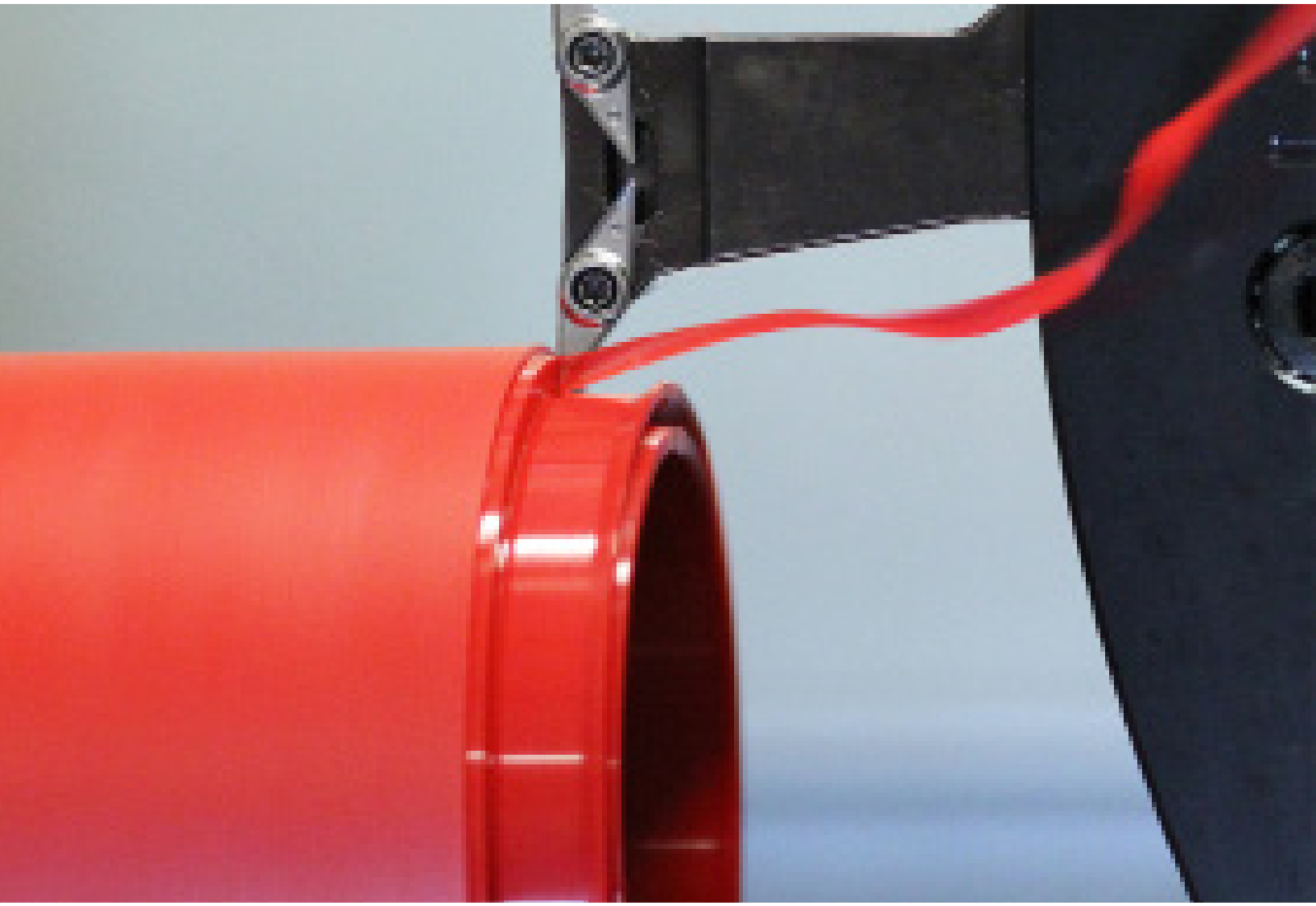
Machined seals

Product range



Contents

A Introduction

SKF Industrial Seals portfolio 4

Sealing materials 7
- Introduction 7
- Thermoplastic elastomers – Polyurethanes 7
- Elastomers 8
- Thermoplastics 9
- Special materials 9

Material properties 10

Criteria for seal and material selection 12

Unit conversions 13

B Product range seals

Piston seals 14

Rod seals 26

Wiper seals 38

Rotary seals 48

Guide rings 58

Back-up rings 62

Static seals 66

C Housing details

Piston seal housing details and recommendations 70

Rod seal housing detailsand recommendations 72

Wiper housing details and recommendations 76

Rotary seal housing details and recommendations 78

Guide ring housing details and recommendations 82

O-ring housing details and recommendations 83

SKF Industrial Seals portfolio

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 our 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.

In our Industrial Seals assortment, we offer a wide range of standard power transmission seals, hydraulic seals as well as fluid handling seals.

Our flexible seal production model combines moulded and machined manufacturing capabilities to accommodate virtually any demand from single seals or prototypes to high volume serial production – from one to a million.

Machined Seals Concept – meeting unique sealing demands, on demand

One important pillar of this manufacturing flexibility is the Machined Seals Concept, which was developed by SKF more than 30 years ago and provides a fast, flexible amendment to the wide assortment of production methods for standard moulded seals. With a unique combination of capabilities, we can deliver polymer seals in a very short time, in virtually any dimension and any design, for virtually any industrial application.

Machined seals can be invaluable for engineers and maintenance technicians. Getting a customized seal made to order in a day or two can keep a project on track when prototyping new designs. Furthermore, machined seals can minimize downtime and lost production when a critical component fails and the standard replacement seal is not in stock.

The Machined Seals Concept combines several SKF strengths, including extensive application engineering support, a wide selection of seal profiles and materials, and worldwide availability.

Together, these capabilities enable on-demand manufacturing for everything from a single seal to serial production, for fluid power, fluid handling and power transmission applications.

Application engineering support

After receiving the customer's request, our application engineers gain an understanding of the particular application demands and the related challenges for the necessary sealing solution. Together with your experience we can develop a sealing solution by choosing the most appropriate seal profiles and sealing materials.

Profile and material selection

We pre-select the seal profiles from an array of standard seal designs that are pre-programmed in our proprietary machining software, or we can work with you to design a fully custom engineered seals profile. Our engineers will also determine the optimum sealing material. Our world class range of standard and special-grade machinable sealing materials includes many that are compliant with FDA, NSF, EU1935/2004, NORSOK, NACE, and other key industry standards and government regulations.

CNC manufacturing process

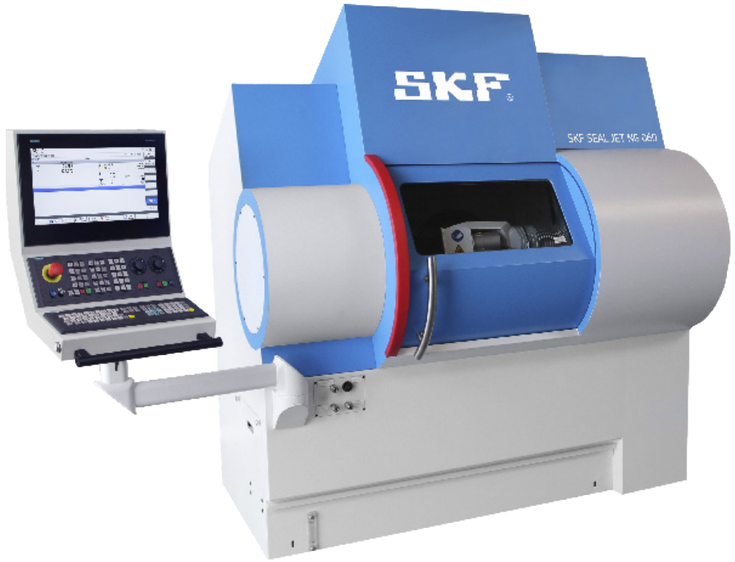
Featuring proprietary software and high-precision cutting tools, the SKF SEAL JET manufacturing system uses Computer Numerical Control (CNC) technology with proprietary software and specially developed machining tools to machine polymer seals quickly. The SKF SEAL JET machines are developed and produced by SKF and machine seals from semi-finished tubes of our specially selected polymeric materials.

Rapid delivery worldwide

The Machined Seals Concept and related services are available globally at selected SKF Machined Seals Centres and at selected SKF distribution partners. Strategically positioned throughout the world's major industrial markets, these facilities enable rapid manufacturing and delivery.

All machined seals, whether standard or customized, are manufactured on demand without any additional tooling costs. Production quantities range from a single piece to several thousand pieces. The SKF SEAL JET production system reduces manufacturing and dispatch time to a minimum compared to other production methods for seals.

Promptly manufactured machined seals are available in a wide size range from 1 mm up to around 4 000 mm as one piece. Larger seals – up to 14 000 mm – and even larger – are available using a special welding technique that also allows on-site joining and fitting of seals, which significantly can reduce equipment downtime. These welded seals provide a performance comparable to continuously machined or moulded seals.



SKF SEAL JET NG 060 machine

Scan to view brochures and video

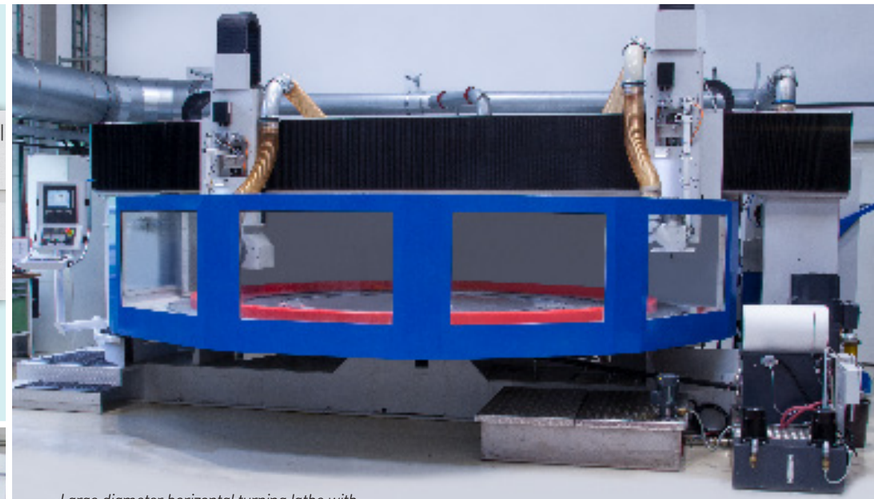
Industrial Shaft Seals

Hydraulic Seals catalogue

Industrial Seals whiteboard movie

Assortment of miniature seals made of different sealing materials

Large diameter machined seal for a hydro power application made of G-ECOPUR



Large diameter horizontal turning lathe with G-ECOPUR semifinished material in front

SKF

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.

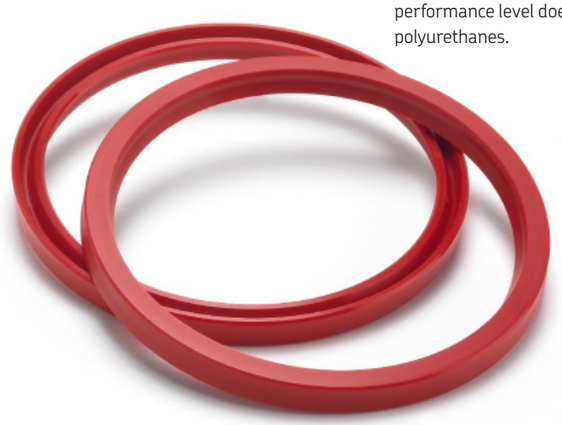
Different types of polymeric materials are available to meet all demands on the seal assembly in the best possible way. In this brochure, 26 standard materials for machined seals are featured. These materials have been developed by SKF to meet the vast majority of customer requirements. In addition, SKF has a variety of special material grades to meet more specific application demands. Finally, customized material solutions can be co-developed if required.

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 mostly 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

ECOPUR is a thermoplastic polyurethane elastomer (TPU) and standard grade of the SKF machined seals range for sealing applications in mineral oil. It features excellent mechanical properties such as abrasion resistance, tear strength and low compression set. Typical products made of ECOPUR are U-cup seals, lip seals, wipers or chevron packings, but also customized shapes for dampers or machine parts are possible.

ECOPUR LD

ECOPUR LD is a cast polyurethane elastomer (CPU) that features similar properties to ECOPUR. It covers the dimensional range from diameters of 600 mm to 1200 mm.

H-ECOPUR

H-ECOPUR is a hydrolysis-resistant TPU. It combines the engineering properties of ECOPUR with excellent compatibility to many operating media at high operating temperatures. These include mineral oils, HFA and HFB fluids or biodegradable hydraulic fluids. H-ECOPUR is approved for various food regulations and is suitable for

many sterilization processes in the food and beverage industry, but not for steam sterilization. Compared to ECOPUR, it features a slightly higher minimum service temperature.

G-ECOPUR

G-ECOPUR is a CPU that features similar properties to H-ECOPUR. Its standard range features diameters from 540 mm up to 4 000 mm. Seal diameters exceeding 4 000 mm can be realized with a specially developed welding procedure.

S-ECOPUR

S-ECOPUR is a TPU which is modified with solid lubricants. It combines the chemical compatibility of H-ECOPUR with excellent friction and wear behaviour, particularly in unlubricated operating conditions. This material is therefore the first choice for applications in water hydraulics or in dry-running pneumatics.

T-ECOPUR

T-ECOPUR is a TPU with an extended minimum service temperature of down to -50 °C. It features comparable properties than ECOPUR. Therefore, it is suitable for severe climatic conditions and processes for frozen goods.

X-ECOPUR

X-ECOPUR is a TPU based on ECOPUR with an increased hardness of 57 Shore D. It features excellent wear and pressure resistance, which makes it the first choice for heavy duty applications. Due to its extrusion resistance, it can compensate larger clearances compared to standard TPUs or PTFEs.

G-ECOPUR 54D

G-ECOPUR 54D is a CPU based on G-ECOPUR with an increased hardness of 54 Shore D. It features similar properties to G-ECOPUR resp. H-ECOPUR with increased pressure resistance due to the increased hardness.

X-ECOPUR-H

X-ECOPUR-H is a TPU based on H-ECOPUR with an increased hardness of 60 Shore D. It combines excellent chemical compatibility known from H-ECOPUR with high pressure resistance, which makes it suitable for heavy duty operating conditions combining high operating temperatures in critical media at high mechanical load levels.

X-ECOPUR-S

X-ECOPUR-S is a TPU based on S-ECOPUR with an increased hardness of 57 Shore D. This enables a better extrusion resistance and thus allows higher operating pressures. It is available for tube sizes up to 340 mm. For larger dimensions, refer to the special grade G-ECOPUR-54D-SL.

Elastomers

SKF Ecorubber-1

SKF Ecorubber-1 is an elastomer based on acrylonitrile-butadiene rubber (NBR) and is used for U-cup seals, chevron packings, special seals and various components. This material has good resistance to mineral oils and greases and HFA, HFB and HFC pressure fluids. However, the material is not resistant to glycol-based brake fluids, HFD fluids, aromatic fluids (such as benzene), esters, ketones and amines or concentrated acids and bases.

SKF Ecorubber-H

SKF Ecorubber-H is a hydrogenated acrylonitrile-butadiene rubber. Compared to SKF Ecorubber-1, its polymer backbone is saturated, which allows increased operating temperatures (in general 150 °C, for short times up to 170 °C), improves weathering and chemical resistance and thus enables applications with aliphatic hydrocarbons like propane, butane or sulfonated crude oil. Furthermore, it can be used in many diluted acids, bases and salt solutions even at elevated temperatures and in glycol-water mixtures. SKF Ecorubber-H is not compatible with fuels that have a high content of aromatic hydrocarbons (premium-blend petrol), gasolines (petrol/alcohol-blends), ketones, esters, ethers and chlorinated hydrocarbons like trichloro-ethylene and tetrachloro-ethylene.

SKF Ecorubber-2

SKF Ecorubber-2 is an elastomer based on fluoro rubber (FKM) that can be used for U-rings, lip seals, chevron packings, wipers and special seals. Its outstanding properties are high resistance to heat, weathering, ozone and many other chemicals. SKF Ecorubber-2 is compatible with mineral oils and greases containing sulphur, HFD pressure fluids (some phosphate esters and chlorinated hydrocarbons) and crude oil. SKF Ecorubber-2 is not resistant to anhydrous ammonia, amines, ketones, esters, hot steam and low molecular weight organic acids and shows medium resistance to sour gas.

SKF Ecorubber-3

SKF Ecorubber-3 is an elastomer based on ethylene-propylene rubber (EPDM) and can be used for U-cup seals, lip seals and chevron packings. SKF Ecorubber-3 has outstanding resistance to hot water, steam, washing agents and polar organic solvents. SKF Ecorubber-3 is not resistant to mineral oil and other unpolar media. Its resistance to weathering, ozone and ageing is good. When used in glycol-based brake fluids, governmental regulations have to be considered.

SKF Ecoflas

SKF Ecoflas is a unique fluoro elastomer based on an alternating copolymer of tetrafluoro-ethylene and propylene (TFE/P). Compared to fluoro rubber, it shows slightly higher tensile strength and a quite similar heat resistance. The resistance of SKF Ecoflas against mineral oils is on a lower level compared to SKF Ecorubber-1, SKF Ecorubber-2 and SKF Ecorubber-H. Especially in mineral oils with an increased content of aromatic hydrocarbons, swelling has to be expected. SKF Ecoflas has outstanding resistance to hot water and hot steam up to 230 °C as well as to sour gas and amines, brake fluids (based on glycol, mineral oil or silicone oil) and fire-resistant hydraulic fluids. In contrast to SKF Ecorubber-2, SKF Ecoflas has a good resistance to radiation.

SKF Ecosil

SKF Ecosil is a silicone rubber (MVQ) and can be used for O-rings, gaskets and special seals. Due to its mechanical properties, it is mostly used for static applications. SKF Ecosil is highly resistant to weathering, ozone and ageing and it is compatible with mineral oil, however resistance to mineral oils with increased content of aromatic or naphtenic hydrocarbons is limited. Poor resistance has to be expected to fuels and acids as well as steam.

Thermoplastics

SKF Ecoflon 1

SKF Ecoflon 1 is a thermoplastic material based on polytetrafluoroethylene (PTFE-virgin) that is used for back-up rings, chevron packings, O-rings, rotary seals and gaskets. SKF Ecoflon 1 has outstanding chemical resistance and will only be attacked by molten alkali metals and elementary fluorine at high temperatures. Using PTFE seals, it should be noted that creeping occurs at relatively low loads (pressure). SKF Ecoflon 1 is suitable for the food industry.

SKF Ecoflon 2

SKF Ecoflon 2 (PTFE + 15% glass fibre + 5% MoS_2) has improved compression strength as well as improved sliding properties compared to SKF Ecoflon 1. The chemical resistance is similar to SKF Ecoflon 1.

SKF Ecoflon 3

SKF Ecoflon 3 (PTFE + 40% bronze) features improved compression strength, sliding properties and an improved thermal conductivity compared to SKF Ecoflon 1.

SKF Ecoflon 4

SKF Ecoflon 4 (PTFE + 25% carbon) has improved mechanical strength, stiffness and hardness as well as improved sliding properties compared to SKF Ecoflon 1.

SKF Ecoflon 5

SKF Ecoflon 5 (PTFE modified) has improved wear and abrasion resistance compared to SKF Ecoflon 1. The material is suitable for the food and beverage industry.

SKF Ecotal

SKF Ecotal is a semi-crystalline polyacetal copolymer (POM-C) which is used for anti-extrusion rings, guide rings, bushings, scrapers and for precision-machined parts with tight tolerances. SKF Ecotal has good mechanical properties, low water absorption and good chemical resistance. SKF Ecotal can be used in mineral oils and in water-based fire-resistant hydraulic fluids (HFA, HFB and HFC fluids). Concentrated acids and bases will attack and destroy it.

SKF Ecomid

SKF Ecomid is a cast polyamide (PA) with good sliding properties and is used for back-up rings, guide rings and bearing components instead of SKF Ecotal for diameters above 260 mm. SKF Ecomid can be used in mineral oils and some water-based fire-resistant hydraulic fluids. When designing parts of SKF Ecomid for an application in water or water-based fluids, the swelling of the material (SKF Ecomid absorbs water up to eight weight percent) must be taken into consideration.

SKF Ecopaek

SKF Ecopaek (PEEK) is a high performance, premium thermoplastic grade. Its maximum service temperature exceeds most other technical plastics by far, while offering excellent dimensional stability, creep and relaxation resistance combined with high tensile strength and good sliding and friction behaviour. It is mainly used for sealing elements where standard materials cannot survive due to limited temperature resistance or too low mechanical strength.

SKF Ecowear 1000

SKF Ecowear 1000 is a semi-crystalline thermoplastic material based on polyethylene (UHMW-PE) with a molecular weight of about 4 500 000 g/mol. SKF Ecowear 1000 has a very low coefficient of friction, an excellent wear resistance and impact strength (also at low temperatures down to –200 °C). Compared to the SKF Ecoflon range, it has a very high creep resistance and is almost water repellent without any swelling. SKF Ecowear 1000 is recommended where outstanding sliding properties are required and in case of wear- and dry-running due to bad lubrication and aqueous media.

Thermosets

SKF Ecotex

SKF Ecotex is a compound based on a thermoset polyester resin (light orange) and reinforced with fabric inlays. Due to the addition of graphite, the material shows very good characteristics in respect to the tribological requirements in gliding systems. SKF Ecotex shows high compressive strength and outstanding friction reduction and wear resistance properties. Therefore, it is very well-suited for guide rings and bushings. Thanks to the very low tendency of absorbing moisture, SKF Ecotex is particularly suitable for use in water and media containing water (swelling in water < 0,1%).

Special materials

The materials listed in this publication are the standard materials for manufacturing machined seals and can be selected in our SKF SEAL JET NG machining software. There are many more grades as derivatives of the standard grades available on request. These materials are specially developed to meet industry related requirements e.g. for the food and beverage or oil and gas industries. Please contact SKF for further information.

