Sealing solutions for the food, beverage and pharmaceutical industries

Customized machined seals and engineered plastic parts

The Power of Knowledge Engineering


Sealing solutions customized

for your system performance

SKF is a supplier of top quality, highly reliable products to the food, beverage and pharmaceutical industries. Customers benefit from the comprehensive field experience and extensive knowledge in the sealing technology.

Optimized sealing solutions

SKF helps customers to achieve their strategic goals:

- Improved safety at work
- Increased productivity
- Reduced ingress of foreign particles
- Increased durability
- Reduced maintenance and downtime
- Energy savings

SKF provides the most flexible options for the entire food and beverage industry: sealing solutions and Advanced Engineered Plastic Parts (AEPP) for wet, abrasive and contaminating environments/cleaning.

Competences

SKF is a leading supplier for standard and custom engineered sealing solutions. Based on many years of experience, especially in the area of food, beverage and pharmaceutical machinery, SKF is able to support this industry with

- on-site solution analysis,
- application engineering,
- material development for high speed solutions, increased wear resistance, reduced friction etc.
- integrated solutions consisting of seals and advanced engineered plastic parts,
- just-in-time availability of standard seals and customized sealing solutions,
- moulded seals for higher volume orders.

Customers benefit from flexibility and short delivery times for customized seals. SKF machined seals are always made from high-performance materials and cover the following product groups:

- Hydraulic and pneumatic sealing systems
- Sealing solutions for rotary distributors and joints
- Radial shaft seals
- V-rings
- Gaskets for flange connections
- Static seals and O-rings
- Advanced engineered plastic parts

Finding the most suitable sealing solution is a complex and rewarding task. SKF's experience shows that a sealing system can always be optimized.


CO2
CO2 zur Nachgärung
CO2
CIP VL
CO2 zur Nachgärung
vom Tank
vom Tank
CO2 ins Freie
Wasser
CO2 ins Freie
Erntekeln
Erntekeln
Würzeweg
Tankablauf
CIP RL
Tankablauf
Befüllleitung
Entl. Filtration
Entl. Filtration

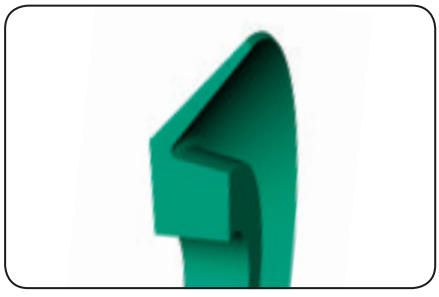



Machined seals – the flexible concept

SKF is a leading player in the global custom-made machined seals market, specializing in complete sealing services for the food, beverage and pharmaceutical industries. SKF serves many countries worldwide with its global sales network.

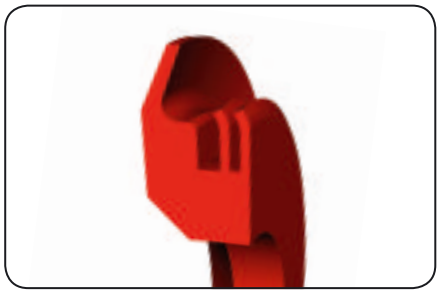
Standard seals

- Seals in standard dimensions
- Extensive range of materials
- On-time availability



Customized seals

- Standard seals modified to specific requirements
- Virtually unlimited dimensions
- Extensive range of materials
- On-time availability (approx. 24 hours)



Custom engineered seals

- Application engineering service
- Customer related designed sealing solutions
- Virtually unlimited dimensions and profiles
- Extensive range of materials
- Short delivery time

Due to the flexible production process, SKF can supply standard and special seals in customized dimensions and high performance sealing materials up to 4 000 mm in diameter as one piece. Large seals with diameters up to 10 000 mm and above are assembled using a special welding technique. SKF's machined seals competence centers provide global availability with truly local service, being very close to the end customer. In some selected locations you can also find:

Advanced engineered plastic parts
Turned, milled and moulded parts, made of high performance plastic materials.

Other business and services
Maintenance and repair of hydraulic and pneumatic cylinders; gaskets and products manufactured using water-jet cutting technology.

