



Hydraulic seals

A wide range for hydraulic cylinders in off-highway applications



Optimizing hydraulic cylinder sealing system performance

See what you can achieve with SKF engineering capabilities and a wide range of hydraulic seals.

We've got you covered

- Full range of standard fluid power seals
- Strong material and product development
- Track record in problem solving
- Cost-effective solutions
- Flexible manufacturing
- Customised solutions capability
- Global presence

If you design and produce hydraulic cylinders or off-highway equipment with hydraulic cylinders, then you are well aware of the increasing demands on reliability and sealing performance. You can rely on our fluid power sealing solutions for hydraulic cylinders and the technical knowledge and experience to implement them. Presented here is our core range of fluid power seals for off-highway applications.

Working together, SKF can help solve hydraulic sealing system problems that involve the interactions of multiple seal components and help you meet specific design challenges. Our goal is clear: to be considered the most capable technical partner for the development and delivery of innovative and reliable hydraulic sealing system performance.

Fluid power sealing solutions

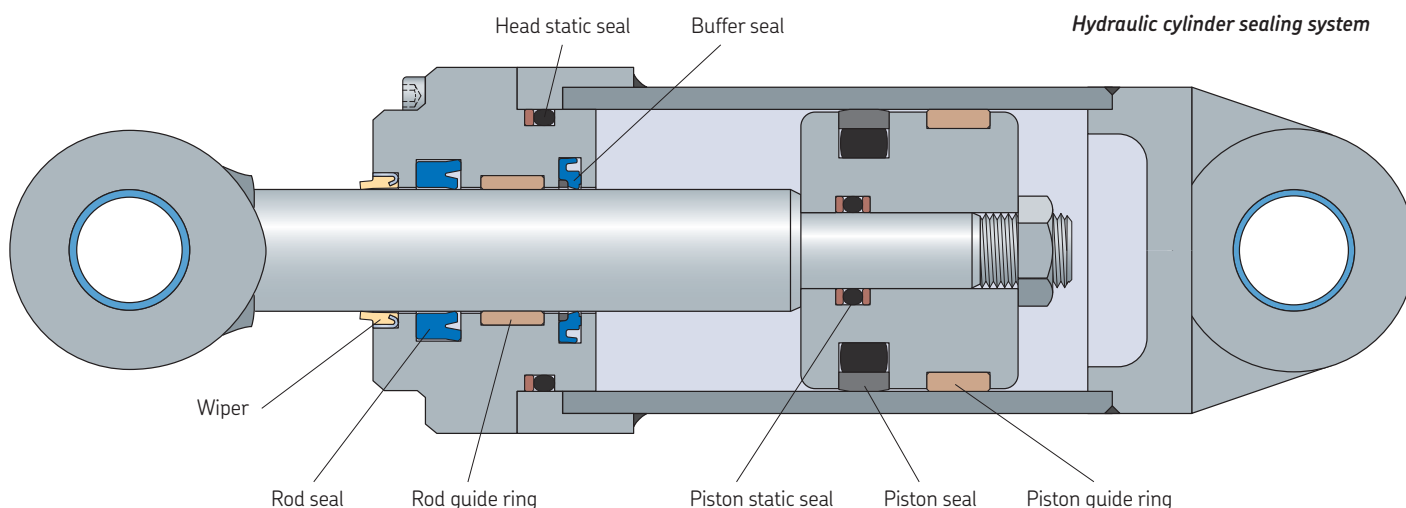
Hydraulic seals are designed to retain hydraulic fluids, exclude solid or liquid contaminants and maintain hydraulic pressure. These tasks require a variety of different seal designs and performance enhancing features. To meet your needs, the SKF range of fluid power sealing solutions for hydraulic cylinders include:

- Rod and buffer seals
- Piston seals
- Wiper seals
- Guide rings
- Static seals and back-up rings

SKF engineering capabilities and support

Performance issues in specific applications are not always solved with a standard range of products. To help you develop the right sealing solution for difficult and constantly evolving fluid sealing applications, SKF engineers can provide expert technical support, including:

- Design and development of fluid sealing systems for custom applications
- Failure analysis and system operating conditions investigations
- Testing according to customer specifications and performance standards
- Technical training at both basic and advanced levels to meet your specific needs



Truly global supply capabilities

SKF is a leading supplier of fluid sealing solutions worldwide. Thanks to the global SKF distribution network, you can expect reliable delivery service and support wherever you need it.

For off-highway applications

- Construction
- Mining
- Agriculture
- Forestry equipment
- Forklift trucks
- Material handling



Material overview

The seal material has a significant impact on seal performance and reliability. To meet the needs of different applications, SKF fluid power seals are produced in a variety of materials. The following list contains only those materials listed as standard materials for the products highlighted in this catalog.