Material properties

			Polyurethanes										Elastomers						Thermoplastics									Thermoset
Properties	**Standard**	**Unit**	**ECOPUR**	**ECOPUR LD**	**G-ECOPUR** cast – hydrolysis resistant	**H-ECOPUR** hydrolysis resistant	**S-ECOPUR** solid lubricants	**T-ECOPUR** low temperature grade	**X-ECOPUR** hard grade	**G-ECOPUR 54D** cast – hard grade	**X-ECOPUR H** hard grade hydrolysis resistant	**X-ECOPUR S** hard grade solid lubricants	**SKF Ecorubber-1**	**SKF Ecorubber-H**	**SKF Ecorubber-2**	**SKF Ecorubber-3**	**SKF Ecoflas**	**SKF Ecosil**	**SKF Ecoflon 1**	**SKF Ecoflon 2** +15% GF + 5% MoS2	**SKF Ecoflon 3** +40% bronze	**SKF Ecoflon 4** +25% Carbon	**SKF Ecoflon 5** modified	**SKF Ecotal**	**SKF Ecomid**	**SKF Ecopaek**	**SKF Ecowear 1000**	**SKF Ecotex**
			TPU	CPU	CPU	TPU	TPU	TPU	TPU	TPU	TPU	TPU	NBR	HNBR	FPM, FKM	EPDM	TFE/P	MVQ	PTFE virgin	PTFE	PTFE	PTFE	PTFE	POM	PA	PEEK	UHMWPE	–
Standard colour			Green	Green	Red	Red	Dark grey	Blue	Dark green	Red	Dark red	Dark grey	Black	Black	Brown	Black	Black	Reddish brown	White	Grey	Bronze	Black	White	Black	Black	Cream	White	Light orange
Hardness	DIN ISO 7619	Shore A	95 ±2[1]	95 ±2[1]	95 ±2[1]	95 ±2[1]	95 ±2[1]	95 ±2[1]	97 ±1[1]	97 ±1[1]	97 ±1[1]	97 ±1[1]	85 ±5	85 ±5	85 ±5	85 ±5	83 ±5	85 ±5	–	–	–	–	–	–	–	–	–	–
Hardness	DIN ISO 7619	Shore D	48 ±3[1]	48 ±3[1]	47 ±3[1]	48 ±3[1]	48 ±3[1]	48 ±3[1]	57 ±3[1]	54 ±3[1]	60 ±3[1]	58 ±3[1]							57[2]	62[2]	65[2]	65[2]	59[2]	82[2]	77[2]	87[2]	61[2]	67–77
Density	DIN EN ISO 1183	g/cm³	1,20	1,19	1,17	1,20	1,23	1,17	1,21	1,19	1,22	1,23	1,32	1,24	2,33	1,22	1,73	1,42	2,16	2,25	3,05	2,10	2,16	1,41	1,15	1,30	0,93	1,21
100% modulus	DIN 53504	MPa	≥ 12	≥ 10	≥ 11	≥ 13	≥ 17	≥ 12	≥ 16	≥ 15	≥ 22	≥ 22	≥ 11	≥ 9	≥ 4,8	≥ 8	6	≥ 4,5	–	–	–	–	–	–	–	–	–	–
Tensile strength/yield stress	DIN 53504	MPa	≥ 50	≥ 45	≥ 45	≥ 50	≥ 45	≥ 50	≥ 45	≥ 45	≥ 45	≥ 38	≥ 16	≥ 18	≥ 7	≥ 11	10	≥ 6,5	27[4]	20[5]	23[5]	15[5]	30[4]	65[6]	55[6]	100[6]	20[6]	55
Elongation at break	DIN 53504	%	≥ 430	≥ 380	≥ 330	≥ 330	≥ 380	≥ 450	≥ 400	≥ 330	≥ 350	≥ 300	≥ 130	≥ 180	≥ 190	≥ 110	190	≥ 130	300[4]	220[5]	240[5]	150[5]	360[4]	25[6]	100[6]	45[6]	≥ 350[6]	–
Modulus of elasticity – tensile test	ISO 527	MPa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2 900	1 800	3 700	600	–
Compression set																												
70 °C/24h 20% compression	DIN ISO 815	%	≤ 27	≤ 30	≤ 30	≤ 27	≤ 30	≤ 27	≤ 30	≤ 30	≤ 30	≤ 33	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
100 °C/24h 20% compression	DIN ISO 815	%	≤ 33	≤ 40	≤ 40	≤ 33	≤ 35	≤ 33[3]	≤ 35	≤ 40	≤ 35	≤ 39	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
100 °C/24h	DIN ISO 815	%	–	–	–	–	–	–	–	–	–	–	≤ 15	≤ 22	–	≤ 16	–	–	–	–	–	–	–	–	–	–	–	–
175 °C/24h	DIN ISO 815	%	–	–	–	–	–	–	–	–	–	–	–	–	≤ 20	–	33	≤ 20	–	–	–	–	–	–	–	–	–	–
Tear strength	DIN ISO 34-1	N/mm	100	–	–	100	120	80	130	–	160	160	20	24	24	18	20	9	–	–	–	–	–	–	–	–	–	–
Abrasion	DIN ISO 4649	mm³	18	22	18	17	21	15	18	18	20	29	90	90	150	120	–	–	–	–	–	–	–	–	–	–	–	–
Minimum service temperature[7]		°C	–30	–35	–30	–20	–20	–50	–30	–30	–20	–20	–30	–30	–20	–50	–10	–60	–200	–200	–200	–200	–200	–50	–40	–100	–200	–40
Brittleness temperature[7]		°C	< –60	< –60	< –60	< –60	< –60	< –60	< –60	< –60	< –60	< –60	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Maximum service temperature[7]		°C	+110	+110	+110	+110	+110	+100	+115	+110	+115	+115	+100	+150	+200	+150	+200	+200	+260	+260	+260	+260	+260	+100	+110	+260	+90	+120
Short term[7]		°C	+125	+125	+125	+125	+125	+120	+130	+125	+130	+130	+120	+160	+220	+160	+220	+220	–	–	–	–	–	–	–	–	–	–

1) Testing time 3 s only valid for polyurethanes
2) DIN EN ISO 868
3) ≤ 45 % according to DIN ISO 815 at –40 °C/24h 20% compression
4) ASTM D4894
5) ASTM 4745
6) ISO 527-1/2
7) Minimum and maximum service temperatures are general material properties only. Deviations due to application parameters and operating media need to be considered. Data concerning special materials based on the here mentioned standard grades are available on request.

SKF

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

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 ¥ 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	$t_F = 1,8\ t_C + 32$

Piston seals

Introduction

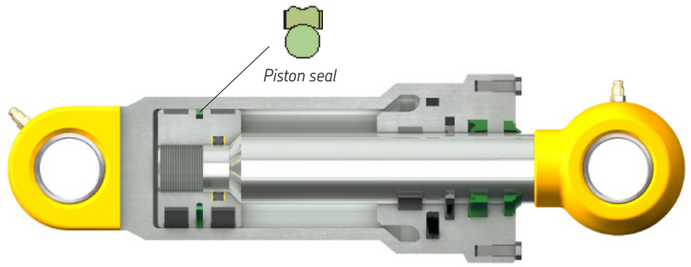
Piston seals provide the sealing function in sliding motion between the piston and the bore of a hydraulic or pneumatic cylinder. These seals need to cope with the differential pressures acting on the piston while extending or retracting the piston rod. These differential pressures can be more than 400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

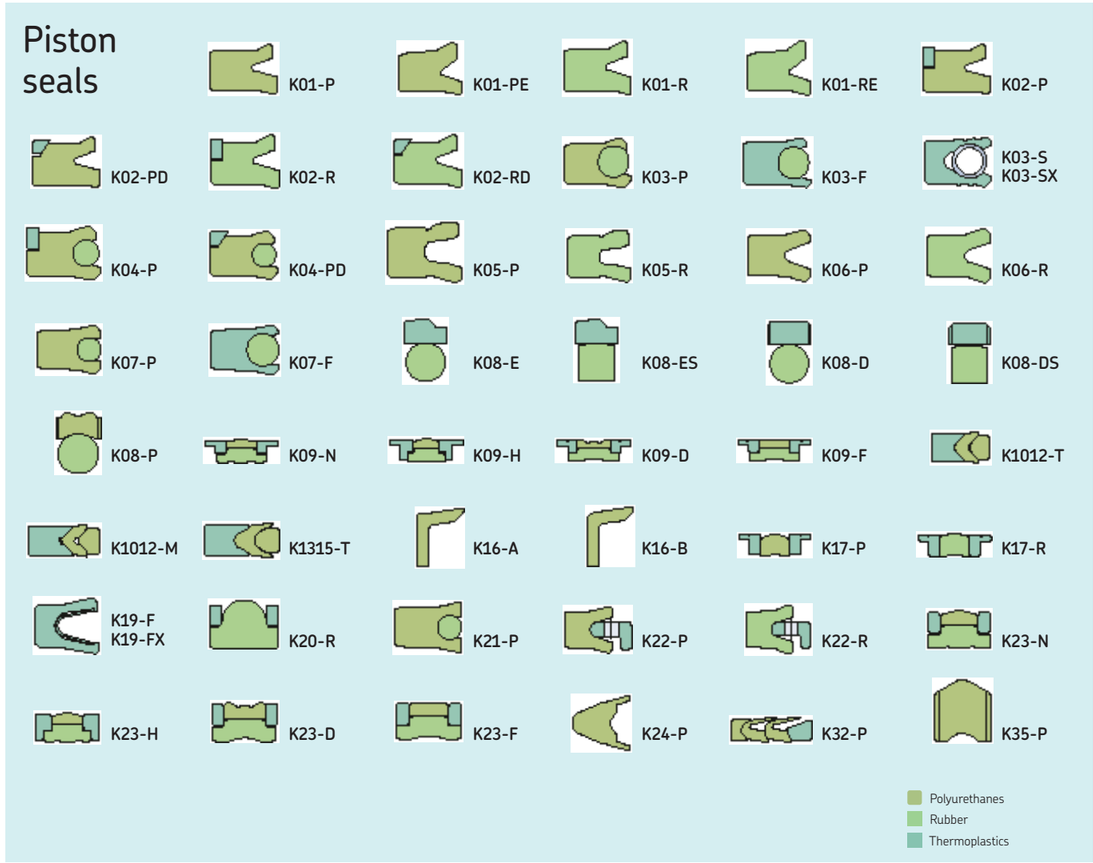
Piston seals are typically classified into single-acting (pressure acting on one side only) and double-acting (pressure acting on both sides) seals. Please see more details in the piston seal selection guide on → **page 16**.



Double-acting piston seal K08-P, pressurized from the system pressure in a hydraulic cylinder.

Single-acting hydraulic seal K01-PE made of H-ECOPUR

Double-acting hydraulic piston seal K08-P made of T-ECOPUR for a deep temperature application



Piston seal selection guide

	Standard use	Symmetric design when usage as piston or rod seal is required	Back-up 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.	 **K01-P** **K01-R**	 **K06-P** **K06-R**	 **K02-P** **K02-R** **K02-PD** **K02-RD**	Pneumatics **K05-P** **K05-R** Retainer ring **K05-P** **K05-R** Single-acting **K01-PE** **K01-RE** Chevron packing with flexible lips **K32-P** PTFE-design **K19-F** **K19-FX** Single lip **K16-A** **K16-B**
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.	 **K03-P** **K03-F**	 **K07-P** **K07-F**	 **K04-P** **K04-PD**	Aggressive lip **K21-P** PTFE-design **K03-S** **K03-SX**
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 **K35-P**		Rubber design **K20-R** **K23-N**	Chevron packings **K1012-T** **K1315-T** Seals with integrated guide rings **K09-H** **K17-P**

Activated slide ring designs

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

Single-acting		Double-acting		
Standard	Heavy duty	Standard	Heavy duty	TPU-design
 K08-E	 **K08-ES**	 **K08-D**	 **K08-DS**	 **K08-P**

Remark: Use X-ECOPUR as slide ring material to improve static sealing behavior

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	Seal	Back-up ring
			°C		m/s	bar	–		
		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 materials.	–30 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	0,5 0,5 0,5 0,5 0,5 0,5	400 400 400 400 400 400	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR		
		Hydraulic, single-acting Asymmetric piston seal with increased contact force for single-acting pistons. Design optimized for ECOPUR materials.	–30 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	0,5 0,5 0,5 0,5 0,5 0,5	400 400 400 400 400 400	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR		
		Hydraulic, single-acting As profile K01-P, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30 –25 –20 –50 –10 –60	+100 +150 +200 +150 +200 +200	0,5 0,5 0,5 0,5 0,5 –	160 160 160 160 160 –	SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecoflas SKF Ecosil[3]		
		Hydraulic, single-acting Asymmetric piston seal with increased contact force for single-acting pistons. Design optimized for SKF Ecorubber materials.	–30 –25 –20 –50 –10 –60	+100 +150 +200 +150 +200 +200	0,5 0,5 0,5 0,5 0,5 –	160 160 160 160 160 –	SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecoflas SKF Ecosil[3]		
		Hydraulic, single-acting Asymmetric piston seal for standard applications based on the K01-P design with an active rectangular back-up ring for larger extrusion gaps or higher pressure ranges.	–30 –35 –30 –20 –20 –40	+100 +110 +110 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5	700 700 700 700 700 700	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	SKF Ecotal[1] SKF Ecomid SKF Ecomid SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
		Hydraulic, single-acting Asymmetric piston seal for standard applications based on the K01-P design with an active tapered back-up ring for larger extrusion gaps or higher pressure ranges.	–30 –35 –30 –20 –20 –40	+100 +110 +110 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5	700 700 700 700 700 700	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	SKF Ecotal[1] SKF Ecomid SKF Ecomid SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils
[3] Only recommended for static or quasi-static applications. Contact SKF for more information

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	–	
	K02-P	**Hydraulic, single-acting** As profile K02-P with rectangular back-up ring, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30	+100	0,5	250	**Seal** SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecorubber-3[2] SKF Ecoflas	**Back-up ring** SKF Ecotal[1] SKF Ecoflon 2 SKF Ecotal[1] SKF Ecoflon 2 SKF Ecoflon 2 SKF Ecotal[1] SKF Ecopaek
			–25	+150	0,5	250		
			–25	+100	0,5	250		
			–20	+200	0,5	250		
			–50	+150	0,5	250		
			–40	+100	0,5	250		
			–10	+200	0,5	250		
	K02-PD	**Hydraulic, single-acting** As profile K02-PD with tapered back-up ring, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30	+100	0,5	250	**Seal** SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecorubber-3[2] SKF Ecoflas	**Back-up ring** SKF Ecotal[1] SKF Ecoflon 2 SKF Ecotal[1] SKF Ecoflon 2 SKF Ecoflon 2 SKF Ecotal[1] SKF Ecopaek
			–25	+150	0,5	250		
			–25	+100	0,5	250		
			–20	+200	0,5	250		
			–50	+150	0,5	250		
			–40	+100	0,5	250		
			–10	+200	0,5	250		
	K03-P	**Hydraulic, single-acting** Asymmetrical 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 materials.	–30	+100	0,5	400	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** NBR 70 NBR 70 NBR 70 NBR 70 NBR 70 MVQ 70
			–30	+100	0,5	400		
			–30	+100	0,5	400		
			–20	+100	0,5	400		
			–20	+100	0,5	400		
			–50	+100	0,5	400		
	K03-F	**PTFE piston seal, single-acting** Asymmetric O-ring loaded piston seal. Design optimized for SKF Ecoflon materials 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.	–55	+200	1	200	**Seal** SKF Ecoflon 1 SKF Ecoflon 1 SKF Ecoflon 2,3,4 SKF Ecoflon 2,3,4 SKF Ecoflon 2,3,4 SKF Ecowear 1000 SKF Ecowear 1000	**Energizer** MVQ 70 NBR 70 EPDM 70 FPM 75 MVQ 70 NBR 70 MVQ 70 NBR 70
			–30	+100	1	200		
			–50	+150	1	400		
			–20	+200	1	400		
			–55	+200	1	400		
			–30	+100	1	400		
			–55	+90	0,5	200		
			–30	+90	0,5	200		
	K03-S	**PTFE piston seal, single-acting** Asymmetric helicoil spring loaded piston seal. Design optimized for SKF Ecoflon materials to reduce friction and stick-slip effects. Excellent chemical and thermal resistance. Mainly used in covers as well as valve seats and stems.	–200	+260	1	200	**Seal** SKF Ecoflon 1 SKF Ecoflon 2,3,4 SKF Ecowear 1000	**Spring** 1.4310[3] 1.4310[3] 1.4310[3]
			–200	+260	1	400		
			–200	+90	0,5	200		
	K03-SX	**PTFE piston seal, single-acting** Similar profile to K03-S with modified spring groove to enable the use of standardized imperial sized springs of the series 100/200/300/400. Elgiloy springs available for extreme chemical resistance	–200	+260	1	200	**Seal** SKF Ecoflon 1 SKF Ecoflon 2, 3, 4 SKF Ecowear 1000 SKF Ecoflon 1 SKF Ecoflon 2, 3, 4 SKF Ecowear 1000	**Spring** 1.4310[3] 1.4310[3] 1.4310[3] 2.4711 2.4711 2.4711
			–200	+260	1	400		
			–200	+90	0,5	200		
			–200	+100	0,5	200		
			–200	+260	1	200		
			–200	+260	1	400		
			–200	+90	0,5	200		

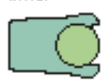
[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils
[3] Spring steel material specification

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

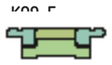
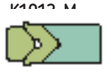
Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	K04-P	**Hydraulic, single-acting** Asymmetric O-ring loaded piston seal for standard applications based on the K01-P design with an active rectangular back-up ring for larger extrusion gaps or higher pressure ranges.	–30	+100	0,5	700	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** NBR 70 NBR 70 NBR 70 NBR 70 NBR 70 MVQ 70	**Back-up ring** SKF Ecotal[1] SKF Ecomid SKF Ecomid SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
			–30	+100	0,5	700			
			–30	+100	0,5	700			
			–20	+100	0,5	700			
			–20	+100	0,5	700			
			–50	+100	0,5	700			
	K04-PD	**Hydraulic, single-acting** Asymmetric O-ring loaded piston seal for standard applications based on the K01-P design with an active tapered back-up ring for larger extrusion gaps or higher pressure ranges.	–30	+100	0,5	700	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** NBR 70 NBR 70 NBR 70 NBR 70 NBR 70 MVQ 70	**Back-up ring** SKF Ecotal[1] SKF Ecomid SKF Ecomid SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
			–30	+100	0,5	700			
			–30	+100	0,5	700			
			–20	+100	0,5	700			
			–20	+100	0,5	700			
			–50	+100	0,5	700			
	K05-P	**Pneumatic, single-acting** Asymmetric piston seal. Design optimized for ECOPUR materials 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	+110	1	25	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR		
			–35	+110	1	25			
			–30	+110	1	25			
			–20	+110	1	25			
			–20	+110	2	25			
			–50	+100	1	25			
	K05-R	**Pneumatic, single-acting** Asymmetric piston seal. Design optimized for SKF Ecorubber 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	+100	1	25	SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecoflas		
			–25	+150	1	25			
			–20	+200	1	25			
			–50	+150	1	25			
			–10	+200	1	25			
	K06-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 materials.	–30	+110	0,5	400	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR		
			–35	+110	0,5	400			
			–30	+110	0,5	400			
			–20	+110	0,5	400			
			–20	+110	0,5	400			
			–50	+100	0,5	400			
	K06-R	**Hydraulic, single-acting** As profile K06-P, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30	+100	0,5	160	SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecoflas SKF Ecosil[3]		
			–25	+150	0,5	160			
			–20	+200	0,5	160			
			–50	+150	0,5	160			
			–10	+200	0,5	160			
			–60	+200	–	–			

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils
[3] Only recommended for static or quasi-static applications. Contact SKF for more information

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	–	
	K07-D	**Hydraulic, single-acting**					**Seal**	**Energizer**
		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 materials.	–30	+100	0,5	400	ECOPUR	NBR 70
			–30	+100	0,5	400	ECOPUR LD	NBR 70
			–30	+100	0,5	400	G-ECOPUR	NBR 70
			–20	+100	0,5	400	H-ECOPUR	NBR 70
			–20	+100	0,5	400	S-ECOPUR	NBR 70
			–50	+100	0,5	400	T-ECOPUR	MVQ 70
	K07-E	**PTFE piston seal, single-acting**					**Seal**	**Energizer**
		Symmetric O-ring loaded lip seal. Design optimized for SKF Ecoflon materials 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	+100	1	200	SKF Ecoflon 1	NBR 70
			–55	+200	1	200	SKF Ecoflon 1	MVQ 70
			–30	+100	1	400	SKF Ecoflon 2,3,4	NBR 70
			–20	+200	1	400	SKF Ecoflon 2,3,4	FPM 75
			–50	+150	1	400	SKF Ecoflon 2,3,4	EPDM 70
			–55	+200	1	400	SKF Ecoflon 2,3,4	MVQ 70
			–30	+90	0,5	200	SKF Ecowear 1000	NBR 70
			–55	+90	0,5	200	SKF Ecowear 1000	MVQ 70
	K08-E	**Hydraulic, single-acting**					**Seal**	**Energizer**
		O-ring loaded asymmetric slide ring piston seal. Design optimized for SKF Ecoflon materials to reduce friction and stick-slip effects. For extremely low and high speeds as well as positioning functions. Use X-ECOPUR materials for improved leak tightness and installation ability.	–55	+100	5	600	G-ECOPUR 54D	MVQ 70
			–30	+100	5	600	G-ECOPUR 54D	NBR 70
			–55	+100	5	600	X-ECOPUR, H, S	MVQ 70
			–30	+100	5	600	X-ECOPUR, H, S	NBR 70
			–20	+200	10	600	SKF Ecoflon 2,3,4	FPM 75
			–30	+100	10	600	SKF Ecoflon 2,3,4	NBR 70
			–55	+90	5	400	SKF Ecowear 1000	MVQ 70
			–30	+90	5	400	SKF Ecowear 1000	NBR 70
	K08-D	**Hydraulic, double-acting**					**Seal**	**Energizer**
		O-ring loaded symmetric slide ring piston seal. Design optimized for SKF Ecoflon materials 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. Use X-ECOPUR materials for improved leak tightness and installation ability.	–55	+100	5	600	G-ECOPUR 54D	MVQ 70
			–30	+100	5	600	G-ECOPUR 54D	NBR 70
			–55	+100	5	600	X-ECOPUR, H, S	MVQ 70
			–30	+100	5	600	X-ECOPUR, H, S	NBR 70
			–20	+200	10	600	SKF Ecoflon 2,3,4	FPM 75
			–30	+100	10	600	SKF Ecoflon 2,3,4	NBR 70
			–55	+90	5	400	SKF Ecowear 1000	MVQ 70
			–30	+90	5	400	SKF Ecowear 1000	NBR 70
	K08-P	**Hydraulic, double-acting**					**Seal**	**Energizer**
		O-ring loaded symmetric slide ring piston seal. Design optimized for ECOPUR materials for increased wear resistance and leak tightness. Typical design for light to medium duty hydraulic pistons.	–30	+100	1	250	ECOPUR	NBR 70
			–30	+100	1	250	ECOPUR LD	NBR 70
			–30	+100	1	250	G-ECOPUR	NBR 70
			–20	+100	1	250	H-ECOPUR	NBR 70
			–20	+100	1	250	S-ECOPUR	NBR 70
			–50	+100	1	250	T-ECOPUR	MVQ 70
	K08-ES	**Hydraulic, single-acting**					**Seal**	**Energizer**
		Energizer loaded asymmetric slide ring piston seal, similar to K08-E, but special heavy duty design. Due to adaption possibilities of the energizer also applicable for special housing dimensions.	–30	+100	5	600	G-ECOPUR 54D	SKF Ecorubber-1
			–60	+100	5	600	G-ECOPUR 54D	SKF Ecosil
			–30	+100	5	600	X-ECOPUR, H, S	SKF Ecorubber-1
			–60	+100	5	600	X-ECOPUR, H, S	SKF Ecosil
			–30	+100	10	600	SKF Ecoflon 2,3,4	SKF Ecorubber-1
			–20	+200	10	600	SKF Ecoflon 2,3,4	SKF Ecorubber-2
			–30	+90	5	400	SKF Ecowear 1000	SKF Ecorubber-1
			–60	+90	5	400	SKF Ecowear 1000	SKF Ecosil

