SKF Ecofkm
SKF Ecoptfe

Bore diameter D H9 over	incl.	Housing groove diameter D h10	Housing groove length L +0,2	Cross section c/s
mm				
18[2]	25	D – 8	6	4
25	50	D – 10	7	5
50	75	D – 12	8	6
75	150	D – 15	10	7,5
150	200[2]	D – 20	12	10

[1] DK03-F and DK07-F are PTFE seals and require an accessible housing. Please refer to the seal data sheet for more details..
[2] The bore diameter depends on choice of material, SKF Ecoptfe starts with 24 mm and ends at 190 mm, SKF Econbr and SKF Ecofkm end at 188 mm.







DK08-D DK08-P DK08-E

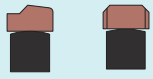
Main function
Single/double-acting piston seals
Energizer loaded PTFE (TPU) seals

Main applications
Standard cylinders for positioning functions, mobile hydraulics, etc

Advantages
Low friction
No stick-slip
Excellent resistance against pressure shocks

Standard materials
ECOPUR DD / NBR 70
SKF Ecoptfe / NBR 70
SKF Ecoptfe / FPM 75

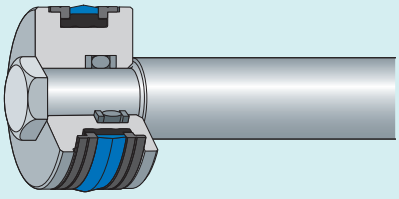
Bore diameter D H9 over	incl.	Housing groove diameter d h10	Housing groove length L +0,2	Cross section c/s
mm				
18[1]	40	D – 7,5	3,2	3,75
40	80	D – 11	4,2	5,5
80	133	D – 15,5	6,3	7,75
133	200[1]	D – 21	8,1	10,5

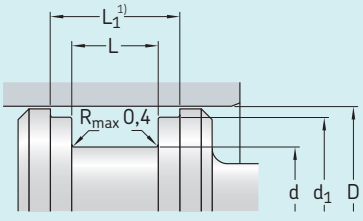


DK08-ES DK08-DS

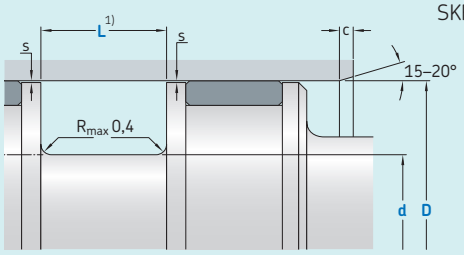
mm		mm	mm	mm
15[1]	50	D – 10	5	5
50	60	D – 15	7,5	7,5
60	200[1]	D – 20	10	10

[1] The bore diameter depends on choice of material, SKF Ecoptfe starts with 24 and ends at 190 mm.
[2] For details regarding R_{max} please refer to the related seal data sheet





Drawing for DK09 profiles



Drawing for DK23 profiles



DK09-D DK23-D
DK09-F DK23-F

Main function
Double-acting piston seal
Compact type

Main applications
Support and retaining cylinders
Standard cylinders

Advantages
Excellent static and dynamic sealing capacity, integrated back-up rings

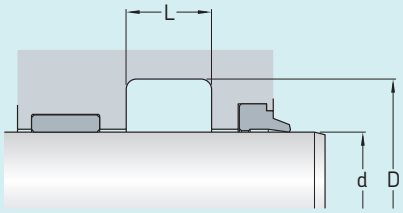
Standard materials
ECOPUR DD / SKF Econbr /
SKF Ecotal / SKF Ecoptfe

Bore diameter D over	incl.	Housing groove diameter d	d_1	Housing groove length L	L_1
mm					
20	50	10	3	12,5	20,5
50	80	15	4	20	28
80	150	20	5	25	36
150	190	25	6	32	46

[1] Not all profiles available above 600 mm

Rod seal housing details and recommendations

Suggested standard housing dimension

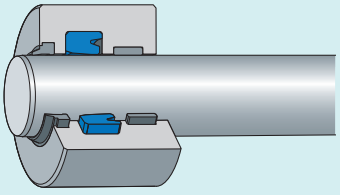


Indicated dimensions are required to process an order
D housing groove diameter
d rod diameter
L housing groove length
c/s cross section