The right sealing solution for extreme conditions

Whenever reduced maintenance costs, increased productivity or process reliability are important – SKF is there with improved machined sealing solutions for the food, beverage and pharmaceutical industries.

The following points are essential when selecting the right seal for the harsh operating conditions of the machine tool industry.

Operating environment

The purpose of sealing is to keep operating fluids or lubricants in the system and/or contaminants out.

Aggressive contamination can be a concern. Abrasive matter, cooling water, emulsions may affect a seal.

Fluids

Fluids affect the sealing system in many ways. The sealing material has to be compatible with internal or external fluids. Those could be lubricants, operating media in a hydraulic system, auxiliary cleaning or assembly media or even the processed food, beverage or pharmaceutical itself.

Operating parameters

Impact of type, speed and duration of the motion on the sealing lip is critical. Motion can be linear, rotating or pivoting, continuous or discontinuous. Operating pressures as well as possible system and application related pressure peaks are also to be considered.

Elevated temperatures may also affect the seal and its performance. In most cases, media temperature and motion speed determine the actual temperature at the sealing lip, but an elevated ambient temperature can also affect the performance of the seal.

Cleaning procedures

The type of cleaning process determines the material used for the seal. In the food, beverage and pharmaceutical industries the cleaning process is extremely important. The seals must be designed to secure the removal of all food particles during cleaning procedures. Also the seal housing design and surrounding conditions are relevant.

Closed housings provide a perfect fit for elastomeric seals. SKF also produces customized seals for non-standard housing dimensions.

Lubrication in abrasive conditions

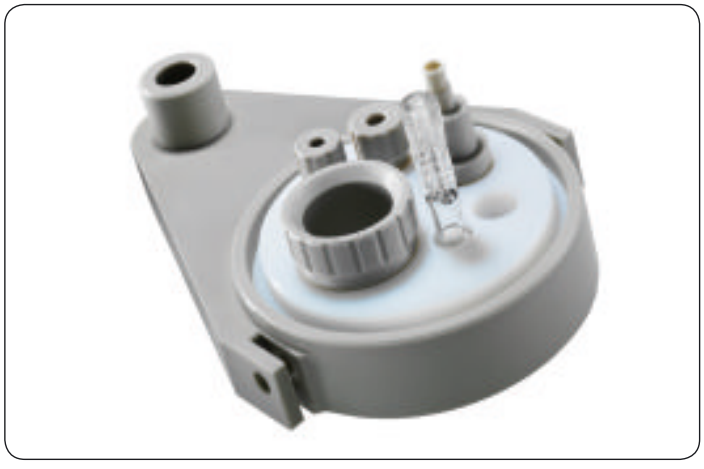
Seals are affected by the type of lubrication chosen for use in abrasive conditions. SKF provides special materials like H-ECOPUR with improved wear characteristics for special applications. The R&D department can develop materials for every specific need.

SKF has a range of food grade sealing materials certified to or complying with a broad range of industry standards and regulations (FDA, NSF, KTW, etc.)

Improvement potentials

Finally, the most important indicators for possible improvements are the existing seal performance and the reasons for seal failure and /or necessary seal replacement.
The seal's performance can affect productivity, process reliability, MTBF and maintenance schedules. Optimizing a sealing solution can be a complex task. SKF applies its experience to customers' specific operating environment to jointly identify system optimization and cost saving potentials (in terms of TCO) generated by an optimized sealing solution.

Lid module made of different chemical resistant materials

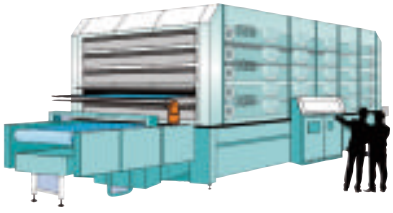




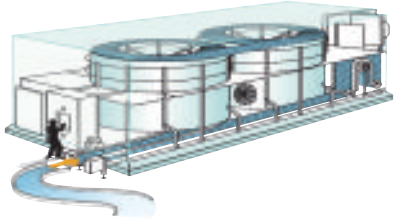
Solutions for food and beverage processes

Preparation

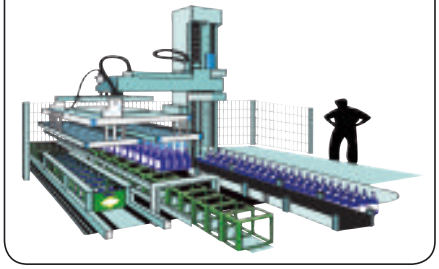
Heating



Removal of heat



Post processing



Preparation

Seals and advanced engineered plastic parts for meat processing units

Meat processing often involves cutting thus requiring machines with fast moving cutters and spindles.