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	–	
	K08-DS	**Hydraulic, double-acting**					**Seal**	**Energizer**
		Energizer loaded asymmetric slide ring piston seal similar to K08-D, but with special heavy duty design. Due to adaption possibilities of the energizer also applicable for special housing dimensions.	–30	+100	5	600	G-ECOPUR 54D	SKF Ecorubber-1
			–60	+100	5	600	G-ECOPUR 54D	SKF Ecosil
			–30	+100	5	600	X-ECOPUR, H, S	SKF Ecorubber-1
			–60	+100	5	600	X-ECOPUR, H, S	SKF Ecosil
			–30	+100	10	600	SKF Ecoflon 2,3,4	SKF Ecorubber-1
			–20	+200	10	600	SKF Ecoflon 2,3,4	SKF Ecorubber-2
			–30	+90	5	400	SKF Ecowear 1000	SKF Ecorubber-1
			–60	+90	5	400	SKF Ecowear 1000	SKF Ecosil
	K09-N	**Hydraulic, double-acting**					**Seal**	**Energizer**	**Guide rings**
		Energizer loaded compact piston seal with integrated guiding elements. Design optimized for slide rings made of ECOPUR materials for improved wear resistance and leak tightness. Typical design for medium to heavy duty standard hydraulic pistons.	–30	+100	0,5	400	ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–30	+100	0,5	400	H-ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–30	+100	0,5	400	S-ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–60	+100	0,5	400	T-ECOPUR	SKF Ecosil	SKF Ecotal[1]
	K09-P	**Hydraulic, double-acting**					**Seal**	**Energizer**	**Guide rings**
		Energizer loaded compact piston seal with integrated guiding elements. Design optimized for slide rings made of ECOPUR materials for improved wear resistance, leak tightness and frequent movements. Typical design for medium to heavy duty standard hydraulic pistons.	–30	+100	0,5	400	ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–30	+100	0,5	400	H-ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–30	+100	0,5	400	S-ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–60	+100	0,5	400	T-ECOPUR	SKF Ecosil	SKF Ecotal[1]
	K09-U	**Hydraulic, double-acting**					**Seal**	**Energizer**	**Guide rings**
		Energizer loaded compact piston seal with integrated guiding elements. Design optimized for slide rings made of ECOPUR materials for improved wear resistance and leak tightness. Typical design for heavy duty hydraulic pistons with extreme pressures.	–30	+100	0,3	1 500	ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–30	+100	0,3	1 500	H-ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–30	+100	0,3	1 500	S-ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–60	+100	0,3	1 500	T-ECOPUR	SKF Ecosil	SKF Ecotal[1]
	K09-F	**Hydraulic, double-acting**					**Seal**	**Energizer**	**Guide rings**
		Energizer loaded compact piston seal with integrated guiding elements. Design optimized for slide rings made of SKF Ecoflon materials for reduced friction and stick-slip. Typical design for medium to heavy duty standard hydraulic pistons.	–30	+100	1	400	X-ECOPUR	SKF Ecorubber-1	SKF Ecotal[1]
			–30	+100	1	400	X-ECOPUR H	SKF Ecorubber-1	SKF Ecotal[1]
			–30	+100	1,2	400	X-ECOPUR S	SKF Ecorubber-1	SKF Ecotal[1]
			–30	+100	1,5	400	SKF Ecoflon 2,3,4	SKF Ecorubber-1	SKF Ecotal[1]
			–20	+200	1,5	400	SKF Ecoflon 2,3,4	SKF Ecorubber-2	SKF Ecopaek
	K1012-M	**Hydraulic, single-acting**					**Support ring K 10-A**	**Chevron K 11-M**	**Pressure ring K 12-M**
		Chevron sealing set, trimmed surface design. In back–to–back arrangement with one intermediate chevron for double sided pressure activation, in single-acting applications with more intermediate chevrons possible. For heavy industry hydraulics. For further material combinations refer to the seal data sheet.	–30	+100	0,5	500	SKF Ecorubber-1	ECOPUR	SKF Ecotal[1]
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	X-ECOPUR
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	SKF Ecotal[1]
			–30	+110	0,5	500	SKF Ecomid	G-ECOPUR	G-ECOPUR 54D[3]
			–20	+100	0,5	500	SKF Ecorubber-1	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	X-ECOPUR H[2]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecorubber-1	S-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	X-ECOPUR S[2]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	SKF Ecotal[1]
			–30	+100	0,5	250	SKF Ecoflon 2	SKF Ecorubber-1	SKF Ecoflon 2
			–25	+150	0,5	250	SKF Ecoflon 2	SKF Ecorubber-H	SKF Ecoflon 2
			–20	+200	0,5	250	SKF Ecoflon 2	SKF Ecorubber-2	SKF Ecoflon 2

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Alternative SKF Ecotal up to † 400 mm, SKF Ecomid above † 260 mm; please refer to the seal data sheet regarding temperature range
[3] Alternative SKF Ecomid; please refer to the seal data sheet regarding temperature range

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	–		
	K1012–T	**Hydraulic, single-acting**					**Support ring K10-A**	**Chevron K11-T**	**Pressure ring K12-T**
		Chevron sealing set, machined	–30	+100	0,5	500	SKF Ecorubber-1	ECOPUR	SKF Ecotal[1]
		surface design. In back–to–back	–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	X-ECOPUR[2]
		arrangement with one intermediate	–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	SKF Ecotal[1]
		chevron for double sided pressure	–30	+110	0,5	500	SKF Ecomid	G-ECOPUR	G-ECOPUR 54D[3]
		activation, in single-acting	–20	+100	0,5	500	SKF Ecorubber-1	H-ECOPUR	SKF Ecotal[1]
		applications with more intermediate	–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	X-ECOPUR H[2]
		chevrons possible. For heavy	–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	SKF Ecotal[1]
		industry hydraulics.	–20	+100	0,5	500	SKF Ecorubber-1	S-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	X-ECOPUR S[2]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	SKF Ecotal[1]
		For further material combinations	–30	+100	0,5	250	SKF Ecoflon 2	SKF Ecorubber-1	SKF Ecoflon 2
		refer to the seal data sheet	–25	+150	0,5	250	SKF Ecoflon 2	SKF Ecorubber-H	SKF Ecoflon 2
			–20	+200	0,5	250	SKF Ecoflon 2	SKF Ecorubber-2	SKF Ecoflon 2
	K1215–T	**Hydraulic, single-acting**					**Support ring K 13-T**	**Chevron K 14-T**	**Pressure ring K 15-T**
		Chevron sealing set, design with	–30	+100	0,5	600	SKF Ecorubber–1	ECOPUR	SKF Ecotal[1]
		flexible sealing lips, good sealing	–30	+100	0,5	600	SKF Ecotal[1]	ECOPUR	X–ECOPUR[2]
		ability in higher pressure range. For	–30	+100	0,5	600	SKF Ecotal[1]	ECOPUR	SKF Ecotal[1]
		heavy industry hydraulics, water–hydraulic systems.	–30	+110	0,5	600	SKF Ecomid	G–ECOPUR	G–ECOPUR 54D[3]
			–20	+100	0,5	600	SKF Ecorubber–1	H–ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	600	SKF Ecotal[1]	H–ECOPUR	X–ECOPUR H[2]
		For further material combinations	–20	+100	0,5	600	SKF Ecotal[1]	H–ECOPUR	SKF Ecotal[1]
		refer to the seal data sheet	–20	+100	0,5	600	SKF Ecorubber–1	S–ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	600	SKF Ecotal[1]	S–ECOPUR	X–ECOPUR S[2]
			–20	+100	0,5	600	SKF Ecotal[1]	S–ECOPUR	SKF Ecotal[1]
	K16-A	**Hydraulic/pneumatic, single-acting**							
		Simple cup seal, usually fixed on the	–30	+110	0,5	160	ECOPUR		
		piston with a clamping plate. Mainly	–35	+110	0,5	160	ECOPUR LD		
		used for replacement in old	–30	+110	0,5	160	G-ECOPUR		
		hydraulic and pneumatic cylinders	–20	+110	0,5	160	H-ECOPUR		
		or for low–grade secondary	–20	+110	0,5	160	S-ECOPUR		
		applications.	–50	+100	0,5	160	T-ECOPUR		
			–30	+100	0,5	160	SKF Ecorubber-1		
			–25	+150	0,5	160	SKF Ecorubber-H		
			–20	+200	0,5	160	SKF Ecorubber-2		
			–50	+150	0,5	160	SKF Ecorubber-3		
			–10	+200	0,5	160	SKF Ecoflas		
	K16-B	**Hydraulic/pneumatic, single-acting**							
		Simple cup seal, usually fixed on the	–30	+110	0,5	160	ECOPUR		
		piston with a clamping plate. Mainly	–35	+110	0,5	160	ECOPUR LD		
		used for replacement in old	–30	+110	0,5	160	G-ECOPUR		
		hydraulic and pneumatic cylinders	–20	+110	0,5	160	H-ECOPUR		
		or for low–grade secondary	–20	+110	0,5	160	S-ECOPUR		
		applications.	–50	+100	0,5	160	T-ECOPUR		
			–30	+100	0,5	160	SKF Ecorubber-1		
			–25	+150	0,5	160	SKF Ecorubber-H		
			–20	+200	0,5	160	SKF Ecorubber-2		
			–50	+150	0,5	160	SKF Ecorubber-3		
			–10	+200	0,5	160	SKF Ecoflas		
	K17–P	**Hydraulic, double-acting**					**Seal**	**Guide rings**	
		Compact piston seal with integrated	–30	+100	0,5	250	ECOPUR	SKF Ecotal[1]	
		guiding elements. Design optimized	–20	+100	0,5	250	H-ECOPUR	SKF Ecotal[1]	
		for sealing elements made of	–20	+100	0,5	250	S-ECOPUR	SKF Ecotal[1]	
		ECOPUR materials for improved	–40	+100	0,5	250	T-ECOPUR	SKF Ecotal[1]	
		wear resistance and leak tightness.							
		Typical design for light to medium							
		duty standard hydraulic pistons.							

1) Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
2) Alternative SKF Ecotal up to † 400 mm, SKF Ecomid above † 260 mm; please refer to the seal data sheet regarding temperature range
3) Alternative SKF Ecomid; please refer to the seal data sheet regarding temperature range

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	–		
	K17–P	**Hydraulic, double-acting**					**Seal**	**Guide rings**	
		Compact piston seal with integrated	–30	+100	0,5	250	SKF Ecorubber-1	SKF Ecotal[1]	
		guiding elements. Design optimized	–25	+150	0,5	250	SKF Ecorubber-H	SKF Ecoflon 2	
		for sealing elements made of	–25	+100	0,5	250	SKF Ecorubber-H	SKF Ecotal[1]	
		Ecorubber materials with increased	–25	+150	0,5	250	SKF Ecorubber-H	SKF Ecopaek	
		chemical and thermal resistance.	–20	+200	0,5	250	SKF Ecorubber-2	SKF Ecoflon 2	
		Typical design for light to medium	–20	+200	0,5	250	SKF Ecorubber-2	SKF Ecopaek	
		duty standard hydraulic pistons.							
	K19-F	**PTFE piston seal, single-acting**					**Seal**	**Spring**	
		Asymmetric finger spring loaded piston	–200	+260	15	200	SKF Ecoflon 1	1.4310[2]	
		seal. Design optimized for SKF Ecoflon	–200	+260	15	400	SKF Ecoflon 2, 3, 4	1.4310[2]	
		materials to reduce friction and stick-slip	–200	+90	15	200	SKF Ecowear 1000	1.4310[2]	
		effects. Excellent chemical and thermal resistance, therefore mainly used in chemical, pharmaceutical and food industry.							
	K19-FX	**PTFE piston seal, single-acting**					**Seal**	**Spring**	
		Similar profile to K19-F with modified	–200	+260	15	200	SKF Ecoflon 1	1.4310[2]	
		spring groove to enable the use of	–200	+260	15	200	SKF Ecoflon 1	2.4711[2]	
		standardized imperial sized springs of	–200	+260	15	400	SKF Ecoflon 2, 3, 4	1.4310[2]	
		the series 100/200/300/400. Elgiloy	–200	+260	15	400	SKF Ecoflon 2, 3, 4	2.4711[2]	
		springs available for extreme chemical	–200	+90	15	200	SKF Ecowear 1000	1.4310[2]	
		resistance.	–200	+90	15	200	SKF Ecowear 1000	2.4711[2]	
	K20–P	**Hydraulic, double-acting**					**Seal**	**Back-up rings**	
		Space saving, compact piston seal,	–30	+100	0,5	700	SKF Ecorubber-1	SKF Ecotal[1]	
		suitable for standard O–Ring housings.	–25	+150	0,5	700	SKF Ecorubber-H	SKF Ecoflon 2	
		Advantage compared to O–Ring:	–25	+100	0,5	700	SKF Ecorubber-H	SKF Ecotal[1]	
		integrated active back–up rings for	–25	+150	0,5	700	SKF Ecorubber-H	SKF Ecopaek	
		high pressure, designed with interference	–20	+200	0,5	700	SKF Ecorubber-2	SKF Ecoflon 2	
		fit on outside diameter, prevents twisting	–20	+200	0,5	700	SKF Ecorubber-2	SKF Ecopaek	
		in dynamic applications. Design optimized for SKF Ecorubber materials.							
	K21–P	**Hydraulic, single-acting**					**Seal**	**Energizer**	
		Symmetric O-ring loaded lip seal for	–30	+100	0,5	400	ECOPUR	NBR 70	
		simple standard applications; not	–20	+100	0,5	400	H-ECOPUR	NBR 70	
		recommended for new designs. Sharp	–20	+100	0,5	400	S-ECOPUR	NBR 70	
		edged sealing lips for good sealing effect	–50	+100	0,5	400	T-ECOPUR	MVQ 70	
		in high viscosity fluids as well as usage as a wiper seal. Universal usage for rod or piston applications. Design optimized for ECOPUR materials.							
	K22–P	**Hydraulic, single-acting**					**Seal**	**Support ring**	
		Symmetric piston seal with support ring	–30	+100	0,5	400	ECOPUR	SKF Ecotal[1]	
		for simple applications to serve repair	–35	+110	0,5	400	ECOPUR LD	SKF Ecomid	
		purpose, not recommended for new	–30	+110	0,5	400	G-ECOPUR	SKF Ecomid	
		designs (Profile K01–P preferred).	–20	+100	0,5	400	H-ECOPUR	SKF Ecotal[1]	
		Retainer ring can be designed straight or	–20	+100	0,5	400	S-ECOPUR	SKF Ecotal[1]	
		as an angled ring. Design optimized for ECOPUR materials.	–40	+100	0,5	400	T-ECOPUR	SKF Ecotal[1]	

1) Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
2) Spring steel material specification

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	–		
	K22-P	**Hydraulic, single-acting** Symmetric lip seal as K22-P, but optimized for SKF Ecorubber materials with increased chemical and thermal properties.	–30 –25 –25 –20 –50 –40 –10	+100 +150 +100 +200 +150 +100 +200	0,5 0,5 0,5 0,5 0,5 0,5 0,5	160 160 160 160 160 160 160	**Seal** SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecorubber-3[2] SKF Ecoflas	**Support ring** SKF Ecotal[1] SKF Ecoflon 2 SKF Ecotal[1] SKF Ecoflon 2 SKF Ecoflon 2 SKF Ecotal[1] SKF Ecoflon	
	K22-N	**Hydraulic, double-acting** Energizer loaded compact piston seal with integrated back-up rings. Design optimized for slide rings made of ECOPUR materials for improved wear resistance and leak tightness. Typical design for heavy duty standard hydraulic pistons. External guiding elements required.	–30 –30 –30 –60	+100 +100 +100 +100	0,5 0,5 0,5 0,5	400 400 400 400	**Seal** ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** SKF Ecorubber-1 SKF Ecorubber-1 SKF Ecorubber-1 SKF Ecosil	**Back–up rings** SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
	K22-P	**Hydraulic, double-acting** Energizer loaded compact piston seal with integrated back–up rings. Design optimized for slide rings made of ECOPUR materials for improved wear resistance and frequent movements. Typical design for heavy duty standard hydraulic pistons. External guiding elements required.	–30 –30 –30 –60	+100 +100 +100 +100	0,5 0,5 0,5 0,5	400 400 400 400	**Seal** ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** SKF Ecorubber-1 SKF Ecorubber-1 SKF Ecorubber-1 SKF Ecosil	**Back–up rings** SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
	K22-H	**Hydraulic, double-acting** Energizer loaded compact piston seal with integrated back–up rings. Design optimized for slide rings made of ECOPUR materials for improved wear resistance and leak tightness. Typical design for heavy duty hydraulic pistons with extreme pressures. External guiding elements required.	–30 –30 –30 –60	+100 +100 +100 +100	0,3 0,3 0,3 0,3	1 500 1 500 1 500 1 500	**Seal** ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** SKF Ecorubber-1 SKF Ecorubber-1 SKF Ecorubber-1 SKF Ecosil	**Back–up rings** SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
	K22-F	**Hydraulic, double-acting** Energizer loaded compact piston seal with integrated back-up rings. Design optimized for slide rings made of SKF Ecoflon materials to reduce friction and stick-slip effects. Typical design for heavy duty standard hydraulic pistons. External guiding elements required.	–30 –30 –30 –30 –20	+100 +100 +100 +100 +200	1 1 1 1,5 1,5	400 400 400 400 400	**Seal** X-ECOPUR X-ECOPUR H X-ECOPUR S SKF Ecoflon 2,3,4 SKF Ecoflon 2,3,4	**Energizer** SKF Ecorubber-1 SKF Ecorubber-1 SKF Ecorubber-1 SKF Ecorubber-1 SKF Ecorubber-2	**Back–up rings** SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1] SKF Ecopaek

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils

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	–			
	K24-P	**Hydraulic, single-acting** Chevron ring with flexible lip design. Replacement part for standard commercial housings (male and female adapter mainly made of metal).	–30 –35 –30 –20 –20 –50 –30 –25 –20 –50 –10	+110 +110 +110 +110 +110 +100 +100 +150 +200 +150 +200	0,5 0,5 0,5 0,5 0,5 0,5 0,5 0,5 0,5 0,5 0,5	500 500 500 500 500 500 250 250 250 250 250	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3 SKF Ecoflas		
	K23-P	**Hydraulic, single-acting** Chevron sealing set, designed with extremely flexible sealing lips for difficult operating conditions like bad guiding, large tolerance range. Available as total chevron sealing set as well as intermediate chevrons only (in case of metal male and female adapters). For further material combinations refer to the seal data sheet	–30 –30 –30 –30 –20 –20 –20 –20 –20 –20	+100 +100 +100 +110 +100 +100 +100 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5 0,5 0,5 0,5 0,5	500 500 500 500 500 500 500 500 500 500	**Pressure ring** SKF Ecotal[1] X-ECOPUR SKF Ecotal[1] G-ECOPUR 54D SKF Ecotal[1] X-ECOPUR H SKF Ecotal[1] SKF Ecotal[1] X-ECOPUR S X-ECOPUR S	**Chevron** ECOPUR ECOPUR ECOPUR G-ECOPUR H-ECOPUR H-ECOPUR H-ECOPUR S-ECOPUR S-ECOPUR S-ECOPUR	**Support ring** SKF Ecorubber-1 SKF Ecotal[1] SKF Ecotal[1] SKF Ecomid SKF Ecorubber-1 SKF Ecotal[1] SKF Ecotal[1] SKF Ecorubber-1 SKF Ecotal[1] SKF Ecotal[1]
	K35-P	**Hydraulic, double-acting** Space saving compact piston seal. Design optimized for ECOPUR materials. Also commonly used as O-ring replacement to prevent twisting of the seal.	–30 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	0,4 0,4 0,4 0,4 0,4 0,4	400 400 400 400 400 400	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR			

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range

Rod seals

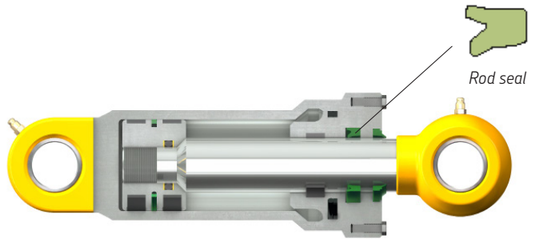
Introduction

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.

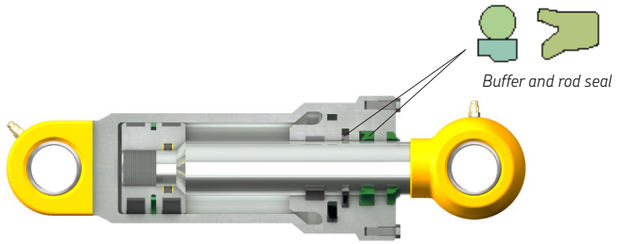
In addition to the sealing function, rod seals also provide a thin lubrication film on the piston rod that lubricates themselves and the wiper seals. The lubricant also inhibits its corrosion of the piston rod surface. Well engineered seal designs allow this required thin lubrication film while utilizing 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 SEAL JET 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.



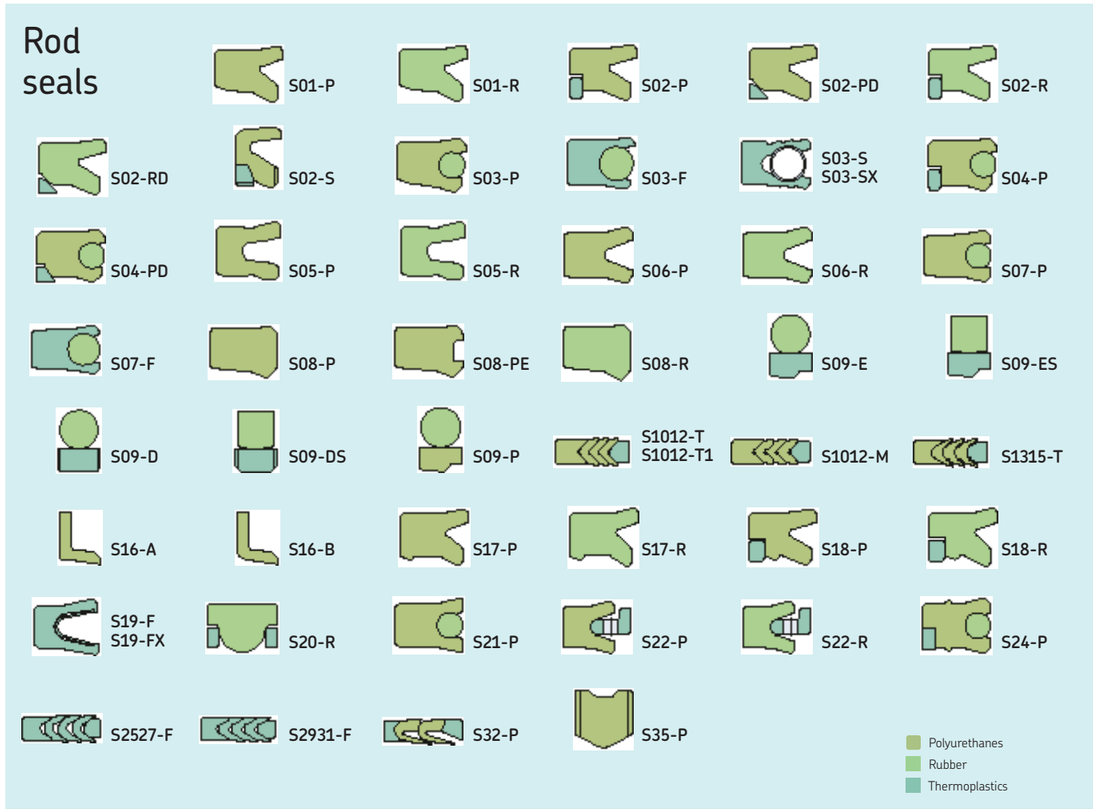
Typical situation using a single rod seal S01-P in a hydraulic cylinder



Tandem rod sealing system with S09-E as primary seal (buffer seal) and S01-P as secondary seal (rod seal)

Single-acting Chevron sealing set S1012-T1 for heavy duty hydraulic applications made of ECOPUR and SKF Ecotal

Single-acting hydraulic seal S01-P made of H-ECOPUR



Rod seal selection guide

	Standard use	Symmetric design when usage as piston or rod seal is required	Back-up 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.	 S01-P S01-R	 S06-P S06-R	 S02-P S02-R S18-P S18-R S02-PD S02-RD	Pneumatics S05-P S05-R Stabilization lip S17-P S17-R Retainer ring S22-P S22-R Chevron packing with flexible lips S32-P PTFE-design S19-F S19-FX Single lip S16-A S16-B
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.	 S03-P S03-F	 S07-P S07-F	 S04-P S24-P S04-PD	Aggressive lip S21-P PTFE-design S03-S S03-SX
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 S35-P		Rubber design S20-R	Chevron packings for open housings for extreme contact forces & extremely small profiles S1012-T S1315-T S08-P S08-R S2527-F S2931-F S08-PE

Activated slide rings & tandem seal designs

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

Single-acting		Double-acting		Unloaded Lip seal design
Standard	Heavy duty	Standard	Heavy duty	
 S09-E	 S09-ES	 S09-D	 S09-DS	 S02-S

Remark: Use X-ECOPUR as slide ring material to improve static sealing behavior.