	Surface properties $R_{t\,max}$	R_a
	µm	
Sliding surface for		
TPU/rubber seals	≤ 2,5	≤ 0,05–0,3
PTFE seals	≤ 2	≤ 0,05–0,2
Groove bottom	≤ 6,3	≤ 1,6
Groove face	≤ 15	≤ 3
Bearing area T_p	50–95%[1]	

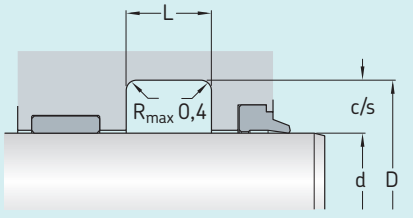
Seal housing tolerances
D H10
d f8
L +0,2

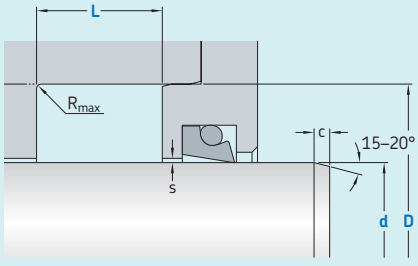
[1] at a cutting depth of 0,5 R_z based on C_{ref} = 0%





DS01-P **DS01-R** | **DS02-P**[1] **DS02-R**[1] | **DS03-P** **DS03-F**[2] | **DS04-P**[1] | **DS05-P** **DS05-R** | **DS06-P** **DS06-R** | **DS07-P** **DS07-F**[2] | **DS17-P** **DS17-R** | **DS18-P**[3] **DS18-R**[3] | **DS24-P**[1]





Drawing for the PTFE seal profiles DS3-F and DS07-F

Main function
Single-acting rod seals
Lip type (U-cup) seals
Compact seals

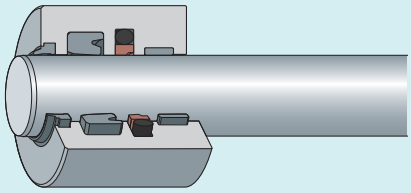
Main applications
Standard cylinders
Light and standard hydraulic applications

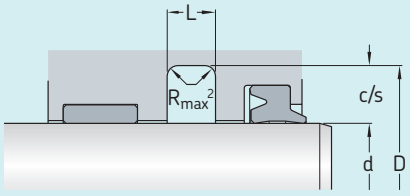
Advantages
Stable fit in the housing
Ultimate sealing effect
Wide temperature range
Good backpumping ability

Standard materials
ECOPUR DD
SKF Econbr
SKF Ecofkm
SKF Ecoptfe

Rod diameter d over	incl.	Housing groove diameter D	Housing groove length L[3]	Cross section c/s
mm				
11[1]	25	d + 8	6,3 (8,0)[3]	4
25	50	d + 10	8 (9)[3]	5
50	150	d + 15	10 (14)[3]	7,5
150	200[1]	d + 20	14 (17)[3]	10

[1] The diameters depend on choice of material and seal profile. Please see details in the seal data sheets. Please contact our technical department for exact limitations.
[2] DK03-F and DK07-F are PTFE seals and require an accessible housing. Please refer to the seal data sheet for more details.
[3] Higher values for L (in brackets) required for DS18-P, DS18-R and DS24-P due to back-up ring.







S09-E



S09-P

Main function
Single/double-acting rod seals,
O-ring activated PTFE (TPU) seals

Main applications
Earth moving equipment
Heavy hydraulics

Advantages
Excellent resistance against pressure shocks
Long lifetime

Standard materials
ECOPUR DD / NBR 70
SKF Ecoptfe / NBR 70
SKF Ecoptfe / FPM 75



DS09-ES

Rod diameter		Housing groove diameter	Housing groove length	Cross section
d		D	L	c/s
over	incl.			
mm				
11[1]	19	d + 7,3	3,2	3,65
19	38	d + 10,7	4,2	5,35
38	185[1]	d + 15,1	6,3	7,55

mm		mm	mm	mm
	50	d+10	5	5
50	60	d+15	7,5	7,5
60	185[1]	d+20	10	10

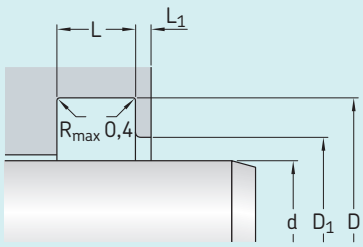
[1] The diameters depend on choice of material and seal profile. Please see details in the seal data sheets. Please contact our technical department for exact limitations.
[2] For details regarding R_{max} please refer to the related seal data sheet.