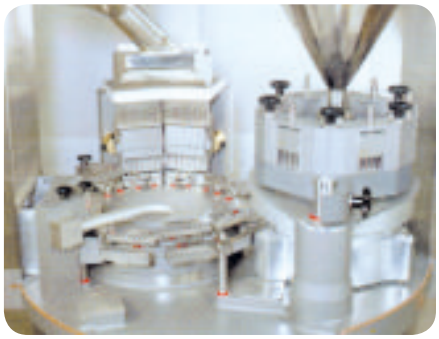
To keep the processed product in place and to prevent contamination, sealing systems have to do their job at high sliding speeds combined with high pressure. Special rotary seals have been designed to meet these requirements. Besides the tightness of the fit, other important features are media and abrasion resistance, compactness and ease of installation.

To dye meat pies, for example, special steel mixing drums can be replaced by highly modular drums made of FDA approved plastic materials, including quick release inserts for dramatically reduced process changeover times.

Special solution for tablet pressing machines

Pharmaceuticals are produced under the strictest conditions and cleanliness regulations. A clean room environment is a must. In order to prevent contamination, lubrication should be kept to a minimum level, yet friction and wear have to be controlled and particulate loss must be minimized, especially for fast moving parts. In the case of an underlubricated tablet pressing machine, which works at a very high process frequency, standard elements would fail.

Therefore, SKF has designed and provided a system with the highest level of friction performance and wear resistance on the one hand and an extraordinary sealing performance for the residual lubricant on the other. A special double acting seal/wiper element combined with an additional drip tray has been designed to satisfy the strictest regulations of the production process. This engineered solution can be installed in existing housings, so no modification of the system is required.





Heating

Seals for ultra high pressure pasteurization

Pasteurizing food with high pressure is a common way to reduce the use of temperature during food processing. The result is less spoilage and increased food safety without affecting the original flavour characteristics. To implement this process, high pressure systems up to 5 000 bar are necessary and therefore the sealing system becomes a very important consideration. This applies to static seals for the tank, as well as for the dynamic seals for the pressurizing system itself.

A specially designed sealing element for this extremely high pressure has been developed. The use of additional back-up rings made of stainless steel and bronze is necessary to compensate for the irregularities of the housing configuration.

Sealing solution for waffle production units

Baking tins give the waffles their specific shape. Unlike a typical household unit, pressurized injection systems are used in the food industry to force the dough into the tins.

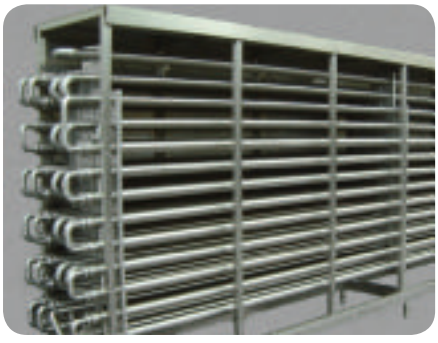
Special seals are required in this pressurized system. To manage the combination of heat resistance, thermal expansion and injection pressure, sealing systems have to be selected very carefully to provide perfect functionality and a long service life.

In such applications it is important that not only the material but also the correct design is specified. The use of silicone rubber as a replacement for PTFE, combined with a high seal compression, eliminates the influence of thermal expansion during the baking process. The softness of the material also protects the seal from mechanical damage during manipulation and cleaning of the tins.

Removal of heat

Specially developed sealing material for cold and harsh environments

The food industry uses many different technologies to remove heat from food products. The sub-zero temperatures of freezing, chilling and cooling processes demand frequent maintenance. During clean-up periods, temperatures can move quickly from sub-zero to 40 °C, causing air expansion combined with increased humidity. These temperature changes can cause water or moisture to enter the processing line, often resulting in corrosion and shortening the lifetime of materials or components like bearings. SKF sealing materials can cope with sudden temperature shifts and prevent the ingress of aggressive media into different mechanical parts in the production line. The sealing material can be used in freezing lines for the production of frozen food or ice cream as well as in chilling areas for removing heat.