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	Back–up ring
			°C		m/s	bar	–	
	S01-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 materials. Also used as rod seal in combination with buffer seals S02-S or S09.	–30 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	0,5 0,5 0,5 0,5 0,5 0,5	400 400 400 400 400 400	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	
	S01-R	**Hydraulic, single-acting** As profile S01-P, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30 –25 –20 –50 –10 –60	+100 +150 +200 +150 +200 +200	0,5 0,5 0,5 0,5 0,5 –	160 160 160 160 160 –	**Seal** SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecoflas SKF Ecosil[3]	
	S02-P	**Hydraulic, single-acting** Asymmetric rod seal for standard applications based on the S01-P design with an active rectangular back-up ring for larger extrusion gaps or higher pressure ranges.	–30 –35 –30 –20 –20 –40	+100 +110 +110 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5	700 700 700 700 700 700	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Back–up ring** SKF Ecotal[1] SKF Ecomid SKF Ecomid SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
	S02-PD	**Hydraulic, single-acting** Asymmetric rod seal for standard applications based on the S01-P design with an active tapered back-up ring for larger extrusion gaps or higher pressure ranges.	–30 –35 –30 –20 –20 –40	+100 +110 +110 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5	700 700 700 700 700 700	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Back–up ring** SKF Ecotal[1] SKF Ecomid SKF Ecomid SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
	S02-R	**Hydraulic, single-acting** As profile S02-P with an active rectangular back-up ring, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30 –25 –25 –20 –50 –40 –10	+100 +150 +100 +200 +150 +100 +200	0,5 0,5 0,5 0,5 0,5 0,5 0,5	250 250 250 250 250 250 250	**Seal** SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecorubber-3[2] SKF Ecoflas	**Back–up ring** SKF Ecotal[1] SKF Ecoflon 2 SKF Ecotal[1] SKF Ecoflon 2 SKF Ecoflon 2 SKF Ecotal[1] SKF Ecopaek
	S02-RD	**Hydraulic, single-acting** As profile S02-PD with an active tapered back-up ring, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30 –25 –25 –20 –50 –40 –10	+100 +150 +100 +200 +150 +100 +200	0,5 0,5 0,5 0,5 0,5 0,5 0,5	250 250 250 250 250 250 250	**Seal** SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecorubber-3[2] SKF Ecoflas	**Back–up ring** SKF Ecotal[1] SKF Ecoflon 2 SKF Ecotal[1] SKF Ecoflon 2 SKF Ecoflon 2 SKF Ecotal[1] SKF Ecopaek

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils
[3] Only recommended for static or quasi-static applications. Contact SKF for more information

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	–		
	S02-S	**Hydraulic, single-acting** Asymmetric rod seal with an integrated back-up ring for special housings (DIN/ISO 7425 part 2) and for use as buffer seal in the rod sealing system. Design optimized for ECOPUR materials.	–30 –20 –20 –40	+100 +100 +100 +100	0,5 0,5 0,5 0,5	400 400 400 400	**Seal** ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Back-up ring** SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]	
	S03-P	**Hydraulic, single-acting** Asymmetrical 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 materials.	–30 –30 –30 –20 –20 –50	+100 +100 +100 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5	400 400 400 400 400 400	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** NBR 70 NBR 70 NBR 70 NBR 70 NBR 70 MVQ 70	
	S03-E	**PTFE rod seal, single-acting** Asymmetric O-ring loaded rod seal. Design optimized for SKF Ecoflon materials 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.	–55 –30 –50 –20 –55 –30 –55 –30	+200 +100 +150 +200 +200 +100 +90 +90	1 1 1 1 1 1 0,5 0,5	200 200 400 400 400 400 200 200	**Seal** SKF Ecoflon 1 SKF Ecoflon 1 SKF Ecoflon 2,3,4 SKF Ecoflon 2,3,4 SKF Ecoflon 2,3,4 SKF Ecoflon 2,3,4 SKF Ecowear 1000 SKF Ecowear 1000	**Energizer** MVQ 70 NBR 70 EPDM 70 FPM 75 MVQ 70 NBR 70 MVQ 70 NBR 70	
	S03-S	**PTFE rod seal, single-acting** Asymmetric helicoil spring loaded rod seal. Design optimized for SKF Ecoflon to reduce friction and stick-slip effects. Excellent chemical and thermal resistance. Mainly used in covers as well as valve seats and stems.	–200 –200 –200	+260 +260 +90	1 1 0,5	200 400 200	**Seal** SKF Ecoflon 1 SKF Ecoflon 2,3,4 SKF Ecowear 1000	**Spring** 1.4310[2] 1.4310[2] 1.4310[2]	
	S03-SY	**PTFE rod seal, single-acting** Similar profile to S03-S with modified spring groove to enable the use of standardized imperial sized springs of the series 100/200/300/400. Elgiloy springs available for extreme chemical resistance	–200 –200 –200 –200 –200 –200	+260 +260 +260 +260 +90 +90	1 1 1 1 0,5 0,5	200 200 400 400 200 200	**Seal** SKF Ecoflon 1 SKF Ecoflon 1 SKF Ecoflon 2, 3, 4 SKF Ecoflon 2, 3, 4 SKF Ecowear 1000 SKF Ecowear 1000	**Spring** 1.4310[2] 2.4711[2] 1.4310[2] 2.4711[2] 1.4310[2] 2.4711[2]	
	S04-P	**Hydraulic, single-acting** Asymmetric O-ring loaded rod seal for standard applications based on the S01-P design with an active rectangular back-up ring for larger extrusion gaps or higher pressure ranges.	–30 –30 –30 –20 –20 –40	+100 +100 +100 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5	700 700 700 700 700 700	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** NBR 70 NBR 70 NBR 70 NBR 70 NBR 70 MVQ 70	**Back-up ring** SKF Ecotal[1] SKF Ecomid SKF Ecomid SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Spring steel material specification

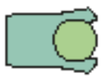
Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	S04-PD	**Hydraulic, single-acting** Asymmetric O-ring loaded rod seal for standard applications based on the S01-P design with an active tapered back-up ring for larger extrusion gaps or higher pressure ranges.	–30 –30 –30 –20 –20 –40	+100 +100 +100 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5	700 700 700 700 700 700	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** NBR 70 NBR 70 NBR 70 NBR 70 NBR 70 MVQ 70	**Back-up ring** SKF Ecotal[1] SKF Ecomid SKF Ecomid SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
	S05-P	**Pneumatic, single-acting** Asymmetric rod seal. Design optimized for ECOPUR materials 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 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	1 1 1 1 2 1	25 25 25 25 25 25	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR		
	S05-R	**Pneumatic, single-acting** Asymmetric rod seal. Design optimized for SKF Ecorubber 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 –25 –20 –50 –10	+100 +150 +200 +150 +200	1 1 1 1 1	25 25 25 25 25	SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecoflas		
	S06-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 materials.	–30 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	0,5 0,5 0,5 0,5 0,5 0,5	400 400 400 400 400 400	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR		
	S06-R	**Hydraulic, single-acting** As profile S06-P, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30 –25 –20 –50 –10 –60	+100 +150 +200 +150 +200 +200	0,5 0,5 0,5 0,5 0,5 –	160 160 160 160 160 –	SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecoflas SKF Ecosil[3]		
	S07-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 materials.	–30 –30 –30 –20 –20 –50	+100 +100 +100 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5	400 400 400 400 400 400	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** NBR 70 NBR 70 NBR 70 NBR 70 NBR 70 MVQ 70	

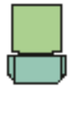
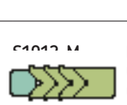
[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils
[3] Only recommended for static or quasi-static applications. Contact SKF for more information

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	–	
	S07-E	**PTFE rod seal, single-acting**					**Seal**	**Energizer**
		Symmetric O-ring loaded lip seal. Design optimized for SKF Ecoflon materials 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.	–55	+200	1	200	SKF Ecoflon 1	MVQ 70
			–30	+100	1	200	SKF Ecoflon 1	NBR 70
			–50	+150	1	400	SKF Ecoflon 2,3,4	EPDM 70
			–20	+200	1	400	SKF Ecoflon 2,3,4	FPM 75
			–55	+200	1	400	SKF Ecoflon 2,3,4	MVQ 70
			–30	+100	1	400	SKF Ecoflon 2,3,4	NBR 70
			–55	+90	0,5	200	SKF Ecowear 1000	MVQ 70
			–30	+90	0,5	200	SKF Ecowear 1000	NBR 70
	S08-P	**Hydraulic, single-acting**						
		Asymmetric compact rod seal with stable fit in the housing. Compact design mainly used to seal high viscosity fluids or for extreme small housings, not suitable for high speed applications. S08-P compact design, no groove.	–30	+110	0,3	400	ECOPUR	
			–20	+110	0,3	400	H-ECOPUR	
			–20	+110	0,3	400	S-ECOPUR	
			–50	+100	0,3	400	T-ECOPUR	
	S08-PE	**Hydraulic, single-acting**						
		Asymmetric compact rod seal with stable fit in the housing. Compact design mainly used to seal high viscosity fluids or for extreme small housings, not suitable for high speed applications. S08-PE with small groove.	–30	+110	0,3	400	ECOPUR	
			–20	+110	0,3	400	H-ECOPUR	
			–20	+110	0,3	400	S-ECOPUR	
			–50	+100	0,3	400	T-ECOPUR	
	S08-R	**Hydraulic, single-acting**						
		As profile S08-P, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30	+100	0,3	160	SKF Ecorubber-1	
			–25	+150	0,3	160	SKF Ecorubber-H	
			–20	+200	0,3	160	SKF Ecorubber-2	
			–50	+150	0,3	160	SKF Ecorubber-3[1]	
			–10	+200	0,3	160	SKF Ecoflas	
	S09-E	**Hydraulic, single-acting**					**Seal**	**Energizer**
		O-ring loaded asymmetric slide ring rod seal. Design optimized for SKF Ecoflon materials 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 S01-P as a rod seal. Use X-ECOPUR materials for improved leak tightness and installation ability.	–55	+100	5	600	G-ECOPUR 54D	MVQ 70
			–30	+100	5	600	G-ECOPUR 54D	NBR 70
			–55	+100	5	600	X-ECOPUR, H, S	MVQ 70
			–30	+100	5	600	X-ECOPUR, H, S	NBR 70
			–20	+200	10	600	SKF Ecoflon 2,3,4	FPM 75
			–30	+100	10	600	SKF Ecoflon 2,3,4	NBR 70
			–55	+90	5	400	SKF Ecowear 1000	MVQ 70
			–30	+90	5	400	SKF Ecowear 1000	NBR 70
	S09-D	**Hydraulic, double-acting**					**Seal**	**Energizer**
		O-ring loaded symmetric slide ring rod seal. Design optimized for SKF Ecoflon materials 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 rods. Use X-ECOPUR materials for improved leak tightness and installation ability.	–55	+100	5	600	G-ECOPUR 54D	MVQ 70
			–30	+100	5	600	G-ECOPUR 54D	NBR 70
			–55	+100	5	600	X-ECOPUR, H, S	MVQ 70
			–30	+100	5	600	X-ECOPUR, H, S	NBR 70
			–20	+200	10	600	SKF Ecoflon 2,3,4	FPM 75
			–30	+100	10	600	SKF Ecoflon 2,3,4	NBR 70
			–55	+90	5	400	SKF Ecowear 1000	MVQ 70
			–30	+90	5	400	SKF Ecowear 1000	NBR 70

[1] Not suitable for mineral oils

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	–	
	S09-P	**Hydraulic, single-acting**					**Seal**	**Energizer**
		O-ring loaded asymmetric slide ring rod seal. Design optimized for ECOPUR materials for increased wear resistance and leak tightness. Typical design for light to medium duty hydraulic rods.	–30	+100	1	250	ECOPUR	NBR 70
			–30	+100	1	250	ECOPUR LD	NBR 70
			–30	+100	1	250	G-ECOPUR	NBR 70
			–20	+100	1	250	H-ECOPUR	NBR 70
			–20	+100	1	250	S-ECOPUR	NBR 70
			–50	+100	1	250	T-ECOPUR	MVQ 70
	S09-ES	**Hydraulic, single-acting**					**Seal**	**Energizer**
		Energizer loaded asymmetric slide ring rod seal, similar to S09-E, but special heavy duty design. Due to adaption possibilities of the energizer also applicable for special housing dimensions.	–30	+100	5	600	G-ECOPUR 54D	SKF Ecorubber-1
			–60	+100	5	600	G-ECOPUR 54D	SKF Ecosil
			–30	+100	5	600	X-ECOPUR, H, S	SKF Ecorubber-1
			–60	+100	5	600	X-ECOPUR, H, S	SKF Ecosil
			–30	+100	10	600	SKF Ecoflon 2,3,4	SKF Ecorubber-1
			–20	+200	10	600	SKF Ecoflon 2,3,4	SKF Ecorubber-2
			–30	+90	5	400	SKF Ecowear 1000	SKF Ecorubber-1
			–60	+90	5	400	SKF Ecowear 1000	SKF Ecosil
	S09-DS	**Hydraulic, double-acting**					**Seal**	**Energizer**
		Energizer loaded asymmetric slide ring rod seal similar to S09-D, but with special heavy duty design. Due to adaption possibilities of the energizer also applicable for special housing dimensions.	–30	+100	5	600	G-ECOPUR 54D	SKF Ecorubber-1
			–60	+100	5	600	G-ECOPUR 54D	SKF Ecosil
			–30	+100	5	600	X-ECOPUR, H, S	SKF Ecorubber-1
			–60	+100	5	600	X-ECOPUR, H, S	SKF Ecosil
			–30	+100	10	600	SKF Ecoflon 2,3,4	SKF Ecorubber-1
			–20	+200	10	600	SKF Ecoflon 2,3,4	SKF Ecorubber-2
			–30	+90	5	400	SKF Ecowear 1000	SKF Ecorubber-1
			–60	+90	5	400	SKF Ecowear 1000	SKF Ecosil
	S1012-M	**Hydraulic, single-acting**					**Support ring S10–A**	**Chevron S11–M**	**Pressure ring S12–M**
		Chevron sealing set, trimmed surface design. For heavy industry hydraulics.	–30	+100	0,5	500	SKF Ecorubber-1	ECOPUR	SKF Ecotal[1]
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	X-ECOPUR[2]
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	SKF Ecotal[1]
		For further material combinations refer to the seal data sheet	–30	+110	0,5	500	SKF Ecomid	G-ECOPUR	G-ECOPUR 54D[3]
			–20	+100	0,5	500	SKF Ecorubber-1	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	X-ECOPUR H[2]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecorubber-1	S-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	X-ECOPUR S[2]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	SKF Ecotal
			–30	+100	0,5	250	SKF Ecoflon 2	SKF Ecorubber-1	SKF Ecoflon 2
			–25	+150	0,5	250	SKF Ecoflon 2	SKF Ecorubber-H	SKF Ecoflon 2
			–20	+200	0,5	250	SKF Ecoflon 2	SKF Ecorubber-2	SKF Ecoflon 2
	S1012-T	**Hydraulic, single-acting**					**Support ring S10–A**	**Chevron S11–T**	**Pressure ring S12–T**
		Chevron sealing set, machined surface design. For heavy industry hydraulics.	–30	+100	0,5	500	SKF Ecorubber-1	ECOPUR	SKF Ecotal[1]
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	X-ECOPUR[2]
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	SKF Ecotal[1]
		For further material combinations refer to the seal data sheet	–30	+110	0,5	500	SKF Ecomid	G-ECOPUR	G-ECOPUR 54D[3]
			–20	+100	0,5	500	SKF Ecorubber-1	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	X-ECOPUR H[2]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecorubber-1	S-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	X-ECOPUR S[2]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	SKF Ecotal[1]
			–30	+100	0,5	250	SKF Ecoflon 2	SKF Ecorubber-1	SKF Ecoflon 2
			–25	+150	0,5	250	SKF Ecoflon 2	SKF Ecorubber-H	SKF Ecoflon 2
			–20	+200	0,5	250	SKF Ecoflon 2	SKF Ecorubber-2	SKF Ecoflon 2

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Alternative SKF Ecotal up to † 400 mm, SKF Ecomid above † 260 mm; please refer to the seal data sheet regarding temperature range
[3] Alternative SKF Ecomid; please refer to the seal data sheet regarding temperature range

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	S1012-T1	**Hydraulic, single-acting** Chevron sealing set for heavy industry hydraulics similar to the S1012-T design, with reduced friction level, increased seal lifetime and increased system efficiency for the hydraulic cylinder. For further material combinations refer to the seal data sheet					**Support ring S10–A**	**Chevron S11–T**	**Pressure ring S12–T**
			–30	+100	0,5	500	SKF Ecorubber-1	ECOPUR	SKF Ecotal[1]
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	X-ECOPUR[2]
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	SKF Ecotal[1]
			–30	+110	0,5	500	SKF Ecomid	G-ECOPUR	G-ECOPUR 54D[3]
			–20	+100	0,5	500	SKF Ecorubber-1	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	X-ECOPUR H[2]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecorubber-1	S-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	X-ECOPUR S[2]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	SKF Ecotal[1]
			–30	+100	0,5	250	SKF Ecoflon 2	SKF Ecorubber-1	SKF Ecoflon 2
			–25	+150	0,5	250	SKF Ecoflon 2	SKF Ecorubber-H	SKF Ecoflon 2
			–20	+200	0,5	250	SKF Ecoflon 2	SKF Ecorubber-2	SKF Ecoflon 2
	S1215-T	**Hydraulic, single-acting** Chevron sealing set, design with flexible sealing lips, good sealing ability in higher pressure range. For heavy industry hydraulics, water–hydraulic systems. For further material combinations refer to the seal data sheet					**Support ring S13–A**	**Chevron S14-T**	**Pressure ring S15-T**
			–30	+100	0,5	500	SKF Ecorubber-1	ECOPUR	SKF Ecotal[1]
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	X-ECOPUR[2]
			–30	+100	0,5	500	SKF Ecotal[1]	ECOPUR	SKF Ecotal[1]
			–30	+110	0,5	500	SKF Ecomid	G-ECOPUR	G-ECOPUR 54D[3]
			–20	+100	0,5	500	SKF Ecorubber-1	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	X-ECOPUR H[2]
			–20	+100	0,5	500	SKF Ecotal[1]	H-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecorubber-1	S-ECOPUR	SKF Ecotal[1]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	X-ECOPUR S[2]
			–20	+100	0,5	500	SKF Ecotal[1]	S-ECOPUR	SKF Ecotal[1]
	S16-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	+110	0,5	160	ECOPUR		
			–35	+110	0,5	160	ECOPUR LD		
			–30	+110	0,5	160	G-ECOPUR		
			–20	+110	0,5	160	H-ECOPUR		
			–20	+110	0,5	160	S-ECOPUR		
			–50	+100	0,5	160	T-ECOPUR		
			–30	+100	0,5	160	SKF Ecorubber-1		
			–25	+150	0,5	160	SKF Ecorubber-H		
			–20	+200	0,5	160	SKF Ecorubber-2		
			–50	+150	0,5	160	SKF Ecorubber-3[4]		
			–10	+200	0,5	160	SKF Ecoflas		
	S16-B	**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	+110	0,5	160	ECOPUR		
			–35	+110	0,5	160	ECOPUR LD		
			–30	+110	0,5	160	G-ECOPUR		
			–20	+110	0,5	160	H-ECOPUR		
			–20	+110	0,5	160	S-ECOPUR		
			–50	+100	0,5	160	T-ECOPUR		
			–30	+100	0,5	160	SKF Ecorubber-1		
			–25	+150	0,5	160	SKF Ecorubber-H		
			–20	+200	0,5	160	SKF Ecorubber-2		
			–50	+150	0,5	160	SKF Ecorubber-3[4]		
			–10	+200	0,5	160	SKF Ecoflas		
	S17-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 materials. Also used in telescopic cylinders with low CS/L-ratio.	–30	+110	0,5	400	ECOPUR		
			–35	+110	0,5	400	ECOPUR LD		
			–30	+110	0,5	400	G-ECOPUR		
			–20	+110	0,5	400	H-ECOPUR		
			–20	+110	0,5	400	S-ECOPUR		
			–50	+100	0,5	400	T-ECOPUR		

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Alternative SKF Ecotal up to ∅ 400 mm, SKF Ecomid above ∅ 260 mm; please refer to the seal data sheet regarding temperature range
[3] Alternative SKF Ecomid; please refer to the seal data sheet regarding temperature range
[4] Not suitable for mineral oils

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	S17-R	**Hydraulic, single-acting** As profile S17-P, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.	–30	+100	0,5	160	SKF Ecorubber-1		
			–25	+150	0,5	160	SKF Ecorubber-H		
			–20	+200	0,5	160	SKF Ecorubber-2		
			–50	+150	0,5	160	SKF Ecorubber-3[2]		
			–10	+200	0,5	160	SKF Ecoflas		
	S18-P	**Hydraulic, single-acting** Asymmetric rod seal for standard applications based on S17-P with additional rectangular active back-up ring for lager extrusion gaps or higher pressure ranges.					**Seal**	**Back–up ring**	
			–30	+100	0,5	600	ECOPUR	SKF Ecotal[1]	
			–35	+110	0,5	600	ECOPUR LD	SKF Ecomid	
			–30	+110	0,5	600	G-ECOPUR	SKF Ecomid	
			–20	+100	0,5	600	H-ECOPUR	SKF Ecotal[1]	
			–20	+100	0,5	600	S-ECOPUR	SKF Ecotal[1]	
			–40	+100	0,5	600	T-ECOPUR	SKF Ecotal[1]	
	S18-R	**Hydraulic, single-acting** As profile S18-P, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.					**Seal**	**Back–up ring**	
			–30	+100	0,5	250	SKF Ecorubber-1	SKF Ecotal[1]	
			–25	+150	0,5	250	SKF Ecorubber-H	SKF Ecoflon 2	
			–25	+100	0,5	250	SKF Ecorubber-H	SKF Ecotal[1]	
			–20	+200	0,5	250	SKF Ecorubber-2	SKF Ecoflon 2	
			–50	+150	0,5	250	SKF Ecorubber-3[2]	SKF Ecoflon 2	
			–40	+100	0,5	250	SKF Ecorubber-3[2]	SKF Ecotal[1]	
			–10	+200	0,5	250	SKF Ecoflas	SKF Ecoflon 2	
	S19-F	**PTFE rod seal, single-acting** Asymmetric finger spring loaded rod seal. Design optimized for SKF Ecoflon materials to reduce friction and stick-slip effects. Excellent chemical and thermal resistance, therefore mainly used in chemical, pharmaceutical and food industry.					**Seal**	**Spring**	
			–200	+260	15	200	SKF Ecoflon 1	1.4310[3]	
			–200	+260	15	400	SKF Ecoflon 2, 3, 4	1.4310[3]	
			–200	+90	15	200	SKF Ecowear	1.4310[3]	
	S19-FX	**PTFE rod seal, single-acting** Similar profile to S19-F with modified spring groove to enable the use of standardized imperial sized springs of the series 100/200/300/400. Elgiloy springs available for extreme chemical resistance.					**Seal**	**Spring**	
			–200	+260	15	200	SKF Ecoflon 1	1.4310[3]	
			–200	+260	15	200	SKF Ecoflon 1	2.4711[3]	
			–200	+260	15	400	SKF Ecoflon 2, 3, 4	1.4310[3]	
			–200	+260	15	400	SKF Ecoflon 2, 3, 4	2.4711[3]	
			–200	+90	15	200	SKF Ecowear 1000	1.4310[3]	
			–200	+90	15	200	SKF Ecowear 1000	2.4711[3]	