Wiper housing details and recommendations

The table on the right shows an example of standard housing measurements for wipers.

Please note that SKF can produce these profiles to application specific requirements or any non-standard housing.

Suggested standard housing dimension



Indicated dimensions are required to process an order

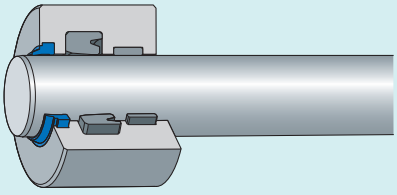
D housing groove diameter
d rod diameter
L housing groove width
H total wiper height

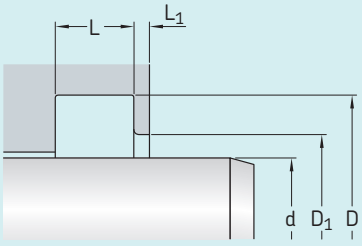
	Surface properties $R_{t\,max}$	R_a
	µm	
Sliding surface for TPU/rubber seals	≤ 2,5	≤ 0,05–0,3
Groove bottom	≤ 6,3	≤ 1,6
Groove face	≤ 15	≤ 3
Bearing area T_p	50–95%[1]	

Seal housing tolerances

D_1 H11
D [2] H11
d f8
L +0,2

[1] at a cutting depth of 0,5 R_z based on C_{ref} = 0%
[2] DA06-A needs tighter tolerances - please see details in the related section.







DA01-B **DA04-B**

Main function
Single-acting wipers

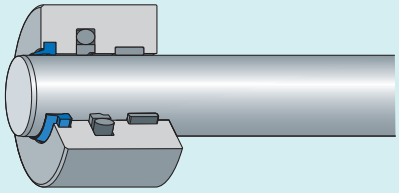
Main applications
Standard wiper for hydraulics

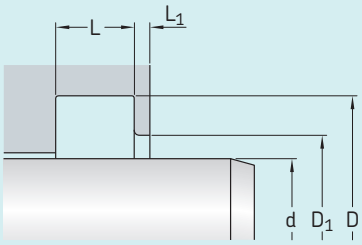
Advantages
Easy installation (snap-in)
Excellent wear resistance
Technically accurate closure

Standard materials
ECOPUR DD
SKF Econbr
SKF Ecofkm

Rod diameter d over	incl.	Housing groove diameter D	D_1	Housing groove width L	L_1
mm					
10	100	d + 8	d + 6	4	1
100	150	d + 12	d + 9	5,5	1,5
150	185[1]	d + 15	d + 11	6,5	2

[1] The maximum rod diameter depends on choice of material, SKF Econbr and SKF Ecofkm end at 180 mm.







DA02-B **DA05-B**

Main function
Single/double-acting wipers

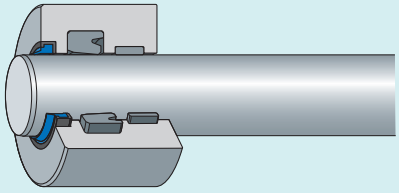
Main applications
In combination with O-ring activated PTFE rod seals (DS09)

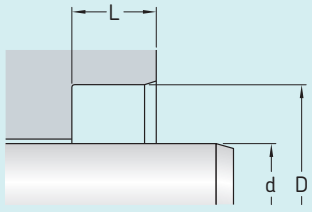
Advantages
Excellent wear resistance
Double-acting function

Standard materials
ECOPUR DD
SKF Econbr
SKF Ecofkm

Rod diameter		Housing groove diameter		Housing groove width	
d		D	D_1	L	L_1
over	incl.				min
mm					
10	50	d +8	d + 4	5	2
50	100	d + 10	d + 5	6	2
100	185[1)]	d + 15	d + 7	8,5	2

[1)] The maximum rod diameter depends on choice of material, SKF Econbr and SKF Ecofkm end at 180 mm.