Post processing

Advanced Engineered Plastic Parts (AEPP) for bottle filling machines

To fill different designed bottles in one filling station, a change of the filling adaptor is required. The faster this can be done, the higher the efficiency and output of the line. For an end user, different filling adaptors for the various bottles have been designed, all of them with the same connection system – a screw joint. A stainless insert has been bonded into the original holder and a thread is cut into all the different centring parts. The filling adaptors made of FDA-approved H-ECOPUR provide high wear resistance, chemical compatibility with the cleaning process and hydrolysis resistance.

The special design with the screw joint allows different bottles to be filled on the same product line with very short changeover times.

Seals for toothpaste filling machines

It is hard to believe that a body care product can be so abrasive, but toothpaste can be like sand – a perfect grinding material.

Therefore, the reduction of wear is a high priority. The answer lies in the selection of material, limited by the strict requirements of the food and pharmaceutical industry. H-ECOPUR, with its outstanding wear resistance, excellent hydrolysis resistance and compliance with food standards, meets the challenge for elasticity and reliable performance in numerous applications around the world.

SKF's standard range of AEPP materials provides an opportunity to fit the optimum plastic part in specific applications, not only to combat wear resistance, but also to meet additional requirements such as heat and chemical resistance, mechanical strength or friction performance. Whatever your process needs, SKF has the right solution.

Optimized for your system performance

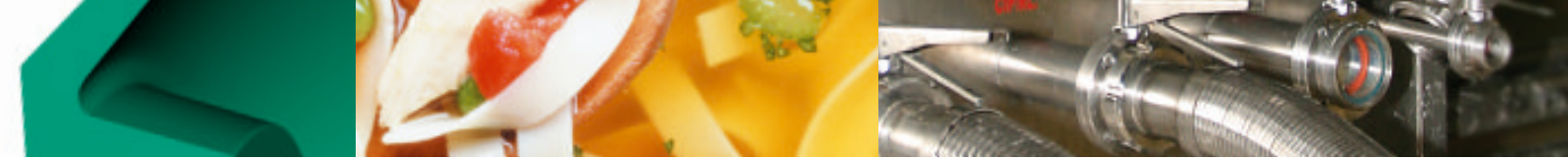
With more than 100 years of experience, SKF provides advanced sealing solutions and meets the requirements of applications and processes for the food, beverage and pharmaceutical industries. This focus has led to the development of new, reliable products and materials specifically engineered, designed and optimized for your system performance.

After a detailed study of the customer's operation and needs, SKF will check its comprehensive list of standard products to find a suitable solution; alternatively, SKF can engineer customized solutions.

The unique SKF total service approach provides a solution with considerable advantages over conventional arrangements. With the SKF SEAL JET system, SKF supplies seals in a wide range of different sizes and offers cost-effective sealing solutions on demand – without any tooling costs or delays.

Piston seals made of FDA approved SKF Ecorubber-3 (EPDM)

Flange connections made of food grade approved SKF Ecotal (POM)



Materials in the food, beverage and pharmaceutical industries

SKF has developed a vast range of high quality sealing materials.

Polyurethanes

Polyurethane offers particularly outstanding mechanical properties, which outperforms many elastomeric sealing materials.

Elastomers

High quality rubber standard grades with well known features of elastomeric materials, like good chemical resistance, are specially optimized for these industries.

Thermoplastics and special materials

Special hard grade materials with outstanding wear resistance for mechanical applications are available.

PTFE and its compounds

Top performance PTFE compound materials with highest chemical and temperature resistance are optimized for sealing applications.