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils
[3] Spring metal material specification

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	–		
	S20-R	**Hydraulic, double-acting** Space saving, compact rod seal, fits standard O–Ring housings. Advantage compared to O–Ring: integrated active back–up rings for high pressure, designed with interference fit on outside diameter prevents twisting in dynamic applications. Design optimized for SKF Ecorubber materials.	–30 –25 –25 –25 –20 –20	+100 +150 +100 +150 +200 +200	0,5 0,5 0,5 0,5 0,5 0,5	700 700 700 700 700 700	**Seal** SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-H SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-2	**Back-up rings** SKF Ecotal[1] SKF Ecoflon 2 SKF Ecotal[1] SKF Ecopaek SKF Ecoflon 2 SKF Ecopaek
	S21-P	**Hydraulic, single-acting** Symmetric O-ring loaded lip seal for simple standard applications; not recommended for new designs. Sharp edged sealing lip for good sealing effect in high viscosity fluids as well as usage as a wiper seal. Universal usage for rod or piston applications. Design optimized for ECOPUR materials.	–30 –20 –20 –50	+100 +100 +100 +100	0,5 0,5 0,5 0,5	400 400 400 400	**Seal** ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** NBR 70 NBR 70 NBR 70 MVQ 70
	S22-P	**Hydraulic, single-acting** Symmetric rod seal with support ring for simple applications to serve repair purpose, not recommended for new designs (profile S01–P preferred). Retainer ring can be designed straight or as an angled ring. Design optimized for ECOPUR materials.	–30 –35 –30 –20 –20 –40	+100 +110 +110 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5	400 400 400 400 400 400	**Seal** ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Support ring** SKF Ecotal[1] SKF Ecomid SKF Ecomid SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
	S22-R	**Hydraulic, single-acting** Symmetric rod seal as S22-P, but optimized for SKF Ecorubber materials with increased chemical and thermal properties.	–30 –25 –25 –20 –50 –40 –10	+100 +150 +100 +200 +150 +100 +200	0,5 0,5 0,5 0,5 0,5 0,5 0,5	160 160 160 160 160 160 160	**Seal** SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[2] SKF Ecorubber-3[2] SKF Ecoflas	**Support ring** SKF Ecotal[1] SKF Ecoflon 2 SKF Ecotal[1] SKF Ecoflon 2 SKF Ecoflon 2 SKF Ecotal[1] SKF Ecoflon 2
	S24-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 materials.	–30 –20 –20 –50	+100 +100 +100 +100	0,5 0,5 0,5 0,5	700 700 700 700	**Seal** ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	**Energizer** NBR 70 NBR 70 NBR 70 MVQ 70	**Back-up ring** SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1] SKF Ecotal[1]
	S2527-F	**PTFE chevron set, single-acting** Optimized for low pressure, unequal angled chevron design results in good contact pressure even in low pressure range. External spring pretension necessary. Mainly used in chemical, pharmaceutical and food industry.	–200	+260	1,5	100	**Support ring S25–F** SKF Ecoflon 2	**Chevron S26–F** SKF Ecoflon 1	**Pressure ring S27–F** SKF Ecoflon 2

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils

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	–		
	S2931-F	**PTFE chevron set, single-acting** Optimized for high pressure, equal angled chevron design suitable for high pressure range. External spring pretension necessary. Mainly used in chemical, pharmaceutical and food industry.	–200	+260	1,5	315	**Support ring S29-F** SKF Ecoflon 2	**Chevron S30-F** SKF Ecoflon 1	**Pressure ring S31-F** SKF Ecoflon 2
	S32-P	**Hydraulic, single-acting** Chevron set, design with extremely flexible sealing lips for difficult operating conditions (bad guiding, large tolerance range). Available as total chevron set as well as intermediate chevrons only (in case of metal male and female adaptors). For further material combinations refer to the seal data sheet	–30 –30 –30 –20 –20 –20 –20 –20	+100 +100 +110 +100 +100 +100 +100 +100	0,5 0,5 0,5 0,5 0,5 0,5 0,5 0,5	500 500 500 500 500 500 500 500	**Pressure ring** SKF Ecotal[1] X-ECOPUR SKF Ecotal[1] G-ECOPUR 54D SKF Ecotal[1] X-ECOPUR H SKF Ecotal[1] SKF Ecotal[1] X-ECOPUR S SKF Ecotal[1]	**Seal** ECOPUR ECOPUR G-ECOPUR H-ECOPUR H-ECOPUR H-ECOPUR S-ECOPUR S-ECOPUR S-ECOPUR	**Support ring** SKF Ecorubber-1 SKF Ecotal[1] SKF Ecotal[1] SKF Ecomid SKF Ecorubber-1 SKF Ecotal[1] SKF Ecotal[1] SKF Ecorubber-1 SKF Ecotal[1] SKF Ecotal[1]
	S35-P	**Hydraulic, double-acting** Space saving compact rod seal. Design optimized for ECOPUR materials. Also commonly used as O-ring replacement to prevent twisting of the seal.	–30 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	0,4 0,4 0,4 0,4 0,4 0,4	400 400 400 400 400 400	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR		

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range

Wiper seals

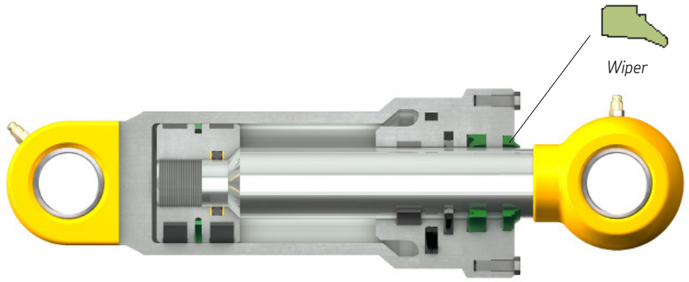
Introduction

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 system.



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

Single-acting hydraulic wiper seal A01-A made of SKF Ecorubber-1

Single-acting hydraulic wiper seal with mounting cage A03-A made of ECOPUR and SKF Ecotal

Double-acting hydraulic wiper seal with additional sealing lip A12-B made of H-ECOPUR

Double-acting wiper A27-F with o-ring as energizer made of SKF Ecoflon 3 and NBR 70

Wiper seal selection guide

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.

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.

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.

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.

Housings according to ISO 6185

Type A | Type B | Type C | Type D

Special design variations

No standard for housings, but still commonly used

Type A

With back support

A01-A

A01-B

Type B

With back support

A03-A

A04-A

A04-B

Type C

A02-I

A05-I

A11-I

Type D

A25-F

Special design variations

Heavy contamination

A02-A

A02-B

A11-A

Heavy contamination

A12-A

A12-B

Special ANSI housings for angled housings

A10-A

A02-B

O-Ring loaded

A26-F

A07-A

O-Ring loaded

A27-F

Single lip

A08-A
A08-B

A05-A

A05-B

Scraper

A13-A

Rod seal

S21-P

Linear moving | Rotating | Oscillating | Spiral moving | Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Material
			°C		m/s	–
	A01-A	**Hydraulic, single-acting** Single-acting snap-in wiper seal providing a technical accurate closure at the cylinder. With a supporting heel to prevent tilting of the wiper, vents on the inside diameter of the heel prevent the wiper trapping pressure. Designed for housings according to ISO 6195-Type A.	–30	+110	4	ECOPUR
			–35	+110	4	ECOPUR LD
			–30	+110	4	G-ECOPUR
			–20	+110	4	H-ECOPUR
			–20	+110	4	S-ECOPUR
			–50	+100	4	T-ECOPUR
			–30	+115	4	X-ECOPUR
			–30	+110	4	G-ECOPUR 54D
			–20	+115	4	X-ECOPUR H
			–20	+115	4	X-ECOPUR S
			–30	+100	4	SKF Ecorubber-1
			–25	+150	4	SKF Ecorubber-H
			–20	+200	4	SKF Ecorubber-2
			–50	+150	4	SKF Ecorubber-3[1)]
			–10	+200	4	SKF Ecoflas
	A01-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	+110	4	ECOPUR
			–35	+110	4	ECOPUR LD
			–30	+110	4	G-ECOPUR
			–20	+110	4	H-ECOPUR
			–20	+110	4	S-ECOPUR
			–50	+100	4	T-ECOPUR
			–30	+115	4	X-ECOPUR
			–30	+110	4	G-ECOPUR 54D
			–20	+115	4	X-ECOPUR H
			–20	+115	4	X-ECOPUR S
			–30	+100	4	SKF Ecorubber-1
			–25	+150	4	SKF Ecorubber-H
			–20	+200	4	SKF Ecorubber-2
			–50	+150	4	SKF Ecorubber-3[1)]
			–10	+200	4	SKF Ecoflas
	A02-A	**Hydraulic, single-acting** Single-acting snap-in wiper seal for housings with a larger step groove for more stable retention of the wiper seal. With a supporting heel to prevent tilting of the wiper, vents on the inside diameter of the heel prevent the wiper trapping pressure.	–30	+110	4	ECOPUR
			–35	+110	4	ECOPUR LD
			–30	+110	4	G-ECOPUR
			–20	+110	4	H-ECOPUR
			–20	+110	4	S-ECOPUR
			–50	+100	4	T-ECOPUR
			–30	+115	4	X-ECOPUR
			–30	+110	4	G-ECOPUR 54D
			–20	+115	4	X-ECOPUR H
			–20	+115	4	X-ECOPUR S
			–30	+100	4	SKF Ecorubber-1
			–25	+150	4	SKF Ecorubber-H
			–20	+200	4	SKF Ecorubber-2
			–50	+150	4	SKF Ecorubber-3[1)]
			–10	+200	4	SKF Ecoflas
	A02-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	+110	4	ECOPUR
			–35	+110	4	ECOPUR LD
			–30	+110	4	G-ECOPUR
			–20	+110	4	H-ECOPUR
			–20	+110	4	S-ECOPUR
			–50	+100	4	T-ECOPUR
			–30	+115	4	X-ECOPUR
			–30	+110	4	G-ECOPUR 54D
			–20	+115	4	X-ECOPUR H
			–20	+115	4	X-ECOPUR S
			–30	+100	4	SKF Ecorubber-1
			–25	+150	4	SKF Ecorubber-H
			–20	+200	4	SKF Ecorubber-2
			–50	+150	4	SKF Ecorubber-3[1)]
			–10	+200	4	SKF Ecoflas

[1)] Not suitable for mineral oils

Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Material	Seal	Casing
			°C		m/s	–		
	A03_I	**Hydraulic, single-acting** Single-acting snap-in wiper seal for housings with a larger step groove for more stable retention of the wiper seal. Designed for housings according to ISO 6195-Type C.	–30	+110	4	ECOPUR		
			–20	+110	4	H-ECOPUR		
			–20	+110	4	S-ECOPUR		
			–50	+100	4	T-ECOPUR		
			–30	+115	4	X-ECOPUR		
			–20	+115	4	X-ECOPUR H		
			–20	+115	4	X-ECOPUR S		
			–30	+100	4	SKF Ecorubber-1		
			–25	+150	4	SKF Ecorubber-H		
			–20	+200	4	SKF Ecorubber-2		
			–50	+150	4	SKF Ecorubber-3[2]		
			–10	+200	4	SKF Ecoflas		
	A03_A	**Hydraulic, 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	+80	4	ECOPUR	SKF Ecotal[1]	
			–20	+80	4	H-ECOPUR	SKF Ecotal[1]	
			–20	+80	4	S-ECOPUR	SKF Ecotal[1]	
			–50	+80	4	T-ECOPUR	SKF Ecotal[1]	
			–30	+80	4	X-ECOPUR	SKF Ecotal[1]	
			–20	+80	4	X-ECOPUR H	SKF Ecotal[1]	
			–20	+80	4	X-ECOPUR S	SKF Ecotal[1]	
			–20	+80	4	X-ECOPUR S	SKF Ecomid	
			–30	+80	4	SKF Ecorubber-1	SKF Ecotal[1]	
			–25	+80	4	SKF Ecorubber-H	SKF Ecotal[1]	
			–25	+150	4	SKF Ecorubber-H	SKF Ecopaek	
			–20	+200	4	SKF Ecorubber-2	SKF Ecopaek	
			–50	+150	4	SKF Ecorubber-3[2]	SKF Ecopaek	
			–10	+200	4	SKF Ecoflas	SKF Ecopaek	
	A04_A	**Pneumatic, single-acting** Single-acting snap-in wiper seal providing a technical accurate closure at the cylinder. With a supporting heel to prevent tilting of the wiper, vents on the inside diameter of the heel prevent the wiper trapping pressure. Designed for housings according to ISO 6195-Type A.	–30	+110	4	ECOPUR		
			–35	+110	4	ECOPUR LD		
			–30	+110	4	G-ECOPUR		
			–20	+110	4	H-ECOPUR		
			–20	+110	4	S-ECOPUR		
			–50	+100	4	T-ECOPUR		
			–30	+115	4	X-ECOPUR		
			–30	+110	4	G-ECOPUR 54D		
			–20	+115	4	X-ECOPUR H		
			–20	+115	4	X-ECOPUR S		
			–30	+100	4	SKF Ecorubber-1		
			–25	+150	4	SKF Ecorubber-H		
			–20	+200	4	SKF Ecorubber-2		
			–50	+150	4	SKF Ecorubber-3[2]		
			–10	+200	4	SKF Ecoflas		
	A04_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	+110	4	ECOPUR		
			–35	+110	4	ECOPUR LD		
			–30	+110	4	G-ECOPUR		
			–20	+110	4	H-ECOPUR		
			–20	+110	4	S-ECOPUR		
			–50	+100	4	T-ECOPUR		
			–30	+115	4	X-ECOPUR		
			–30	+110	4	G-ECOPUR 54D		
			–20	+115	4	X-ECOPUR H		
			–20	+115	4	X-ECOPUR S		
			–30	+100	4	SKF Ecorubber-1		
			–25	+150	4	SKF Ecorubber-H		
			–20	+200	4	SKF Ecorubber-2		
			–50	+150	4	SKF Ecorubber-3[2]		
			–10	+200	4	SKF Ecoflas		

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils

Linear moving · Rotating · Oscillating · Spiral moving · Static

Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Material	Seal	Casing
			°C		m/s	–		
	A05_A	**Pneumatic, single-acting** Single-acting snap-in wiper seal for housings with a larger step groove for more stable retention of the wiper seal. With a supporting heel to prevent tilting of the wiper, vents on the inside diameter of the heel prevent the wiper trapping pressure.	–30	+110	4	ECOPUR		
			–35	+110	4	ECOPUR LD		
			–30	+110	4	G-ECOPUR		
			–20	+110	4	H-ECOPUR		
			–20	+110	4	S-ECOPUR		
			–50	+100	4	T-ECOPUR		
			–30	+115	4	X-ECOPUR		
			–30	+110	4	G-ECOPUR 54D		
			–20	+115	4	X-ECOPUR H		
			–20	+115	4	X-ECOPUR S		
			–30	+100	4	SKF Ecorubber-1		
			–25	+150	4	SKF Ecorubber-H		
			–20	+200	4	SKF Ecorubber-2		
			–50	+150	4	SKF Ecorubber-3[2]		
			–10	+200	4	SKF Ecoflas		
	A05_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	+110	4	ECOPUR		
			–20	+110	4	H-ECOPUR		
			–20	+110	4	S-ECOPUR		
			–50	+100	4	T-ECOPUR		
			–30	+115	4	X-ECOPUR		
			–20	+115	4	X-ECOPUR H		
			–20	+115	4	X-ECOPUR S		
			–30	+100	4	SKF Ecorubber-1		
			–25	+150	4	SKF Ecorubber-H		
			–20	+200	4	SKF Ecorubber-2		
			–50	+150	4	SKF Ecorubber-3[2]		
			–10	+200	4	SKF Ecoflas		
	A05_I	**Pneumatic, single-acting** Single-acting snap-in wiper seal for housings with a larger step groove for more stable retention of the wiper seal. Designed for housings according to ISO 6195-Type C.	–30	+110	4	ECOPUR		
			–20	+110	4	H-ECOPUR		
			–20	+110	4	S-ECOPUR		
			–50	+100	4	T-ECOPUR		
			–30	+115	4	X-ECOPUR		
			–20	+115	4	X-ECOPUR H		
			–20	+115	4	X-ECOPUR S		
			–30	+100	4	SKF Ecorubber-1		
			–25	+150	4	SKF Ecorubber-H		
			–20	+200	4	SKF Ecorubber-2		
			–50	+150	4	SKF Ecorubber-3[2]		
			–10	+200	4	SKF Ecoflas		
	A04_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	+80	4	ECOPUR	SKF Ecotal[1]	
			–20	+80	4	H-ECOPUR	SKF Ecotal[1]	
			–20	+80	4	S-ECOPUR	SKF Ecotal[1]	
			–50	+80	4	T-ECOPUR	SKF Ecotal[1]	
			–30	+80	4	X-ECOPUR	SKF Ecotal[1]	
			–20	+80	4	X-ECOPUR H	SKF Ecotal[1]	
			–20	+80	4	X-ECOPUR S	SKF Ecotal[1]	
			–30	+80	4	SKF Ecorubber-1	SKF Ecotal[1]	
			–25	+80	4	SKF Ecorubber-H	SKF Ecotal[1]	
			–25	+150	4	SKF Ecorubber-H	SKF Ecopaek	
			–20	+200	4	SKF Ecorubber-2	SKF Ecopaek	
			–50	+150	4	SKF Ecorubber-3[2]	SKF Ecopaek	
			–10	+200	4	SKF Ecoflas	SKF Ecopaek	

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils

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

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Material
			°C		m/s	–
	A07-A	**Hydraulic, single-acting** Single-acting snap-in wiper seal to fit in special angled housings (30° angle).	–30	+110	4	ECOPUR
			–20	+110	4	H-ECOPUR
			–20	+110	4	S-ECOPUR
			–50	+100	4	T-ECOPUR
			–30	+115	4	X-ECOPUR
			–20	+115	4	X-ECOPUR H
			–20	+115	4	X-ECOPUR S
			–30	+100	4	SKF Ecorubber-1
			–25	+150	4	SKF Ecorubber-H
			–20	+200	4	SKF Ecorubber-2
			–50	+150	4	SKF Ecorubber-3[1]
			–10	+200	4	SKF Ecoflas
	A08-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. A08-A with chamfer on the inside edge.	–30	+110	4	ECOPUR
			–35	+110	4	ECOPUR LD
			–30	+110	4	G-ECOPUR
			–20	+110	4	H-ECOPUR
			–20	+110	4	S-ECOPUR
			–50	+100	4	T-ECOPUR
			–30	+115	4	X-ECOPUR
			–30	+110	4	G-ECOPUR 54D
			–20	+115	4	X-ECOPUR H
			–20	+115	4	X-ECOPUR S
			–30	+100	4	SKF Ecorubber-1
			–25	+150	4	SKF Ecorubber-H
			–20	+200	4	SKF Ecorubber-2
			–50	+150	4	SKF Ecorubber-3[1]
			–10	+200	4	SKF Ecoflas
	A08-B	**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. A08-B with radius on the inside edge.	–30	+110	4	ECOPUR
			–35	+110	4	ECOPUR LD
			–30	+110	4	G-ECOPUR
			–20	+110	4	H-ECOPUR
			–20	+110	4	S-ECOPUR
			–50	+100	4	T-ECOPUR
			–30	+115	4	X-ECOPUR
			–30	+110	4	G-ECOPUR 54D
			–20	+115	4	X-ECOPUR H
			–20	+115	4	X-ECOPUR S
			–30	+100	4	SKF Ecorubber-1
			–25	+150	4	SKF Ecorubber-H
			–20	+200	4	SKF Ecorubber-2
			–50	+150	4	SKF Ecorubber-3[1]
			–10	+200	4	SKF Ecoflas
	A09-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	+110	4	ECOPUR
			–20	+110	4	H-ECOPUR
			–20	+110	4	S-ECOPUR
			–50	+100	4	T-ECOPUR
			–30	+115	4	X-ECOPUR
			–20	+115	4	X-ECOPUR H
			–20	+115	4	X-ECOPUR S
			–30	+100	4	SKF Ecorubber-1
			–25	+150	4	SKF Ecorubber-H
			–20	+200	4	SKF Ecorubber-2
			–50	+150	4	SKF Ecorubber-3[1]
			–10	+200	4	SKF Ecoflas

[1] Not suitable for mineral oils

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	–
	A10-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	+110	4	–	ECOPUR
			–20	+110	4	–	H-ECOPUR
			–20	+110	4	–	S-ECOPUR
			–50	+100	4	–	T-ECOPUR
			–30	+115	4	–	X-ECOPUR
			–20	+115	4	–	X-ECOPUR H
			–20	+115	4	–	X-ECOPUR S
			–30	+100	4	–	SKF Ecorubber-1
			–25	+150	4	–	SKF Ecorubber-H
			–20	+200	4	–	SKF Ecorubber-2
			–50	+150	4	–	SKF Ecorubber-3[1]
			–10	+200	4	–	SKF Ecoflas
	A11-A	**Hydraulic/pneumatic, double-acting** Double-acting snap-in wiper seal for housings with a larger step groove for more stable retention of the wiper seal. The inside wiping lip reduces the residual oil film.	–30	+110	4	16	ECOPUR
			–35	+110	4	16	ECOPUR LD
			–30	+110	4	16	G-ECOPUR
			–20	+110	4	16	H-ECOPUR
			–20	+110	4	16	S-ECOPUR
			–50	+100	4	16	T-ECOPUR
			–30	+100	4	16	SKF Ecorubber-1
			–25	+150	4	16	SKF Ecorubber-H
			–20	+200	4	16	SKF Ecorubber-2
			–50	+150	4	16	SKF Ecorubber-3[1]
			–10	+200	4	16	SKF Ecoflas
	A11-I	**Hydraulic/pneumatic, double-acting** As profile A11-A, special housing design according ISO 6195-Type C	–30	+110	4	16	ECOPUR
			–20	+110	4	16	H-ECOPUR
			–20	+110	4	16	S-ECOPUR
			–50	+100	4	16	T-ECOPUR
			–30	+100	4	16	SKF Ecorubber-1
			–25	+150	4	16	SKF Ecorubber-H
			–20	+200	4	16	SKF Ecorubber-2
			–50	+150	4	16	SKF Ecorubber-3[1]
			–10	+200	4	16	SKF Ecoflas
	A12-A	**Hydraulic, single-acting** Single-acting snap-in wiper seal with an additional sealing lip on the housing face to prevent against heavy contamination. With a supporting heel to prevent tilting of the wiper, vents on the inside diameter of the heel prevent the wiper trapping pressure.	–30	+110	4	–	ECOPUR
			–35	+110	4	–	ECOPUR LD
			–30	+110	4	–	G-ECOPUR
			–20	+110	4	–	H-ECOPUR
			–20	+110	4	–	S-ECOPUR
			–50	+100	4	–	T-ECOPUR
			–30	+115	4	–	X-ECOPUR
			–30	+110	4	–	G-ECOPUR 54D
			–20	+115	4	–	X-ECOPUR H
			–20	+115	4	–	X-ECOPUR S
	A12-B	**Hydraulic, double-acting** Double-acting snap-in wiper seal with an additional sealing lip on the housing face to prevent against heavy contamination. The inside wiping lip reduces the residual oil film.	–30	+110	4	16	ECOPUR
			–35	+110	4	16	ECOPUR LD
			–30	+110	4	16	G-ECOPUR
			–20	+110	4	16	H-ECOPUR
			–20	+110	4	16	S-ECOPUR
			–50	+100	4	16	T-ECOPUR