Code	Color	Description
ECOPUR	Green	95A Polyurethane developed for optimal rod seal performance in heavy duty applications
X-ECOPUR PS	Green	60D Polyurethane developed for optimal piston seal performance in heavy duty applications
U-1003	Black	95A Polyurethane AU.
U-1023	Dark blue	93A Polyurethane AU for heavy duty applications. Better high temperature and wear resistance than EU.
U-1029	Light blue	94A Polyurethane AU for heavy duty applications. Better high temperature and wear resistance than EU.
B93	Blue	93A Polyurethane EU. Better than AU for low temperature applications. More hydrolysis resistant than AU.
W93	White	93A Polyurethane EU. Better than AU for low temperature applications. More hydrolysis resistant than AU.
PU54/199	Blue	53D Polyurethane EU for light/medium duty piston rings. More hydrolysis resistant than AU.
395A	Black	95A Polyurethane for inch-size backup rings
Y95A	Yellow	95A Polyurethane for metric-size backup rings
N70	Black	70A Nitrile (NBR) rubber
N80	Black	80A Nitrile (NBR) rubber
A-8501	Black	70A Nitrile (NBR) rubber
A-8504	Black	70A Nitrile (NBR) rubber for low temperature resilience
N70/6015	Black	70A Nitrile (NBR) with very low compression set
N80/6047	Black	80A Nitrile (NBR) rubber
A-8526	Black	90A Nitrile (NBR) with improved wear resistance
P-2506	Black	Polyamide 6/12
POM/076	Red/white	Polyacetal (POM)
P-2518	Black	Polyacetal (POM)
PA66/6011	Black	Polyamide 66 glass fiber reinforced 20%
P-2501	Black	Polyamide 66 glass fiber reinforced 30%
P-2551	Black	Polyamide 66 glass fiber reinforced 40%
PF	Brown	Phenolic resin laminated fabric
741	Brown	PTFE bronze 40%
702	Grey	PTFE glass 15% with 5% MoS ₂
292	Brown	PTFE bronze 40% with up to 5% MoS ₂ (dark brown to green grey)
ET55/161	Cream	55D Polyester thermoplastic elastomer (TPC)
ET727/075	Black	72D Polyester thermoplastic elastomer (TPC)

On the following pages, you will find general information of our standard range of hydraulic system seals. Parameters such as pressure, temperature range and velocity depend upon proper system design. Maximum values shown on the following pages may not be applied simultaneously in some applications. For more information and product recommendations, please contact your local SKF representative.



Rod seals and buffer seals

A rod seal is the dynamic pressure barrier between the cylinder body and the reciprocating piston rod. It also regulates the film of lubrication on the piston rod for optimum friction and corrosion resistance. Buffer seals protect the rod seal from pressure spikes that may occur in the system.

Description

- S1S** Single Lip U-cup. Optimized geometry and ECOPUR TPU for heavy duty applications
- ZBR** U-cup with secondary lip. Polyester TPU for heavy duty applications.
- SIL** U-cup with secondary lip. Polyether TPU for light-medium applications and low temperature performance.
- PTB** "Type-B" loaded lip U-cup for use where single-element U-cups are not adequate.
- STD** Square cross-section used for space-saving applications (usually inch sizes). Also used as heavy duty static seal or heavy duty wiper.
- DZ** Hybrid rod seal. Rubber and TPU dynamic sealing interfaces.
- DZR** Variant of DZ with triangular back-up for extremely heavy duty applications.
- RBB** TPU U-cup-style buffer with PA back-up fitting buffer grooves. Heavy duty applications.
- S9B** PTFE buffer seal with O-ring energizer.
- RSB** Heavy duty buffer with PTFE or PA seal ring and molded rubber energizer. Patented geometry provides optimum protection from pressure spikes.

Rod seals and buffer seals

Design	Pressure ¹⁾	Temperature ²⁾	Maximum linear velocity ³⁾	Material
–	bar (psi)	°C (°F)	m/s (ft/min)	–
 S1S	0 to 400 (0 to 5 800)	–40 to 120 (–40 to 250)	1 (200)	ECOPUR
 ZBR	0 to 400 (0 to 5 800)	–40 to 120 (–40 to 250)	1 (200)	TPU U-1029
 SIL	0 to 350 (0 to 5 075)	–50 to 100 (–58 to 210)	0,5 (100)	TPU B93
 PTB	–1 to 400 (–14 to 5 800)	–40 to 110 (–40 to 230)	1 (200)	TPU U-1003 and NBR A-8501
 STD	0 to 400 (0 to 5 800)	–40 to 110 (–40 to 230)	1 (200)	TPU U-1003 and NBR A-8501
 DZ	0 to 400 (0 to 5 800)	–50 to 110 (–58 to 230)	1 (200)	TPU U-1003 and NBR A-8504
 DZR	0 to 690 (0 to 10 000)	–50 to 120 (–58 to 250)	1 (200)	TPU U-1003 and PA P-2506
 RBB	0 to 400 (0 to 5 800)	–40 to 120 (–40 to 250)	1 (200)	TPU U-1029 light blue, and PA P-2506 (inch) or POM P-2518 (metric)
 S9B	0 to 400 (0 to 5 800)	–60 to 120 (–75 to 250)	1 (200)	PTFE 741 or 702, and NBR N70
 RSB	0 to 400 (0 to 5 800)	–60 to 120 (–75 to 250)	1 (200)	PTFE 741 or PA P-2506 and NBR A-8501