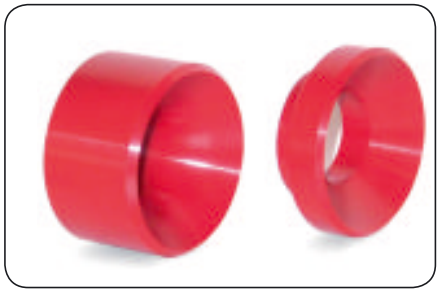
FDA approved materials

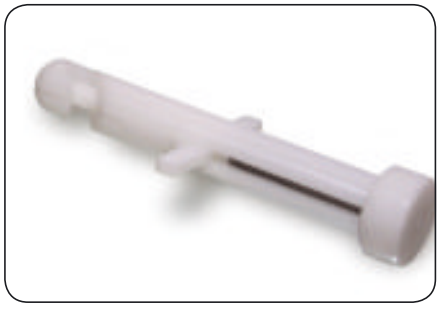
SKF supplies the above mentioned materials which comply to the FDA regulations. For detailed information and material data sheets or approval certificates, please contact SKF.

Material availability

All the materials listed in this brochure are available in diameters up to 600 mm and some selected grades can be supplied in diameters of up to 1 600 mm for rubber materials and up to 10 000 mm and above in polyurethane materials. Milled parts, plates and sheets are available in a wide range of dimensions.

SKF produces all seals and plastic parts as a single item, in small quantities, or larger quantities up to a few thousand, using machining or milling techniques.








Cleaning procedures

Common rules for sanitizing programmes have been established. Cleaning and sanitizing procedures have to be followed for all food processing equipment. The objective of cleaning and sanitizing food contact surfaces is to remove remaining food particles (nutrients) from the system.

Cleaning definitions

Clean

Free from dirt, stain, or impurities and generally unsoiled.

Sanitized

Free from elements that endanger health, reduction of micro-organisms.

Disinfect

Refers to inanimate objects and the destruction of all vegetative cells (not spores).

Sterilize

Refers to the statistical destruction and removal of all living organisms.

Manual cleaning

Procedures performed by cleaning personnel using:

- buckets, brushes and hoses or
- HPLV-Systems (High Pressure Low Volume) via spray nozzles or
- foaming (cleaning primarily by chemical action)

Mechanical cleaning

COP (Clean-Out-of-Place)

System using an agitated tank to clean disassembled components (equipment parts and short section of piping) placed in the tank.

CIP (Clean-In-Place)

This cleaning process is usually accomplished via chemical action based on spray or pressure recirculation of the flush, wash, and rinse solutions under controlled conditions of time, temperature and chemical concentration. It involves the washing of processing and storage tanks, the piping systems and integrated equipment.

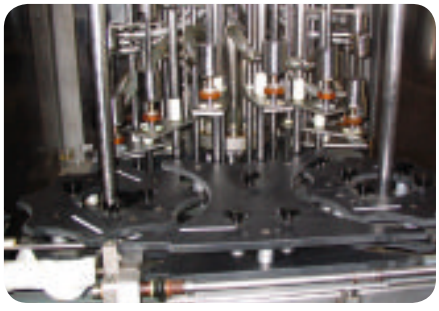
SIP (Sterilization-In-Place)

The objective is to sterilize all sterile product contact equipment at its point of use to eliminate or reduce the need for aseptic additions or connections.

SKF capability

SKF has wide ranging experience in material and product design compatibility to overcome problems in the cleaning processes used in the food, beverage and pharmaceutical industries. Our laboratories can offer compatibility testing of particular formulations if needed. Ongoing material development keeps SKF at the forefront of this vital requirement.





Seals in contact with cleaning chemicals

SKF has a wide variety of plastics and polymeric sealing materials available which comply with the most important food standards and regulations.

Standards and regulations for material manufacturers*)

- FDA
- NSF
- EC regulations
- Drinking water
- Pharmaceutical regulations

Requirements for seals

- Resistance against chemical cleaning products
- Resistance against used CIP media
- Sealing surfaces which are easily cleaned and sterilized
- Good resistance against abrasion and wear
- Non-toxic sealing materials
- Installation without any dead spots (spaces)

Compatibility

In addition to the above mentioned requirements, the following parameters strongly influence the quality of the cleaning process as well as the durability of the seals:

- Immersion period
- Temperature
- Type of cleaning media
- Concentration of the cleaning solution