[1] Not suitable for mineral oils

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	–	
	A13-A	**Hydraulic/pneumatic, single-acting**						
		Special scraper ring to wipe off firmly clinging dirt and extremely heavy contamination (mud, tar, ice). Mainly used in combination with an elastomeric wiper, which should be protected.	–70	+115	1	–	X-ECOPUR	
			–70	+115	1	–	X-ECOPUR H	
			–70	+115	1	–	X-ECOPUR S	
			–50	+80	1	–	SKF Ecotal[1)]	
			–100	+260	1	–	SKF Ecopaek	
			–200	+90	1	–	SKF Ecowear 1000	
	A25-F	**Hydraulic/pneumatic, single-acting**					**Seal**	**Energizer**
		Single-acting O-ring loaded snap-in wiper seal designed for SKF Ecoflon materials 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. Use X-ECOPUR materials for increased wear resistance and improved installation behaviour. Designed for housings according to ISO 6195-Type D	–30	+100	5	–	X-ECOPUR	NBR 70
			–20	+100	5	–	X-ECOPUR H	NBR 70
			–20	+100	5	–	X-ECOPUR S	NBR 70
			–20	+200	10	–	SKF Ecoflon 2,3,4	FPM 75
			–30	+100	10	–	SKF Ecoflon 2,3,4	NBR 70
			–55	+90	10	–	SKF Ecowear 1000	MVQ 70
			–30	+90	10	–	SKF Ecowear 1000	NBR 70
	A26-F	**Hydraulic/pneumatic, double-acting**					**Seal**	**Energizers**
		Double-acting O-ring loaded snap-in wiper seal designed for SKF Ecoflon materials 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. Use X-ECOPUR materials for increased wear resistance and improved installation behaviour.	–30	+100	5	16	G-ECOPUR 54D	NBR 70
			–30	+100	5	16	X-ECOPUR	NBR 70
			–20	+100	5	16	X-ECOPUR H	NBR 70
			–20	+100	5	16	X-ECOPUR S	NBR 70
			–20	+200	10	16	SKF Ecoflon 2,3,4	FPM 75
			–30	+100	10	16	SKF Ecoflon 2,3,4	NBR 70
			–55	+90	10	16	SKF Ecowear 1000	MVQ 70
			–30	+90	10	16	SKF Ecowear 1000	NBR 70
	A27-F	**Hydraulic/pneumatic, double-acting**					**Seal**	**Energizer**
		Double-acting O-ring loaded snap-in wiper seal designed for SKF Ecoflon materials 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. Use X-ECOPUR materials for increased wear resistance and improved installation behaviour.	–30	+100	5	16	G-ECOPUR 54D	NBR 70
			–30	+100	5	16	X-ECOPUR	NBR 70
			–20	+100	5	16	X-ECOPUR H	NBR 70
			–20	+100	5	16	X-ECOPUR S	NBR 70
			–20	+200	10	16	SKF Ecoflon 2,3,4	FPM 75
			–30	+100	10	16	SKF Ecoflon 2,3,4	NBR 70
			–55	+90	10	16	SKF Ecowear 1000	MVQ 70
			–30	+90	10	16	SKF Ecowear 1000	NBR 70

[1)] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range

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.

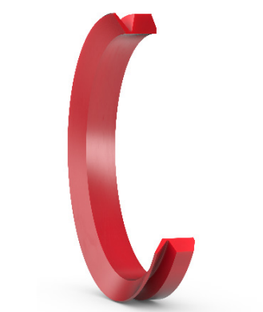
Some radial shaft seal designs have an auxiliary lip that protects the primary sealing lip from dust and other contaminants. A suitable lubricant in the space between the primary sealing lip and the auxiliary lip can reduce wear and delay corrosion. Contaminants that have passed the auxiliary lip will 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 SEAL JET system.

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

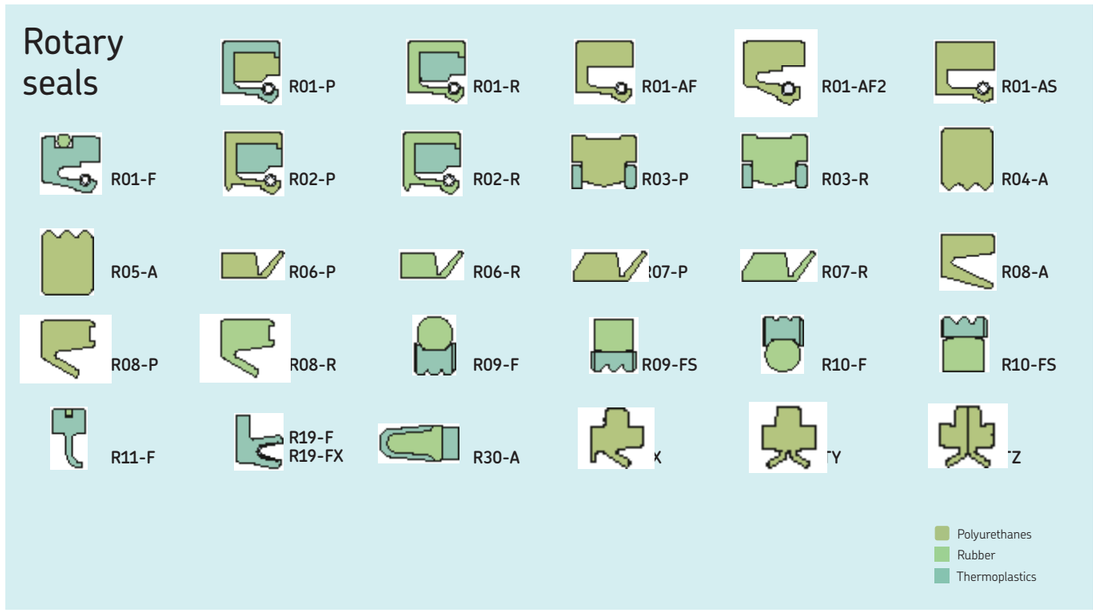
Single-acting rotary shaft seal R01-AF2 made of SKF Ecorubber-2

Single-acting rotary shaft seal R02-R with additional sealing lip and retainer ring made of SKF Ecorubber-2 and SKF Ecotal

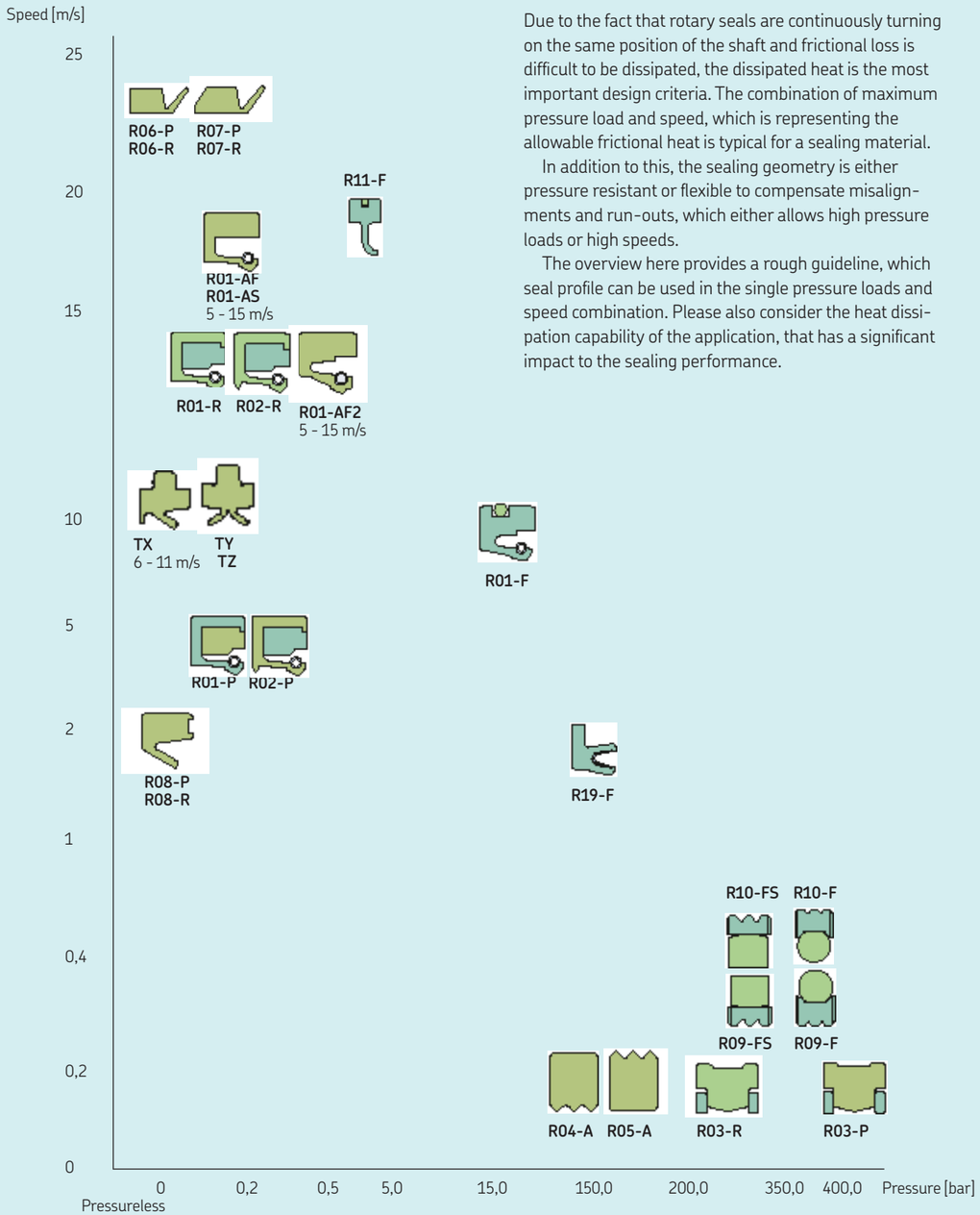


Axially acting rotary seal (V-ring) R07-P made of H-ECOPUR

Double-acting energizer loaded rotary seal R09-F made of SKF Ecoflon 4 and SKF Ecorubber-2



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

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max	Pressure max.	Material		
			°C		*m/s*	bar	–		
	R01-P	**Single-acting rotary shaft seal**					**Seal**	**Retainer ring**	**Spring**
		Single-acting spring loaded rotary lip seal with a retainer ring for press-fit installation into axially open housings. Design optimized for ECOPUR materials for increased wear resistance. Mainly used for low friction applications as a protecting element for bearings.	+0	+80	5[3]	0,2	ECOPUR	SKF Ecotal[1]	1.4310[4]
			+0	+80	5[3]	0,2	ECOPUR LD	SKF Ecomid	1.4310[4]
			+0	+80	5[3]	0,2	G-ECOPUR	SKF Ecomid	1.4310[4]
			+0	+80	5[3]	0,2	H-ECOPUR	SKF Ecotal[1]	1.4310[4]
			+0	+80	5[3]	0,2	S-ECOPUR	SKF Ecotal[1]	1.4310[4]
	R01-R	**Single-acting rotary shaft seal**					**Seal**	**Retainer ring**	**Spring**
		Single-acting spring loaded rotary lip seal with a retainer ring for press-fit installation into axially open housings. Design optimized for SKF Ecorubber materials with increased chemical and thermal resistance. Higher temperatures require metal clamping rings. Mainly used for low friction applications as a protecting element for bearings.	+0	+80	10[3]	0,2	SKF Ecorubber-1	SKF Ecotal[1]	1.4310[4]
			+0	+80	10[3]	0,2	SKF Ecorubber-H	SKF Ecotal[1]	1.4310[4]
			–20	+200	15[3]	0,2	SKF Ecorubber-2	Metal	1.4310[4]
			+0	+80	10[3]	0,2	SKF Ecorubber-3[2]	SKF Ecotal[1]	1.4310[4]
			–50	+150	10[3]	0,2	SKF Ecorubber-3[2]	Metal	1.4310[4]
			–10	+200	10[3]	0,2	SKF Ecoflas	Metal	1.4310[4]
			+0	+80	5[3]	0,2	SKF Ecosil	SKF Ecotal[1]	1.4310[4]
			–60	+200	5[3]	0,2	SKF Ecosil	Metal	1.4310[4]
	R01-AF	**Single-acting rotary shaft seal**							
		Single-acting spring loaded rotary lip seal for axially open housings with clamping rings. Mainly used for low friction applications as a protecting element for bearings.	–30	+110	5[3]	0,2	ECOPUR		
			–35	+110	5[3]	0,2	ECOPUR LD		
			–30	+110	5[3]	0,2	G-ECOPUR		
			–20	+110	5[3]	0,2	H-ECOPUR		
			–20	+110	5[3]	0,2	S-ECOPUR		
			–50	+100	5[3]	0,2	T-ECOPUR		
			–30	+100	10[3]	0,2	SKF Ecorubber-1		
			–25	+150	10[3]	0,2	SKF Ecorubber-H		
			–20	+200	15[3]	0,2	SKF Ecorubber-2		
			–50	+150	10[3]	0,2	SKF Ecorubber-3[2]		
			–10	+200	10[3]	0,2	SKF Ecoflas		
			–60	+200	5[3]	0,2	SKF Ecosil		
		Single-acting rotary shaft seal							
		Similar to R01-AF, but more robust design compared to R01-AF providing increased pressure resistance but also higher contact force.	–30	110	5	0,5	ECOPUR		
			–35	110	5	0,5	ECOPUR LD		
			–30	110	5	0,5	G–ECOPUR		
			–20	110	5	0,5	H–ECOPUR		
			–20	110	5	0,5	S–ECOPUR		
			–50	100	5	0,5	T–ECOPUR		
			–30	100	10	0,5	SKF Ecorubber–1		
			–25	150	10	0,5	SKF Ecorubber–H		
			–20	200	15	0,5	SKF Ecorubber–2		
			–50	150	10	0,5	SKF Ecorubber–3[2]		
			–10	200	10	0,5	SKF Ecoflas		
			–60	200	5	0,2	SKF Ecosil		
	R01-AS	**Single-acting rotary shaft seal**							
		Single-acting spring loaded rotary lip seal for axially open housings with clamping rings. Mainly used for low friction applications as a protecting element for bearings. Split version for repair purposes.	–30	+110	5[3]	0,2	ECOPUR		
			–35	+110	5[3]	0,2	ECOPUR LD		
			–30	+110	5[3]	0,2	G-ECOPUR		
			–20	+110	5[3]	0,2	H-ECOPUR		
			–20	+110	5[3]	0,2	S-ECOPUR		
			–50	+100	5[3]	0,2	T-ECOPUR		
			–30	+100	10[3]	0,2	SKF Ecorubber-1		
			–25	+150	10[3]	0,2	SKF Ecorubber-H		
			–20	+200	15[3]	0,2	SKF Ecorubber-2		
			–50	+150	10[3]	0,2	SKF Ecorubber-3[2]		
			–10	+200	10[3]	0,2	SKF Ecoflas		
			–60	+200	5[3]	0,2	SKF Ecosil		

[1] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
[2] Not suitable for mineral oils
[3] Surface speed limit values are depending on heat dissipation ability of the sealing system (shaft diameter, lubrication, ...)
[4] Spring metal material specification

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	R01-F	**Single-acting rotary shaft seal** Single-acting spring loaded rotary lip seal for axially open housings with clamping rings. An O-ring is used for static sealing in the housing. Design optimized for SKF Ecoflon materials for increased pressure resistance and higher speeds. Allowable pressure and speed depend on each other, it is not recommended to use maximum values simultaneously.					**Seal**	**Energizer**	**Spring**
			–20	+200	10[3]	15	SKF Ecoflon 4	FPM 75	1.4310[4]
			–30	+100	10[3]	15	SKF Ecoflon 4	NBR 70	1.4310[4]
	R02-P	**Single-acting rotary shaft seal** As profile R01-P, but with additional dust lip to avoid ingress of dust and dirt.					**Seal**	**Retainer ring**	**Spring**
			+0	+80	5[3]	0,2	ECOPUR	SKF Ecotal[1]	1.4310[4]
			+0	+80	5[3]	0,2	ECOPUR LD	SKF Ecomid	1.4310[4]
			+0	+80	5[3]	0,2	G-ECOPUR	SKF Ecomid	1.4310[4]
			+0	+80	5[3]	0,2	H-ECOPUR	SKF Ecotal[1]	1.4310[4]
			+0	+80	5[3]	0,2	S-ECOPUR	SKF Ecotal[1]	1.4310[4]
	R02-R	**Single-acting rotary shaft seal** As profile R01-R, but with additional dust lip to avoid ingress of dust and dirt.					**Seal**	**Retainer ring**	**Spring**
			+0	+80	10[3]	0,2	SKF Ecorubber-1	SKF Ecotal[1]	1.4310[4]
			+0	+80	10[3]	0,2	SKF Ecorubber-H	SKF Ecotal[1]	1.4310[4]
			–20	+200	15[3]	0,2	SKF Ecorubber-2	Metal	1.4310[4]
			+0	+80	10[3]	0,2	SKF Ecorubber-3[2]	SKF Ecotal[1]	1.4310[4]
			–50	+150	10[3]	0,2	SKF Ecorubber-3[2]	Metal	1.4310[4]
			–10	+200	10[3]	0,2	SKF Ecoflas	Metal	1.4310[4]
			+0	+80	5[3]	0,2	SKF Ecosil	SKF Ecotal[1]	1.4310[4]
			–60	+200	5[3]	0,2	SKF Ecosil	Metal	1.4310[4]
	R03-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 materials for increased wear resistance. Mainly used in rotary joints (mobile hydraulic) to separate different fluid channels.					**Seal**	**Back-up rings**	
			–30	+100	0,2	400	ECOPUR	SKF Ecotal[1]	
			–20	+100	0,2	400	H-ECOPUR	SKF Ecotal[1]	
			–20	+100	0,2	400	S-ECOPUR	SKF Ecotal[1]	
			–40	+100	0,2	400	T-ECOPUR	SKF Ecotal[1]	
	R03-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 Ecorubber materials with increased chemical and thermal resistance. Mainly used in rotary joints (mobile hydraulic) to separate different fluid channels.					**Seal**	**Back-up rings**	
			–30	+100	0,2	250	SKF Ecorubber-1	SKF Ecotal[1]	
			–25	+100	0,2	250	SKF Ecorubber-H	SKF Ecotal[1]	
			–20	+200	0,2	250	SKF Ecorubber-2	SKF Ecoflon 2	
			–50	+150	0,2	250	SKF Ecorubber-3[2]	SKF Ecoflon 2	
			–40	+100	0,2	250	SKF Ecorubber-3[2]	SKF Ecotal[1]	
			–10	+200	0,2	250	SKF Ecoflas	SKF Ecopaek	
	R04-A	**Double-acting rotary seal** Symmetric rotary compact swivel seal. Mainly used in rotary joints (mobile hydraulic) to separate different fluid channels. Dynamic sealing surface on inside diameter.							
			–30	+110	0,2	160	ECOPUR		
			–20	+110	0,2	160	H-ECOPUR		
			–20	+110	0,2	160	S-ECOPUR		
			–50	+100	0,2	160	T-ECOPUR		
			–30	+100	0,2	100	SKF Ecorubber-1		
			–25	+150	0,2	100	SKF Ecorubber-H		
			–20	+200	0,2	100	SKF Ecorubber-2		
			–50	+150	0,2	100	SKF Ecorubber-3[2]		
			–10	+200	0,2	100	SKF Ecoflas		

1) Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
2) Not suitable for mineral oils
3) Surface speed limit values are depending on heat dissipation ability of the sealing system (shaft diameter, lubrication, ...)
4) Spring metal material specification

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material
			°C		m/s	bar	–
	R05-A	**Double-acting rotary seal** Symmetric rotary compact swivel seal. Mainly used in rotary joints (mobile hydraulic) to separate different fluid channels. Dynamic sealing surface on outside diameter.					
			–30	+110	0,2	160	ECOPUR
			–20	+110	0,2	160	H-ECOPUR
			–20	+110	0,2	160	S-ECOPUR
			–50	+100	0,2	160	T-ECOPUR
			–30	+100	0,2	100	SKF Ecorubber-1
			–25	+150	0,2	100	SKF Ecorubber-H
			–20	+200	0,2	100	SKF Ecorubber-2
			–50	+150	0,2	100	SKF Ecorubber-3[2]
			–10	+200	0,2	100	SKF Ecoflas
	R06-P	**Axially acting rotary seal** Axially acting rotary lip seal installed by interference fit on the shaft. Design optimized for ECOPUR 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	+110	25[1]	–	ECOPUR
			–35	+110	25[1]	–	ECOPUR LD
			–30	+110	25[1]	–	G-ECOPUR
			–20	+110	25[1]	–	H-ECOPUR
			–20	+110	25[1]	–	S-ECOPUR
			–50	+100	25[1]	–	T-ECOPUR
	R06-R	**Axially acting rotary seal** As profile R06-P, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.					
			–30	+100	25[1]	–	SKF Ecorubber-1
			–25	+150	25[1]	–	SKF Ecorubber-H
			–20	+200	25[1]	–	SKF Ecorubber-2
			–50	+150	25[1]	–	SKF Ecorubber-3[2]
			–10	+200	25[1]	–	SKF Ecoflas
	R07-P	**Axially acting rotary seal** Axially acting rotary lip seal installed by interference fit on the shaft. Design optimized for ECOPUR 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	+110	25[1]	–	ECOPUR
			–35	+110	25[1]	–	ECOPUR LD
			–30	+110	25[1]	–	G-ECOPUR
			–20	+110	25[1]	–	H-ECOPUR
			–20	+110	25[1]	–	S-ECOPUR
			–50	+100	25[1]	–	T-ECOPUR
	R07-R	**Axially acting rotary seal** As profile R07-P, but design optimized for SKF Ecorubber materials with increased chemical and thermal resistance.					
			–30	+100	25[1]	–	SKF Ecorubber-1
			–25	+150	25[1]	–	SKF Ecorubber-H
			–20	+200	25[1]	–	SKF Ecorubber-2
			–50	+150	25[1]	–	SKF Ecorubber-3[2]
			–10	+200	25[1]	–	SKF Ecoflas
	R08-A	**Single-acting rotary seal** Single-acting spring-less rotary lip seal for axially open housings with clamping plate. 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.					
			–30	+110	–	–	ECOPUR
			–35	+110	–	–	ECOPUR LD
			–30	+110	–	–	G-ECOPUR
			–20	+110	–	–	H-ECOPUR
			–20	+110	–	–	S-ECOPUR
			–50	+100	–	–	T-ECOPUR
			–30	+100	–	–	SKF Ecorubber-1
			–25	+150	–	–	SKF Ecorubber-H
			–20	+200	–	–	SKF Ecorubber-2
			–50	+150	–	–	SKF Ecorubber-3[2]
			–10	+200	–	–	SKF Ecoflas
			–60	+200	–	–	SKF Ecosil