¹⁾ Pressure limits depend upon metal clearances and temperature. For higher pressures special anti-extrusion rings can be provided. See publication 12393 or contact SKF for additional information.

²⁾ Performance and seal life can be affected near the high or low end of temperature limits. Not for prolonged exposure. See publication 12393 or contact SKF for additional information.

³⁾ Higher velocities may be acceptable with special system design considerations or at reduced pressure or temperature. See publication 12393 or contact SKF for additional information.



Piston seals

The piston seal is the dynamic pressure barrier between the reciprocating piston and the cylinder tube bore. It must be tight enough to avoid flow past the piston in dynamic and static states. At the same time, the piston seal must allow a certain oil film to minimize friction and wear.

Description

- MPV** Heavy duty TPU piston ring with side vents. Rectangular rubber expander. Fits ISO 7425 grooves
- DPV** Heavy duty TPU piston ring with side vents. Rectangular rubber expander. Fits inch size grooves common in North America
- LPV** Light-to-medium duty TPU piston ring with side vents. O-ring energizer. Fits ISO 7425 grooves
- CPV** TPU piston ring with O-ring expander. Fits inch size o-ring grooves. Also used as heavy duty static seal or light duty oscillating seal.
- CUT** GFR PA piston ring with step-shaped split to allow installation and effective sealing. Rectangular rubber expander. Fits ISO 7425 grooves.
- SCP** Inch size GFR PA piston ring with step-shaped split to allow installation and effective sealing. Oval rubber expander. Fits inch size grooves common in North America.
- LCP** Four piece "capped T-seal" of PTFE with rubber energizer and patented locking PA back-up rings.
- LTP** Rubber "T-seal" with patented locking PA back-up rings.
- MD-L** Five piece piston seal incorporating guide rings. Some sizes fitting ISO 6457 grooves.
- GH** PTFE piston ring with side vent notches. Available with O-ring or square-ring expander.
- APR** PTFE piston ring with rubber X-ring in the dynamic interface and side vent notches. Available with O-ring or square-ring expander.
- UNP** Single acting piston U-cup. Polyester TPU for heavy duty applications

Piston seals

Design	Pressure ¹⁾	Temperature ²⁾	Maximum linear velocity ³⁾	Material
–	bar (psi)	°C (°F)	m/s (ft/min)	–
 MPV	0 to 400 (0 to 5 800)	–50 to 120 (–58 to 210)	0,5 (100)	X-ECOPUR PS and NBR N80
 DPV	0 to 400 (0 to 5 800)	–40 to 120 (–40 to 250)	0,5 (100)	X-ECOPUR PS and NBR A-8501
 LPV	0 to 250 (0 to 3 625)	–50 to 100 (–58 to 210)	0,5 (100)	PU54/199 and NBR N70
 CPV	0 to 345 (0 to 5 000)	–50 to 110 (–58 to 230)	0,5 (100)	TPU U-1003 and NBR -N70
 CUT	0 to 500 (0 to 7 250)	–40 to 120 (–40 to 250)	1 (200)	PA66/6011 black and NBR N70/6015
 SCP	0 to 690 (0 to 10 000)	–50 to 120 (–58 to 250)	1 (200)	PA P-2501 or P-2551 and NBR A-8526
 LCP	0 to 690 (0 to 10 000)	–50 to 120 (–58 to 250)	1,5 (300)	PTFE 741 or 702 and NBR A-8501 and PA P-2506
 LTP	0 to 345 (0 to 5 000)	–40 to 110 (–40 to 230)	0,5 (100)	NBR A-8501 and PA P-2506
 MD-L	0 to 250 (0 to 3 625)	–40 to 110 (–40 to 230)	1 (200)	NBR N80/6047 and TPC ET727/075 and POM /076
 GH	0 to 400 (0 to 5 800)	–50 to 120 (–58 to 250)	1 (200)	PTFE 292 (metric) or PTFE 741 (inch) and NBR N70
 APR	0 to 350 (0 to 5 075)	–50 to 120 (–58 to 250)	1 (200)	PTFE 741 or 702, and NBR A-8501
 UNP	0 to 350 (0 to 5 075)	–40 to 120 (–40 to 250)	1 (200)	TPU U-1029

¹⁾ Pressure limits depend upon metal clearances and temperature. See publication 12393 or contact SKF for additional information.