Material	H-ECOPUR	SKF Ecorubber-1	SKF Ecorubber-H	SKF Ecorubber-2	SKF Ecorubber-2 85A-w-FG	SKF Ecorubber-3	SKF Ecorubber-3 85-w-FG	SKF Ecosil
Nitric acid, 85 °C, 3%	+	(-)	(-)	(o)	o	(o)	o	-
Caustic soda, 85 °C, 3%	+	+	+	o	-	(o)	o	(-)
Auqua dest., 100 °C	+	+at 70 °C	+	o	(o)	+	(+)	+
Steam, 140 °C	-	(-)	-	-	(-)	+	(+)	(-)
Sodium - hypochlorite solution, 70 °C, 5%	+	n.d.a.	n.d.a.	o	o	o	o	n.d.a.
Sodium - sodium hydroxide sodium hypochlorite, 70 °C, 3%	+	n.d.a.	n.d.a.	o	o	o	o	n.d.a.
Sodium - sodium hydroxide sodium carbonate, 70 °C, 3%	+	n.d.a.	+	+	+	+	+	+
Sodium - hydrogen peroxide peracetic acid, 50 °C, 3%	+	n.d.a.	-	+	+	+	+	n.d.a.
3-A Sanitary standards 18-03	Class 1,3[1)]	n.d.a.	n.d.a.	Class 1	Class 1	Class 2	Class 2	n.d.a.

[1)] The data mentioned above are only valid for short-term operations and must be evaluated for longer periods. Please contact SKF for further information.

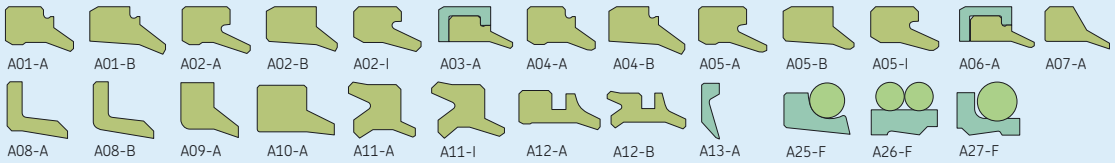
+	resistant
o	limited resistance
-	not resistant
n.d.a.	no data available

immersion period: 168 hours

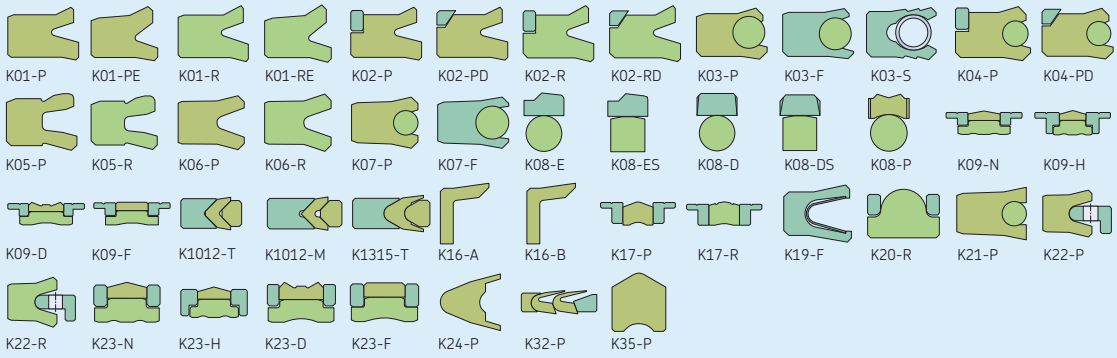
*) For detailed information about standards and regulations, please contact SKF.