1) Surface speed limit values are valid for rotating applications
2) Not suitable for mineral oils

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material	
			°C		m/s	bar	–	
	R08-P	**Single-acting rotary seal** Single-acting spring-less rotary lip seal for axially open housings with clamping plate. Design optimized for ECOPUR materials for increased wear resistance. Mainly used for grease retention or contamination exclusion.	–30 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	2,5 2,5 2,5 2,5 2,5 2,5	– – – – – –	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	
	R08-R	**Single-acting rotary seal** Single-acting spring-less rotary lip seal for axially open housings with clamping plate. Design optimized for SKF Ecorubber materials for increased chemical and thermal resistance. Mainly used for grease retention or contamination exclusion.	–30 –25 –20 –50 –10 –60	+100 +150 +200 +150 +200 +200	2,5 5 7,5 5 7,5 –	– – – – – –	SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[1] SKF Ecoflas SKF Ecosil	
	R09-F	**Double-acting rotary seal** O-ring loaded symmetric slide ring rotary swivel seal. Design optimized for SKF Ecoflon materials 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 Ecoflon 4 SKF Ecoflon 4	**Energizer** NBR 70 FPM 75
	R09-FS	**Double-acting rotary seal** As profile R09-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 Ecoflon 4 SKF Ecoflon 4	**Energizer** SKF Ecorubber-1 SKF Ecorubber-2
	R10-F	**Double-acting rotary seal** O-ring loaded symmetric slide ring rotary swivel seal. Design optimized for SKF Ecoflon materials 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 Ecoflon 4 SKF Ecoflon 4	**Energizer** NBR 70 FPM 75
	R10-FS	**Double-acting rotary seal** As profile R10-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 Ecoflon 4 SKF Ecoflon 4	**Energizer** SKF Ecorubber-1 SKF Ecorubber-2

[1] Not suitable for mineral oils

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material		
			°C		m/s	bar	–		
	R11-F	**Single-acting PTFE rotary seal** Single-acting spring-less rotary PTFE-lip seal. Design requires SKF Ecoflon materials, because the contact force is created by the memory effect, which tries to set back the bended sealing lip. Allowable pressure and speed depend on each other, it is not recommended to use maximum values simultaneously. For axially open housings with clamping plates. Static sealing either by an O-ring or an elastomeric washer required.	–200	+260	20	5	SKF Ecoflon 2,3,4		
	R19-F	**Single-acting PTFE rotary seal** Finger spring loaded rotary seal with integrated clamping flange on the back of the seal. Design optimized for SKF Ecoflon materials to reduce friction and stick-slip effects. Excellent chemical and thermal resistance.	–200	+260	2	150	**Seal** SKF Ecoflon 1,2,3,4	**Spring** 1.4310[1]
	R19-FX	**Singe-acting PTFE rotary seal** Similar profile to R19-F with modified spring groove to enable the use of standardized imperial sized springs of the series 100/200/300/400. Elgiloy springs available for extreme chemical resistance.	–200 –200	+260 +260	2 2	150 150	**Seal** SKF Ecoflon 1, 2, 3, 4 SKF Ecoflon 1, 2, 3, 4	**Spring** 1.4310[1] 2.4711[1]
	R20-A	**Valve stem seal with PTFE jacket** For low friction, rubber energizer automatically increases preload as it senses leakage.	–25 –25 –20 –20	+150 +100 +200 +100	0,5 0,5 0,5 0,5	1 000 500 1 000 500	**Seal** SKF Ecorubber-H SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-2	**Casing** SKF Ecoflon[2] SKF Ecoflon[2] SKF Ecoflon[2] SKF Ecoflon[2]	**Back-up ring** SKF Ecopaek SKF Ecotal[3] SKF Ecopaek SKF Ecotal[3]
	TX	**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 –20 –20 –30 –25	+110 +110 +110 +100 +150	6 6 6 11 11	– – – – –	ECOPUR H-ECOPUR S-ECOPUR SKF Ecorubber-1 SKF Ecorubber-H		

[1] Spring metal material specification
[2] For all types of SKF Ecoflon, refer to material properties on page 10
[3] Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range

Linear moving · Rotating · Oscillating · Spiral moving · Static

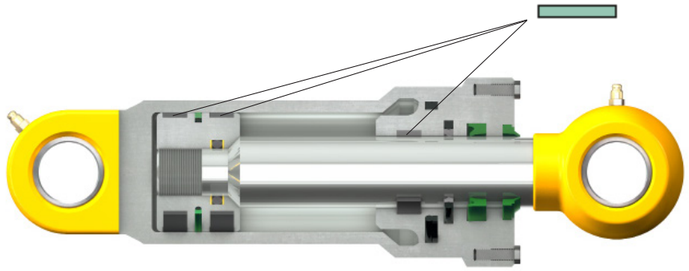
Grey symbols: contact SKF for application limitations

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Pressure max.	Material
			°C		m/s	bar	–
	TY	**SNL plummer block housing seal; double-acting** Double-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	+110	11	–	ECOPUR
			–20	+110	11	–	H-ECOPUR
			–20	+110	11	–	S-ECOPUR
			–30	+100	11	–	SKF-Ecorubber-1
			–25	+150	11	–	SKF Ecorubber-H
	TZ	**SNL plummer block housing seal; double-acting, split version** Double-acting SNL plummer block housing seal similar to the TY profile; 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	+110	11	–	ECOPUR
			–20	+110	11	–	H-ECOPUR
			–20	+110	11	–	S-ECOPUR
			–30	+100	11	–	SKF Ecorubber-1
			–25	+150	11	–	SKF Ecorubber-H

Guide rings

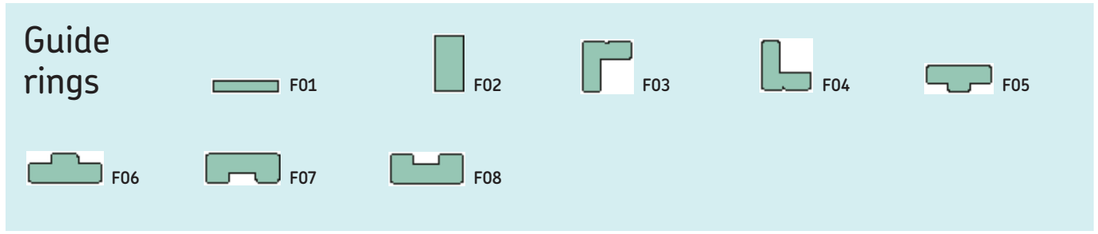
Introduction

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 F01 made of SKF Ecoflon 2



Guide rings

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

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Specific load[3] max.	Material
			°C		m/s	N/mm²	–
	F01	**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 –200 –50 –40 –40	+200 +200 +100 +110 +120	4 5 1 1 1	3 5 25 25 90	SKF Ecoflon 2 SKF Ecoflon 3 SKF Ecotal[1] SKF Ecomid[1] SKF Ecotex[2]
	F02	**Guide ring** For rod or piston application, split and non split design available. Not only used as guide ring, also as plain washer or spacer.	–200 –200 –50 –40	+200 +200 +100 +110	4 5 1 1	3 5 25 25	SKF Ecoflon 2 SKF Ecoflon 3 SKF Ecotal[1] SKF Ecomid[1]
	F03	**Guide ring** For piston application. Angled design combines guide ring and back-up ring functions and the grooves provide improved lubrication. Split and non split design available.	–200 –200 –50 –40	+200 +200 +100 +110	4 5 1 1	3 5 25 25	SKF Ecoflon 2 SKF Ecoflon 3 SKF Ecotal[1] SKF Ecomid[1]
	F04	**Guide ring** Same as profile F03 but for rod application.	–200 –200 –50 –40	+200 +200 +100 +110	4 5 1 1	3 5 25 25	SKF Ecoflon 2 SKF Ecoflon 3 SKF Ecotal[1] SKF Ecomid[1]
	F05	**Guide ring** With integrated collar on inside diameter, for piston application. Split and non split design available.	–200 –200 –50 –40	+200 +200 +100 +110	4 5 1 1	3 5 25 25	SKF Ecoflon 2 SKF Ecoflon 3 SKF Ecotal[1] SKF Ecomid[1]
	F06	**Guide ring** With integrated collar on outside diameter, for rod application. Split and non split design available.	–200 –200 –50 –40	+200 +200 +100 +110	4 5 1 1	3 5 25 25	SKF Ecoflon 2 SKF Ecoflon 3 SKF Ecotal[1] SKF Ecomid[1]

1) Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
2) Special fabric reinforced material, available as a guide tape only
3) Depending on temperature and allowable compression. Contact SKF for more information

Guide rings

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

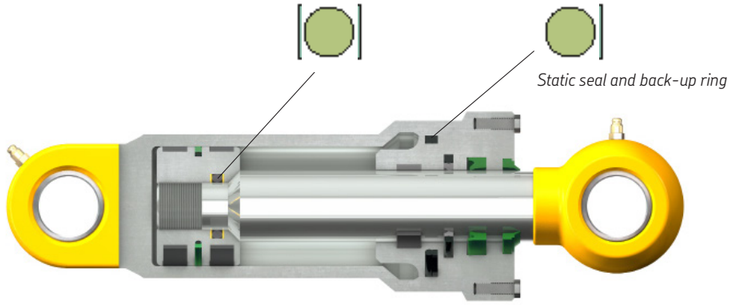
Appli-cation	Profile	Description	Temperature min.	Temperature max.	Speed max.	Specific load[2] max.	Material
			°C		m/s	N/mm²	–
	507	**Guide ring** With groove on inside diameter, for piston application. Split and non split design available.	–200 –200 –50 –40	+200 +200 +100 +110	4 5 1 1	3 5 25 25	SKF Ecoflon 2 SKF Ecoflon 3 SKF Ecotal[1] SKF Ecomid[1]
	508	**Guide ring** With groove on outside diameter, for rod application. Split and non split design available.	–200 –200 –50 –40	+200 +200 +100 +110	4 5 1 1	3 5 25 25	SKF Ecoflon 2 SKF Ecoflon 3 SKF Ecotal[1] SKF Ecomid[1]

1) Size limitation D: Up to 260 mm SKF Ecotal, from 260 - 400 mm SKF Ecotal or SKF Ecomid and above 400 mm SKF Ecomid; please refer to the seal data sheet regarding temperature range
2) Depending on temperature and allowable compression. Contact SKF for more information

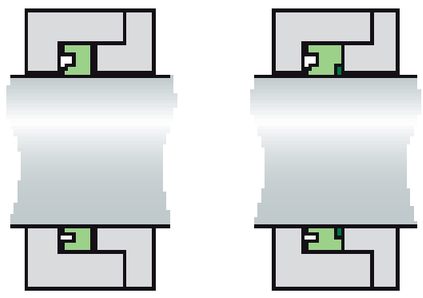
Back-up rings

Introduction

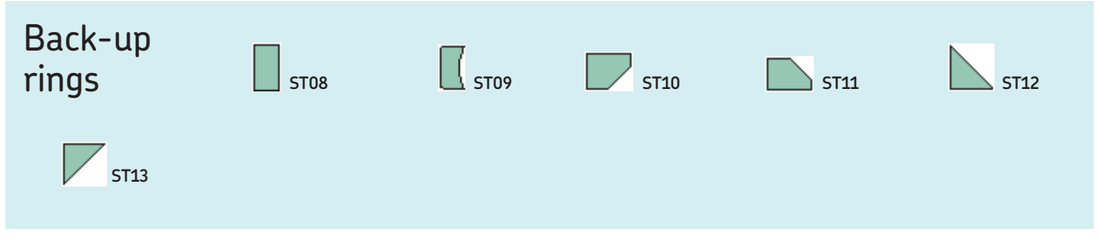
Back-up rings prevent gap extrusion of the seal or a static O-Ring. The standard machined hydraulic seals normally have active back-up rings, which allow the back-up ring to adjust on the dynamic counter surface to optimize the extrusion resistance.



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

Appli-cation	Profile	Description	Temperature min.	max.	Material
			°C		–
	ST08	**Back-up ring** Common inactive back-up ring, mainly used with O-rings to avoid gap extrusion. Split and non split design available.	–70 –70 –70 –70 –70 –70 –70 –70 –70 –70 –200 –200 –50 –40 –100	+110 +110 +110 +110 +110 +100 +115 +110 +115 +115 +200 +200 +100 +110 +260	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR X-ECOPUR G-ECOPUR 54D X-ECOPUR H X-ECOPUR S SKF Ecoflon 1 SKF Ecoflon 2 SKF Ecotal[1] SKF Ecomid[2] SKF Ecopaek
	ST09	**Back-up ring** Common inactive back-up ring especially for O-rings to avoid gap extrusion. Split and non split design available.	–70 –70 –70 –70 –70 –70 –70 –70 –70 –70 –200 –200 –50 –40 –100	+110 +110 +110 +110 +110 +100 +115 +110 +115 +115 +200 +200 +100 +110 +260	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR X-ECOPUR G-ECOPUR 54D X-ECOPUR H X-ECOPUR S SKF Ecoflon 1 SKF Ecoflon 2 SKF Ecotal[1] SKF Ecomid[2] SKF Ecopaek
	ST10	**Back-up ring** Standard active back-up ring for piston seal type PD. Normally already included in PD-type seal profiles, designed for automatic pressure activation. Split and non split design available.	–200 –50 –40 –100	+200 +100 +110 +260	SKF Ecoflon 2 SKF Ecotal[1] SKF Ecomid[2] SKF Ecopaek
	ST11	**Back-up ring** Standard active back-up ring for rod seal type PD. Normally already included in PD-type seal profiles, designed for automatic pressure activation. Split and non split design available.	–200 –50 –40 –100	+200 +100 +110 +260	SKF Ecoflon 2 SKF Ecotal[1] SKF Ecomid[2] SKF Ecopaek
	ST12	**Back-up ring** Triangular back-up ring for rod applications, fits in special shaped housings (see seal data sheets). Also used as integrated active back-up ring in special high pressure or low friction seal profiles. Split and non split design available.	–200 –50 –40 –100	+200 +100 +110 +260	SKF Ecoflon 2 SKF Ecotal[1] SKF Ecomid[2] SKF Ecopaek

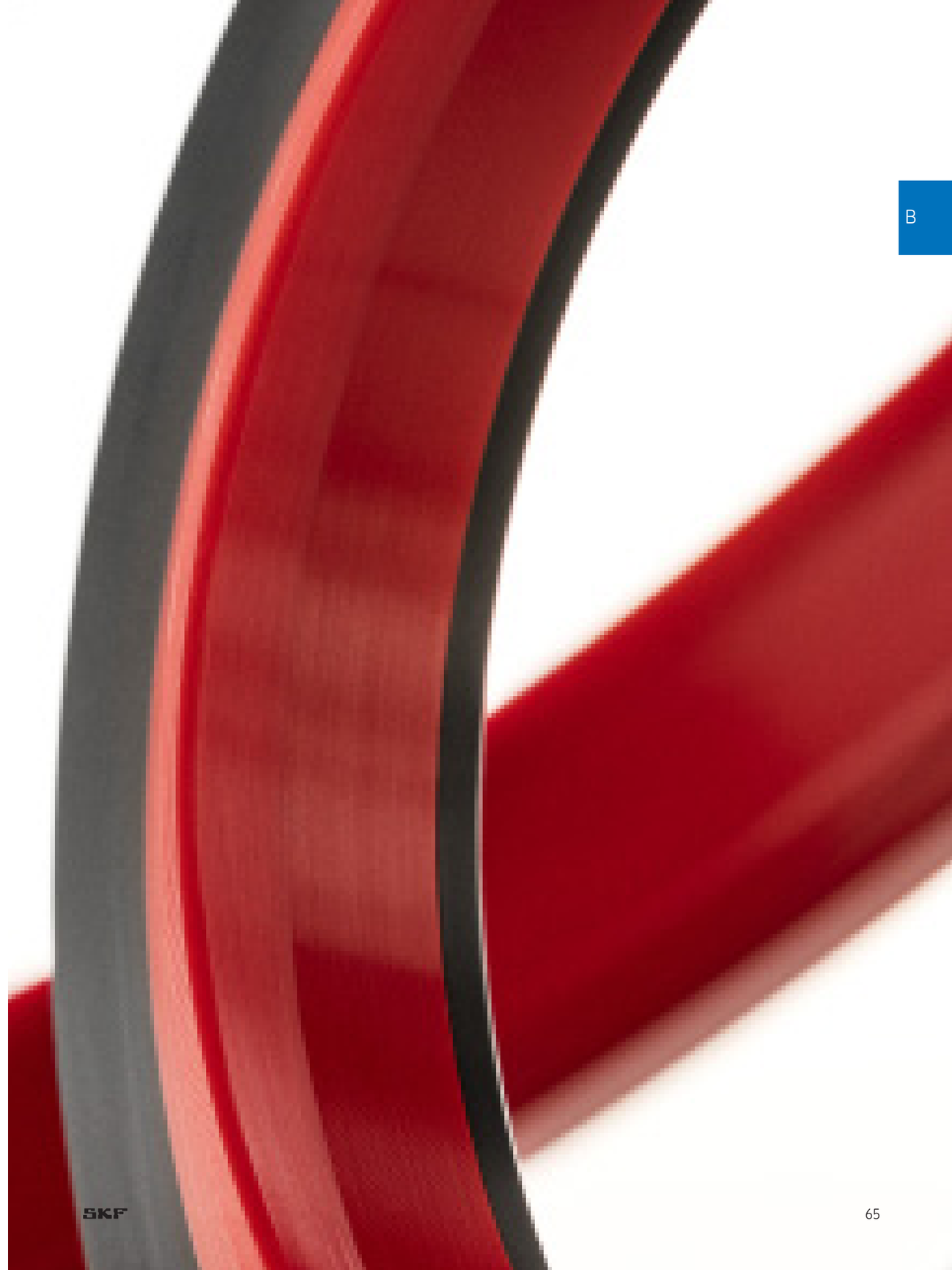
[1] Up to † 400 mm
[2] Above † 260 mm

Back-up rings

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

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Material
			°C		–
	ST12	**Back-up ring** Triangular back-up ring for piston applications, fits in special shaped housings (see seal data sheets). Also used as integrated active back-up ring in special high pressure or low friction seal profiles. Split and non split design available.	–200 –50 –40 –100	+200 +100 +110 +260	SKF Ecoflon 2 SKF Ecota[1] SKF Ecomid[2] SKF Ecopaek

[1] Up to † 400 mm
[2] Above † 260 mm



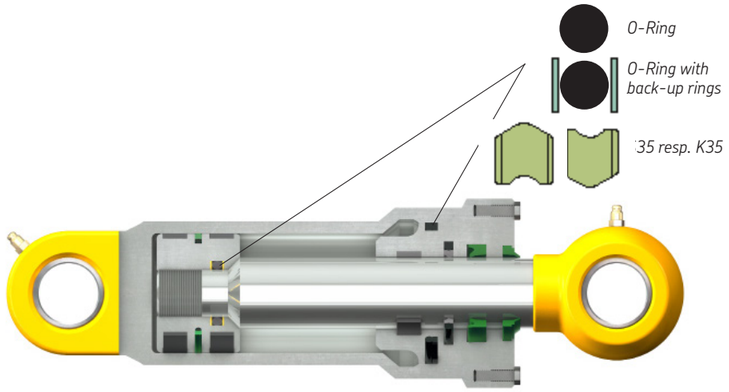
Static seals

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.

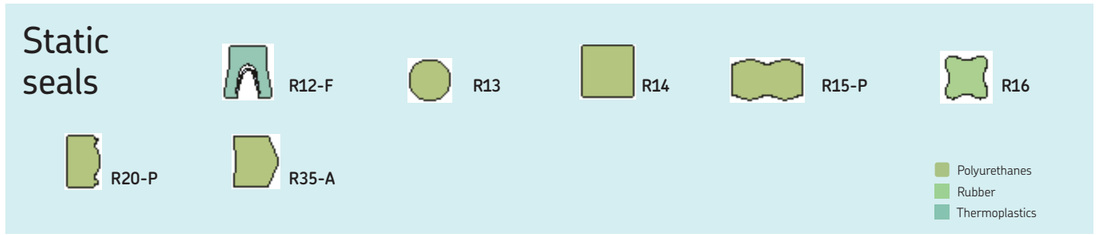
The Illustration shows different static seals used in hydraulic cylinders. O-rings might do the job for standard applications. For heavy duty applications additional back-up rings might be applicable. For tricky situations regarding mounting also S35 resp. K35 seals might be the best solution to avoid twisting.



Typical situation for different static seals used in hydraulic cylinders.

K35-P in ECOPUR

S35-P in T-ECOPUR



Profile	Description
R13 R14 R16-P	**Universal type** Most common and simple seal profiles with proven reliability in a wide range of different applications and industries.
S20-R S35-P R15-P	**Inside sealing type** Interference fit on outside diameter[1] provides stable fit in the housing and reliable performance at all pressures.
K20-R K35-P R15-P	**Outside sealing type** Interference fit on inside diameter[1] provides stable fit in the housing and reliable performance at all pressures.
R35-A R20-P R12-F	**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] R15-P is a symmetric profile and has no defined interference fit to inner or outer diameter.