DA06-A

Main function
Single-acting wipers

Main applications
Standard hydraulic applications
Pressfit for axially open housings

Advantages
Excellent wear resistance
Plastic retainer ring
No oxidation issues between retainer and housing

Standard materials
ECOPUR DD + SKF Ecotal
SKF Econbr + SKF Ecotal

Rod diameter		Housing groove diameter	Housing groove width
d		D H8	L
over	incl.		
mm			
11	22	d + 8	5
22	100	d + 10	7
100	181[1)]	d + 15	9

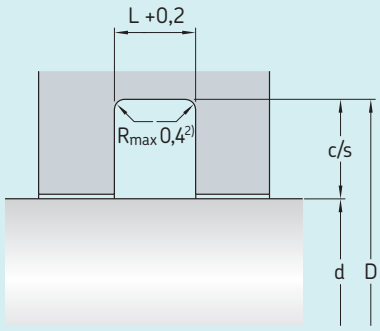
[1)] The maximum rod diameter depends on choice of material, SKF Econbr ends at 180 mm.

Rotary seal housing details and recommendations

The table on the right shows an example of standard housing measurements for rotary seals.

Please note that SKF can produce these profiles to application specific requirements or any non-standard housing.

Suggested standard housing dimension



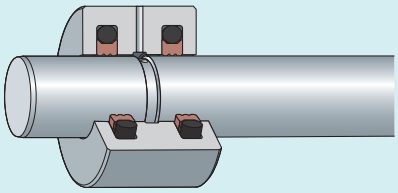
Indicated dimensions are required to process an order
D housing groove diameter
d shaft diameter
L housing groove length
c/s cross section

	Surface properties $R_{t\,max}$	R_a
	µm	
Sliding surface for		
TPU/rubber seals	≤ 2,5	≤ 0,1–0,5
PTFE seals	≤ 2	≤ 0,05–0,3
Groove bottom	≤ 6,3	≤ 1,6
Groove face	≤ 15	≤ 3
Bearing area T_p	50–95% 1)	

Seal housing tolerances
depending on seal profile

Hardness
Min 45 HRC
(55 HRC recommended)
Hardened depth > 0,3 mm
Grinded free of twists

1) at a cutting depth of 0,5 R_z based on C_{ref} = 0%
2) For details regarding R_{max} please refer to the related seal data sheet





DR09-F

Main function
Double-acting rotary seal, O-ring activated PTFE seal

Main applications
Rotary pivots

Advantages
For high pressure

Standard materials
SKF Ecoptfe / NBR or FKM



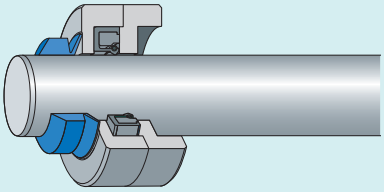
DR09-FS

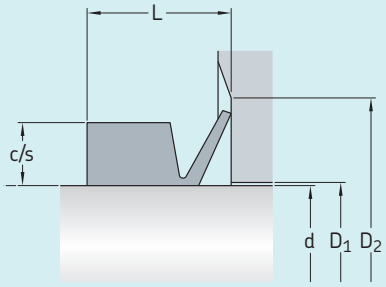


DR03-P
DR03-R

Shaft diameter d over	incl.	Housing groove diameter D	Housing groove length L	Cross section c/s
mm				
16	19	d + 4,9	2,2	2,45
19	38	d + 7,5	3,2	3,75
38	178	d + 11	4,2	5,5
mm				
5	50	d + 10	5	5
50	60	d + 15	7,5	7,5
60	178	d + 20	10	10
d 1) over	incl.	D H9	L	c/s
mm				
21 1)	22 1)	d + 8	6,5	4
22	36	d + 10	8	5
36	56	d + 12	8	6
56	85	d + 15	11	7,5
85	140	d + 20	13	10
140	178	d + 25	16	12,5

1) Only valid for R03-P.