Standard machined seal profiles

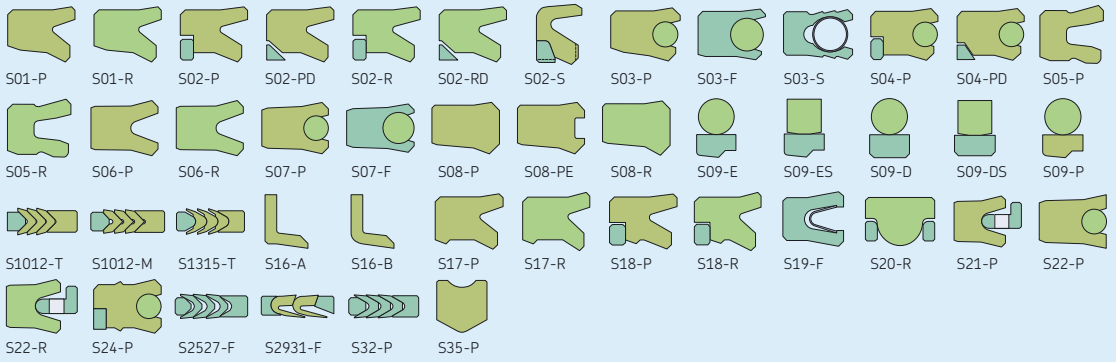
Wipers



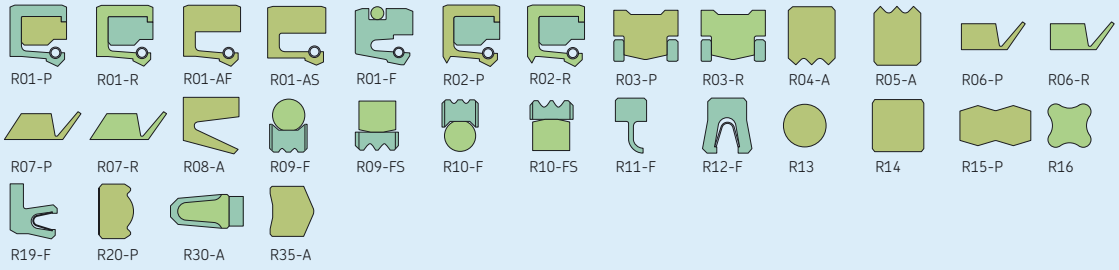
Piston seals



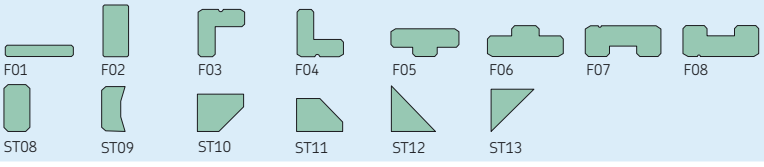
Rod seals



Rotary seals

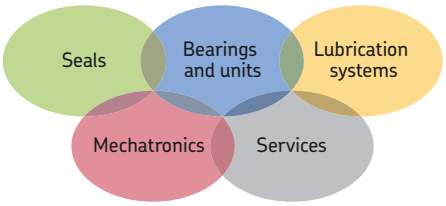


Guide and backup rings



O-rings and static seals

SKF



The Power of Knowledge Engineering

Drawing on five areas of competence and application-specific expertise amassed over more than 100 years, SKF brings innovative solutions to OEMs and production facilities in every major industry worldwide. These five competence areas include bearings and units, seals, lubrication systems, mechatronics (combining mechanics and electronics into intelligent systems), and a wide range of services, from 3-D computer modelling to advanced condition monitoring and reliability and asset management systems. A global presence provides SKF customers uniform quality standards and worldwide product availability.

This brochure was presented by:

Competence centres for machined seals

Austria
seals.austria@skf.com

Australia
seals.australia@skf.com

Argentina
seals.argentina@skf.com

Belgium
seals.belgium@skf.com

Brazil
seals.brasil@skf.com

Canada
seals.canada@skf.com

China
seals.china@skf.com

Denmark
seals.denmark@skf.com

France
seals.france@skf.com

Germany
seals.germany@skf.com

India
seals.india@skf.com

Italy
seals.italy@skf.com

Japan
seals.japan@skf.com

Malaysia
seals.malaysia@skf.com

Netherlands
seals.netherlands@skf.com

Philippines
seals.philippines@skf.com

Poland
seals.poland@skf.com

Singapore
seals.singapore@skf.com

Spain
seals.spain@skf.com

Sweden
seals.sweden@skf.com

Switzerland
seals.swiss@skf.com

Thailand
seals.thailand@skf.com

United Kingdom
seals.uk@skf.com

USA
seals.usa@skf.com

All other countries
machined.seals@skf.com

PUB SE/S2 11351 EN · May 2012

This publication supersedes publication 6988 EN

Printed in Sweden on environmentally friendly paper.

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