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Pressure max.	Material	
			°C		bar	–	
	R12-F	**Single-acting PTFE flange seal** Fingerspring activated flange seal, excellent chemical and thermal resistance, mainly used on flanges, fittings or pivoting joints in chemical industry. Pressure from the inside.	–200	+260	300	**Seal** SKF Ecoflon 1,2,3,4	**Spring** 1.4310[2]
	R13	**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 S20-R or K20-R resp. S35-P or K35-P or R35-A.	–30 –35 –30 –20 –20 –50 –30 –25 –20 –50 –10 –60 –200	+110 +110 +110 +110 +110 +100 +100 +150 +200 +150 +200 +200 +260	600 600 600 600 600 600 160 160 160 160 160 160 160	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[1] SKF Ecoflas SKF Ecosil SKF Ecoflon 1	
	R14	**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 ST08 for back-up rings and F01 for guide rings to ensure correct manufacturing tolerances, cutting gaps and chamfers.	–30 –35 –30 –20 –20 –50 –30 –25 –20 –50 –10 –60 –200 –200 –200 –200 –50 –40 –100 –200	+110 +110 +110 +115 +115 +100 +150 +200 +150 +200 +200 +260 +260 +260 +260 +100 +110 +110 +90	– – – – – – – – – – – – – – – – – – – –	ECOPUR ECOPUR LD ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR X-ECOPUR G-ECOPUR 54D X-ECOPUR H X-ECOPUR S SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[1] SKF Ecoflas SKF Ecosil SKF Ecoflon 1 SKF Ecoflon 2 SKF Ecoflon 3 SKF Ecoflon 4 SKF Ecotal SKF Ecomid SKF Ecopaek SKF Ecowear 1000	
	R15-P	**Double-acting static seal** For static applications as an O-ring replacement to avoid twisting in the housing, simple installation and improved extrusion resistance.	–30 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	400 400 400 400 400 400	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR	

[1] Not suitable for mineral oils
[2] Spring metal material specification

Appli-cation	Profile	Description	Temperature min.	Temperature max.	Pressure max.	Material
			°C		bar	–
	R14	**Double-acting static seal** For static and dynamic applications as an O-ring replacement in radial and axial grooves. The design enables retention of lubricant.	–30 –35 –30 –20 –20 –50 –30 –25 –20 –50 –10	+110 +110 +110 +110 +110 +100 +110 +150 +200 +150 +200	400 400 400 400 400 400 50 50 50 50 50	ECOPUR ECOPUR G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[1] SKF Ecoflas
	R20-P	**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 –35 –30 –20 –20 –50	+110 +110 +110 +110 +110 +100	800 800 800 800 800 800	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR
	R35-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 –35 –30 –20 –20 –50 –30 –25 –20 –50 –10 –60	+110 +110 +110 +110 +110 +100 +100 +150 +200 +150 +200 +200	800 800 800 800 800 800 250 250 250 250 250 250	ECOPUR ECOPUR LD G-ECOPUR H-ECOPUR S-ECOPUR T-ECOPUR SKF Ecorubber-1 SKF Ecorubber-H SKF Ecorubber-2 SKF Ecorubber-3[1] SKF Ecoflas SKF Ecosil

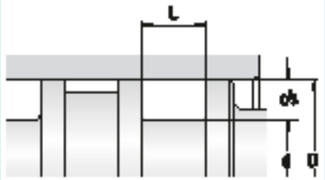
[1] Not suitable for mineral oils

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



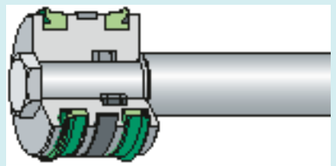
Indicated dimensions are required to process an order

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

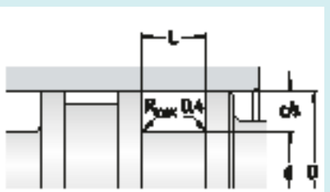
	Surface properties $R_{t\,max}$	R_a
	µm	
Sliding surface for		
TPU/rubber seals	≤ 2,5	≤ 0,05–0,2
PTFE seals	≤ 2	≤ 0,05–0,2
Groove bottom	≤ 6,3	≤ 1,6
Groove face	≤ 15	≤ 3
Bearing area T_p	50–95% [1]	

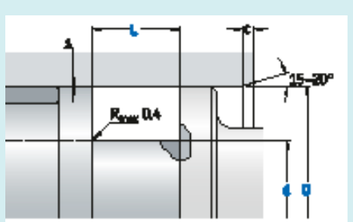
Seal housing tolerances
Depending on the seal profiles

[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



K01-P **K02-P** **K03-F** [1] **K04-P** **K05-P** **K06-P** **K07-F** [1] **K21-P** **K22-P**
K01-PE **K02-PD** **K03-P** **K04-PD** **K05-R** **K06-R** **K07-P** **K22-R**
K01-R **K02-R**
K01-RE **K02-RD**





Drawing for K03-F and K07-F profiles

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

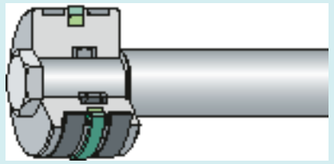
Main applications
Support and retaining cylinders
Standard cylinders

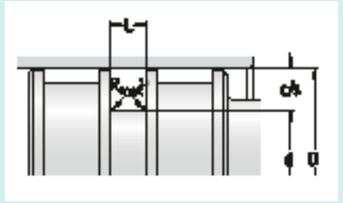
Advantages
Stable fit in the housing
Ultimate sealing effect
Wide temperature range

Standard materials
ECOPUR grades
SKF Ecorubber grades
SKF Ecoflon grades

Bore diameter D H9 over	incl.	Housing groove diameter d h10	Housing groove length L +0,2	Cross section c/s
mm		mm	mm	mm
	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	300	D – 20	12	10
300	500	D – 25	18	12,5
500	600 [1]	D – 30	20	15

[1] K03-F and K07-F are PTFE seals and require an accessible housing. Please refer to the seal data sheet for more details.





K08-D **K08-P** **K08-E**

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

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

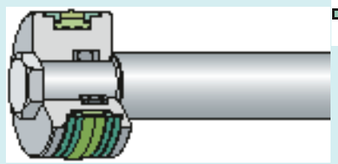
Advantages
Low friction
No stick-slip
Excellent resistance against pressure shocks

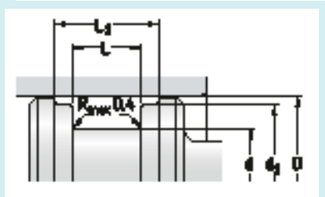
Standard materials
SKF Ecoflon/NBR
SKF Ecoflon/FKM
X-ECOPUR/NBR

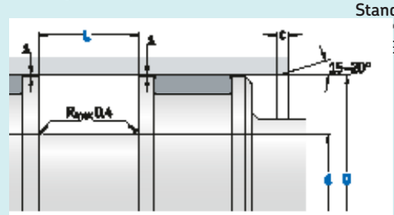
K08-ES **K08-DS**

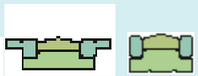
Bore diameter D H9 over	incl.	Housing groove diameter d h10	Housing groove length L +0,2	Cross section c/s
mm		mm	mm	mm
10	15	D – 4,9	2,2	2,45
15	40	D – 7,5	3,2	3,75
40	80	D – 11	4,2	5,5
80	133	D – 15,5	6,3	7,75
133	330	D – 21	8,1	10,5
330	670	D – 24,5	8,1	12,25
670	1 000	D – 28	9,5	14
1 000		D – 38	13,8	19
mm		mm	mm	mm
15	50	D – 10	5	5
50	60	D – 15	7,5	7,5
60	200	D – 20	10	10
200	300	D – 25	12,5	12,5
300	530	D – 30	15	15
530	680	D – 35	17,5	17,5
680	1500	D – 40	20	20

[1] For details regarding R_{max} please refer to the related seal data sheet









K09-N **K23-N**
K09-D **K23-D**
K09-H **K23-H**
K09-F **K23-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

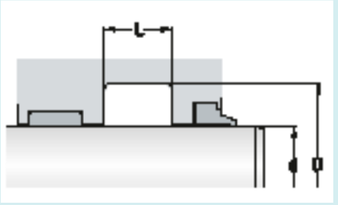
Standard materials
[illegible]UR / SKF Ecorubber/
[illegible]cotal

Bore diameter D H9 over	incl.	Housing groove diameter d h9	d_1 h8	Housing groove length L +0,2	L_1
mm		mm		mm	
20	50	D – 10	D – 3	12,5	20,5
50	80	D – 15	D – 4	20	28
80	150	D – 20	D – 5	25	36
150	400	D – 25	D – 6	32	46
400	650 [1]	D – 30	D – 8	36	50

[1] Not all profiles available above 600 mm

Rod seal housing details and recommendations

Suggested standard housing dimension

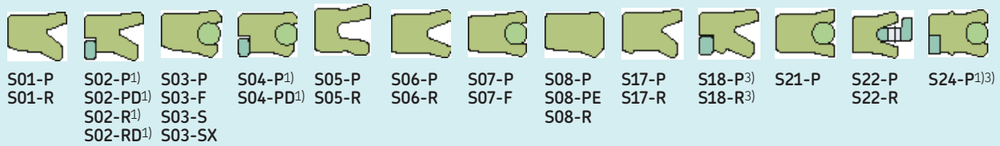


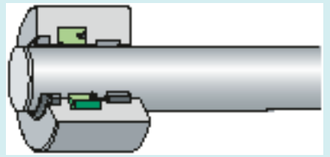
Indicated dimensions are required to process an order
D housing groove diameter
d rod diameter
L housing groove length
c/s cross section

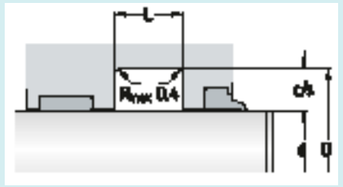
	Surface properties $R_{t\,max}$	R_a
	µm	
Sliding surface for		
TPU/rubber seals	≤ 2,5	≤ 0,05–0,3
PTFE seals	≤ 2	≤ 0,05–0,2
Groove bottom	≤ 6,3	≤ 1,6
Groove face	≤ 15	≤ 3
Bearing area T_p	50–95%[1]	

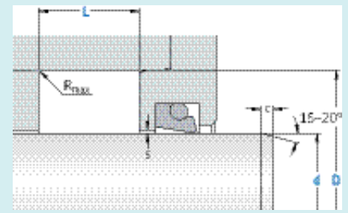
Seal housing tolerances
D H10
d f8
L +0,2

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









Drawing for the PTFE seal profiles S03-F, S03-S, S03-SX and S07-F

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

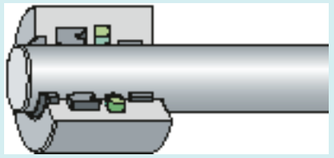
Main applications
Standard cylinders
Light and standard hydraulic applications

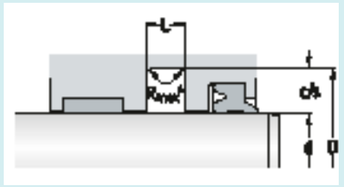
Advantages
Stable fit in the housing
Ultimate sealing effect
Wide temperature range
Good backpumping ability

Standard materials
ECOPUR grades
SKF Ecorubber grades
SKF Ecoflon grades

Rod diameter d over	incl.	Housing groove diameter D	Housing groove length L[3]	Cross section c/s
mm		mm	mm	mm
	25[1]	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	300	d + 20	14 (17)[3]	10
300	500	d + 25	17 (20)[3]	12,5
500	700[2]	d + 30	25	15
700	1 000[2]	d + 40	32	20
1 000		d + 40	32	20

[1] Restrictions in minimum diameter vary. Please see details in the seal data sheets. Please consult our technical department for exact limitations.
[2] Not all profiles available above 600 mm.
[3] Higher values for L (in brackets) required for S18-P, S18-R and S24-P due to back-up ring.





S02-S S09-E S09-P S09-D

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

Main applications
Buffer or tandem seals for
Mobile hydraulics
Heavy duty hydraulics

Advantages
Excellent resistance against pressure shocks
Long lifetime

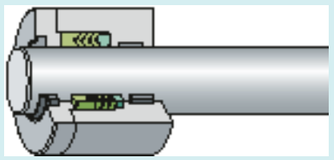
Standard materials
S02: ECOPUR
S09: SKF Ecoflon/NBR or SKF Ecoflon/FKM, X-ECOPUR/NBR

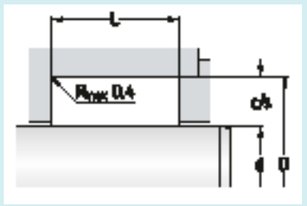
Rod diameter d over	incl.	Housing groove diameter D	Housing groove length L	Cross section c/s
mm		mm	mm	mm
4[1]	8[1]	d + 4,9	2,2	2,45
8 (10)[2]	19	d + 7,3	3,2	3,65
19	38	d + 10,7	4,2	5,35
38	200	d + 15,1	6,3	7,55
200	256	d + 20,5	8,1	10,25
256	650[3]	d + 24	8,1	12
650	1 000[3]	d + 27,3	9,5	13,65
1 000		d + 38	13,8	13,65

S09-ES S09-DS

mm		mm	mm	mm
	50	d+10	5	5
50	60	d+15	7,5	7,5
60	200	d+20	10	10
200	300	d+25	12,5	12,5
300	530	d+30	15	15
530	680	d+35	17,5	17,5
680	1500	d+40	20	20

[1] Not valid for S02-S.
[2] Higher value in brackets (10) only valid for S02-S.
[3] Not all profiles available above 600 mm
[4] For details regarding R_{max} please refer to the related seal data sheet





S1012-M S1315-T
S1012-T
S1012-T1

Main function
Single-acting rod seals
Chevron packings

Main applications
Heavy duty hydraulics
Presses

Advantages
Suitable for old, worn rods
Split version for easy installation available

Standard materials
ECOPUR / SKF Ecotal

Rod diameter d over	incl.	Housing groove diameter D	Housing groove length L	Cross section c/s
mm		mm	mm	
10	40	d + 10	16	5
40	75	d + 15	25	7,5
75	150	d + 20	32	10
150	200	d + 25	40	12,5
200	300	d + 30	50	15
300		d + 40	63	20
500[1]	800	d + 45	70	13
800[1]	1000	d + 50	80	13
1000[1]	1200	d + 55	90	13
1200[1]	1540	d + 60	100	13

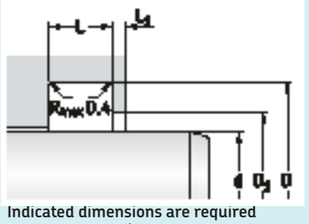
[1] Only valid for S1012-T1 above 500 mm.

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



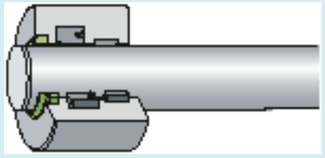
Indicated dimensions are required to process an order

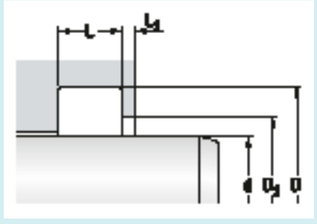
D housing groove diameter
d rod diameter
L housing groove width
H total wiper height

	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] A03-A and A06-A need tighter tolerances – please see details in the related section





A01-A A01-B | A04-A A04-B

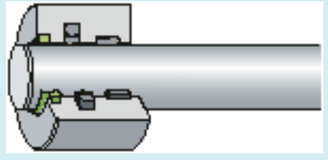
Main function
Single-acting wipers

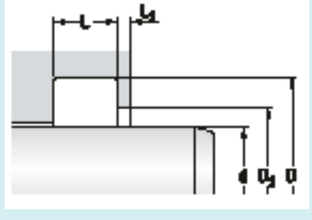
Main applications
Standard wiper for hydraulics

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

Standard materials
ECOPUR (X-ECOPUR) / SKF Ecorubber

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





A02-A A02-B | A05-A A05-B | A11-A

Main function
Single/double-acting wipers

Main applications
In combination with O-ring activated PTFE rod seals (S09)

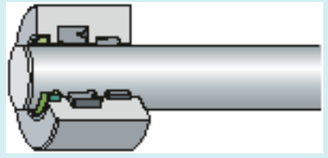
Advantages
Excellent wear resistance
Double-acting function

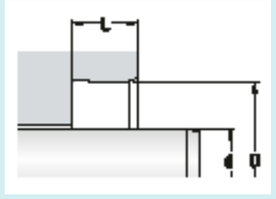
Standard materials
ECOPUR (X-ECOPUR) / SKF Ecorubber.

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

A12-A A12-B

Rod diameter d over	incl.	Housing groove diameter D	D_1	Housing groove width L	L_1 min
mm		mm		mm	
	50	d +8	d + 4	5	1,5
50	100	d + 10	d + 5	6	2
100	600	d + 15	d + 7,5	8,5	3





A03-A | A06-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 (X-ECOPUR) + SKF Ecotal / SKF Ecorubber + SKF Ecotal

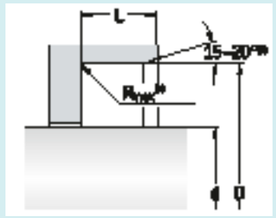
Rod diameter d over	incl.	Housing groove diameter D H8	Housing groove width L
mm		mm	mm
22	100	d + 10	7
100	200	d + 15	9
200		d + 20	12

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



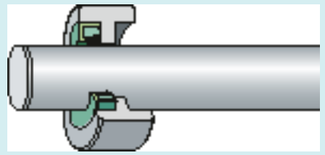
Indicated dimensions are required to process an order
D housing groove diameter
d shaft diameter
L housing groove length
c/s cross section

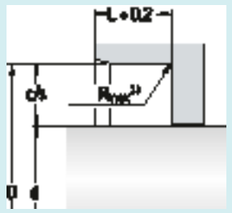
	Surface properties $R_{t\,max}$	R_a
	µm	
Sliding surface for		
TPU/rubber seals	≤ 2,5	≤ 0,1–0,5
PTFE seals	≤ 2	≤ 0,05–0,3
Groove bottom	≤ 6,3	≤ 1,6
Groove face	≤ 15	≤ 3
Bearing area T_p	50–95%[1]	

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 chamfer details please refer to the related seal data sheet
[3] For details regarding R_{max} please refer to the related seal data sheet





R01-P **R02-P**
R01-R **R02-R**

Main function
Single-acting rotary seals
Oil seals
Radial shaft seals

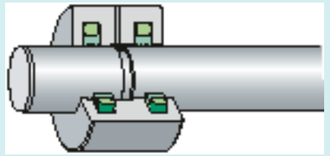
Main applications
Bearing protection

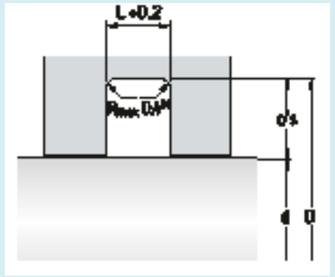
Advantages
Easier installation and reduced costs due to open housings

Standard materials
ECOPUR, SKF Ecorubber/SKF Ecotal, metal

Shaft diameter d h11 over	incl.	Housing groove diameter D H8	Housing groove length L +0,2	Cross section c/s
mm		mm	mm	mm
15	60	d + 12	7	6
60	140	d + 15	8	7,5
140	300	d + 20	10	10
300	500	d + 30	12	15
500	800	d + 40	20	20
800		d + 50	22	25

[1] For details regarding R_{max} please refer to the related seal data sheet





R09-F

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

Main applications
Rotary pivots

Advantages
For high pressure

Standard materials
SKF Ecoflon, NBR or FKM

Shaft diameter d f8 over	incl.	Housing groove diameter D H9	Housing groove length L +0,2	Cross section c/s
mm		mm	mm	mm
5	19	d + 4,9	2,2	2,45
19	38	d + 7,5	3,2	3,75
38	200	d + 11	4,2	5,5
200	256	d + 15,5	6,3	7,75
256	650	d + 21	8,1	10,5
650	1 000	d + 28	9,5	14

R09-FS

mm		mm	mm	mm
5	50	d + 10	5	5
50	60	d + 15	7,5	7,5
60	200	d + 20	10	10
200	300	d + 25	12,5	12,5
300	530	d + 30	15	15
530	650	d + 35	17,5	17,5
650	1 000	d + 40	20	20

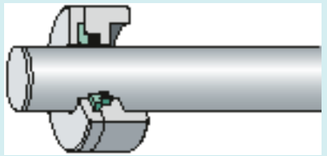
R03-P
R03-R

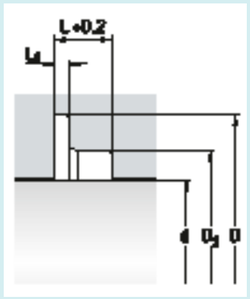
d[1] over	incl.	D H9	L	c/s
mm		mm	mm	mm
21[2]	22[2]	d + 8	6,5	4
22	36	d + 10	8	5
36	56	d + 12	8	6
56	85	d + 15	11	7,5
85	140	d + 20	13	10
140	200	d + 25	16	12,5
200	300	d + 30	19	15
300		d + 40	26	20

R04-A

mm		mm	mm	mm
5	22	d + 8	4,5	4
22	36	d + 10	5,6	5
36	56	d + 12	5,6	6
56	85	d + 15	7,7	7,5
85	140	d + 20	9,2	10
140	200	d + 25	11,3	12,5
200	300	d + 30	13,5	15
300		d + 40	18,5	20

[1] Tolerance area shaft ≤ 56 mm ->e8, > 56 mm -> f7.
[2] Only valid for R03-P.
[3] For details regarding R_{max} please refer to the related seal data sheet





R19
Main function
Single-acting rotary seal
Spring activated PTFE seal

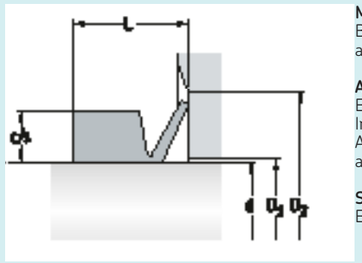
Main applications
Bearing protection for chemical and pharma industries

Advantages
Low friction
Good chemical and thermal resistance
Suitable for high speed

Standard materials
SKF Ecoflon, stainless steel spring

Shaft diameter		Housing groove diameter		Housing groove length	
d f8		D H10	D_1 H9	L +0,2	L_1 [1]
over	incl.				
mm		mm		mm	
5	20	d + 9	d + 5	3,6	0,85
20	40	d + 12,5	d + 7	4,8	1,35
40	400	d + 17,5	d + 10,5	7,1	1,8
400		d + 22	d + 14	9,5	2,8

[1] Please refer to the seal data sheet for the tolerance details of L_1.



R06-P **R07-P**
R06-R **R07-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, SKF Ecorubber

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	210	d + 4	d + 24	12 (16,5)[1]	8
210	300	d + 5	d + 30	14,5 (20,5)[1]	10
300	450	d + 6,25	d + 36,5	17,5 (24,5)[1]	12,5
450	–	d + 7,5	d + 45	20 (28,5)[1]	15

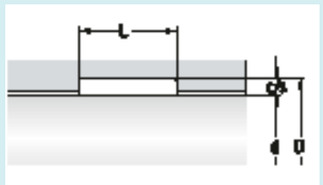
[1] Higher values in brackets valid for R07-P and R07-R.

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. They can also be ordered as endless, 90° split versions or yard ware.

Seal housing tolerances

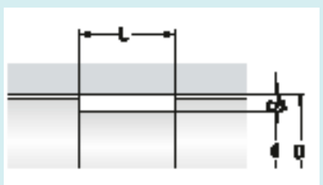
D H9
d f8
L +0,2



F01

Main function
Rod guide rings

Rod diameter d over	incl.	Housing groove diameter D	Housing groove length L	Cross section c/s
mm		mm	mm	mm
6	30	d + 3	4	1,5
30	50	d + 3	5,6	1,5
50	100	d + 5	9,7	2,5
100	800	d + 5	15	2,5
800	1 000	d + 8	25	4
1 000		d + 8	25	4



F01

Main function
Piston guide rings

Bore diameter D over	incl.	Housing groove diameter d	Housing groove length L	Cross section c/s
mm		mm	mm	mm
6	30	D – 3	4	1,5
30	50	D – 3	5,6	1,5
50	100	D – 5	9,7	2,5
100	800	D – 5	15	2,5
800	1 000	D – 8	25	4
1 000		D – 8	25	4

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 d_2	Groove t +0,05	Without back-up ring L +0,25	One back-up ring L_1 +0,25	Two back-up rings L_2 +0,25	Recommended back-up ring width
mm	mm	mm	mm	mm	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
5,33	4,53	6,7	8,4	10,1	1,7
5,70	4,85	7,1	9,1	11,1	2,0
6,00	5,10	7,5	9,5	11,5	2,0
6,99	5,94	8,8	10,8	12,8	2,0
7,00	5,95	8,8	10,8	12,8	2,0
8,00	6,80	10,0	12,5	15,0	2,5
10,00	8,50	12,5	15,0	17,5	2,5

Distributed by:

SKF Specialized Seals Distributor Chesterton Customseal

skf.com/seals

® SKF, ECOPUR, G-ECOPUR, H-ECOPUR, S-ECOPUR, T-ECOPUR,X-ECOPUR and SEALJET are registered trademarks of the SKF Group.

© SKF Group 2020
The contents of this publication are the copyright of the publisher and may not be reproduced (even extracts) unless prior written permission is granted. Every care has been taken to ensure the accuracy of the information contained in this publication but no liability can be accepted for any loss or damage whether direct, indirect or consequential arising out of the use of the information contained herein.

PUB SE/P2 15235/1 EN · June 2020

Certain image(s) used under license from Shutterstock.com