DR06-P DR07-P
DR06-R DR07-R

Main function
Axially acting rotary seal
Rotates with the shaft
Sealing axially

Main applications
Bearing protection for heavy industrial applications

Advantages
Excellent wear resistance
Interference fit on the shaft
Adaption for diverse temperatures and media

Standard materials
ECOPUR DD
SKF Econbr

Shaft diameter		Housing groove diameter		Housing groove length	
d h11		D_1	D_2	L	c/s
over	incl.	max	min		
mm		mm		mm	
5	40	d + 2	d + 12	6 (8,5)[1]	4
40	70	d + 2,5	d + 15	7 (10)[1]	5
70	100	d + 3	d + 18	9 (12,5)[1]	6
100	150	d + 3,5	d + 21	10,5 (14,5)[1]	7
150	200	d + 4	d + 24	12 (16,5)[1]	8

[1] Higher values in brackets valid for R07-P and R07-R.

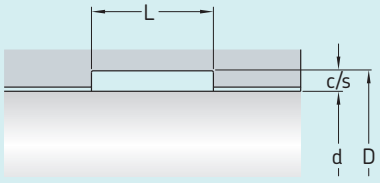
C

Guide ring housing details and recommendations

Guide ring housing details and recommendations for dynamic applications. SKF standard guide rings are available as 45° split versions. Those can be ordered as well as endless, 90° split versions or yard ware.

Seal housing tolerances

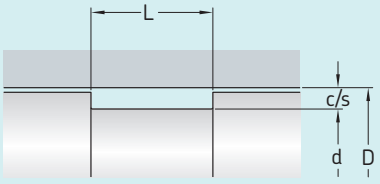
D H9
d f8
L +0,2



DF01

Main function
Rod guide rings

Rod diameter d over	incl.	**Housing groove diameter** D	**Housing groove length** L	**Cross section** c/s
mm				
16	30	d + 3	4	1,5
30	50	d + 3	5,6	1,5
50	100	d + 5	9,7	2,5
100	181	d + 5	15	2,5



DF01

Main function
Piston guide rings

Bore diameter D over	incl.	**Housing groove diameter** d	**Housing groove length** L	**Cross section** c/s
mm				
19	30	D – 3	4	1,5
30	50	D – 3	5,6	1,5
50	100	D – 5	9,7	2,5
100	196[1)]	D – 5	15	2,5

[1)] The maximum bore diameter depends on choice of material, SKF Ecoptfe ends at 190 mm.

O-ring housing details and recommendations

Housing tolerances

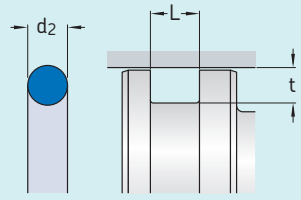
f7 / H8

Bearing area

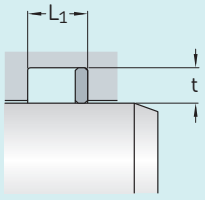
50–95% at a cutting depth of 0,5 R_z
based on C_{ref} = 0%

Surface	Surface roughness Pressure constant R_{tmax}	R_a	pulsating R_{tmax}	R_a	Dynamic applications R_{tmax}	R_a
–	µm		µm		µm	
Sliding surface	6,3	1,6	3,2	0,8	1,6	0,4
Bottom of groove	12,5	3,2	6,3	1,6	6,3	1,6
Groove face	12,5	3,2	12,5	3,2	12,5	3,2

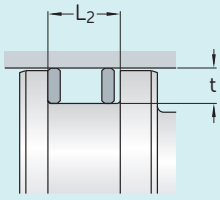
O-ring housing recommendations for static applications



Direction of pressure



Direction of pressure



Direction of pressure

Cord	Groove	Without back-up ring	One back-up ring	Two back-up rings	Recommended back-up ring width
d	t +0,05	L +0,25	L_1 +0,25	L_2 +0,25	
mm					
1,5	1,10	2,1	3,1	4,1	1,0
1,78	1,35	2,5	3,5	4,5	1,0
2,00	1,56	2,7	4,2	5,7	1,5
2,50	2,05	3,3	4,8	6,3	1,5
2,62	2,18	3,5	5,0	6,5	1,5
3,00	2,52	3,9	5,4	6,9	1,5
3,50	3,00	4,4	5,9	7,4	1,5
3,53	3,00	4,4	5,9	7,4	1,5
4,00	3,40	5,0	6,7	8,4	1,7
5,00	4,25	6,3	8,0	9,7	1,7


TU.FKM.82099
140/188
SKF ECOFKM
TU.FKM.82231
70/108
SKF ECOFKM
TU.FKM.82225
0/30
SKF ECOFKM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