²⁾ Performance and seal life can be affected near the high or low end of temperature limits. Not for prolonged exposure. See publication 12393 or contact SKF for additional information.

³⁾ Higher velocities may be acceptable with special system design considerations or at reduced pressure or temperature. See publication 12393 or contact SKF for additional information.











Wiper seals

Contaminants in the hydraulic system are a common cause of breakdowns and premature seal failures. The wiper prevents contaminants from being transported into the system with the reciprocating piston rod.

Description

- PA** Single-acting wiper. Used extensively in off highway equipment.
- PAD** Double-acting wiper. Prevents excess lubrication film outstroke.
- PADV** Vented PAD (hole through in-wiper lip). Vent prevents wiper from blowing out if the rod seal becomes damaged and leaks.
- MCW** Flush-mount sharp single acting wiper.
- DTW** Single-acting snap-in wiper. Vented ID heel to prevent blow-out. OD static side sealing lip.
- HW** Double-acting snap-in wiper. No vents. Use with back-venting rod seal designs.
- DX** Patented snap-in with single-acting wiper functional benefits of press-in, plus better rod tracking. Vented heel.
- STD** Loaded rod seal often used as aggressive single-acting wiper. Fits in some D-series wiper grooves.

Wiper seals

Design	Function	Mounting	Maximum linear velocity ¹⁾	Material
–	–	–	m/s (ft/min)	–
 PA	Single-acting	Press-in fit	1 (200)	TPU W93
 PAD	Double-acting	Press-in with retainer	1 (200)	TPU W93
 PADV	Double-acting, vented	Press-in fit	1 (200)	TPU W93
 MCW	Single-acting	Press-in fit	1,5 (300)	TPU U-1029 (metric) or TPU U-1023 (inch)
 DTW	Single-acting, vented	Snap-in	0,75 (150)	TPU U-1003
 HW	Double-acting	Snap-in	0,75 (150)	TPU U-1003
 DX	Single-acting, vented	Snap-in two piece	1 (200)	TPU U-1003 or U-1004 and NBR N70
 STD	Single-acting, loaded	Snap-in	1 (200)	TPU U-1003 and NBR A-8501

¹⁾ Higher velocities may be acceptable with special system design considerations or at reduced pressure or temperature. See publication 12393 or contact SKF for additional information





Guide rings

Non-metallic guide rings prevent wear and damage to the cylinder bore and piston rod sealing surfaces. The radial loads in sliding motion are accommodated by these guides, and metal-to-metal contact is avoided. This increases the life of the cylinder components and seals.

Description

- RGR** Rod guide ring with angle cut. Precision machined for heavy duty applications.
- WAT** Rod or piston guide ring with angle cut. Precision machined for heavy duty applications.
- PGR** Piston guide ring with angle cut. Precision machined for heavy duty applications.



Guide rings						
Design	Ultimate compressive strength	Maximum recommended dynamic load at 80 °C	Temperature	Maximum linear velocity	Material	Material specification
–	MPa (psi)	MPa (psi)	°C (°F)	m/s (ft/min)	–	–
 WAT	158 (23 000)	30 (4 350)	–100 to 120 (–150 to 250)	1 (200)	GFR PA	P-2551
 PGR/RGR	240 (34 800)	30 (4 350)	–40 to 120 (–40 to 250)	0,5 (100)	Phenolic and fabric	PF

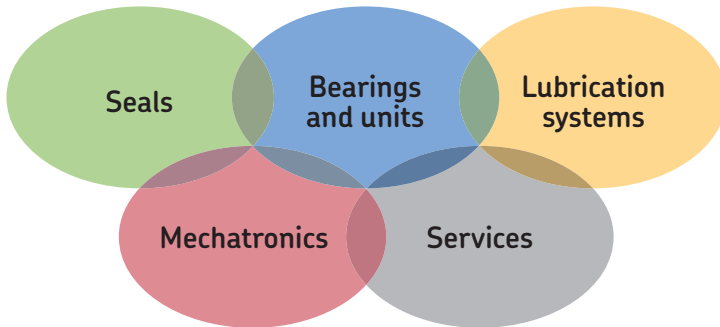
Static seals and back-up rings

O-rings are often used as static sealing elements in hydraulic systems, however, at high pressure, they tend to extrude into the clearance gaps between components. An appropriate solution is to combine the O-ring with one or two back-up rings.

Description

- OR** Elastomer O-rings available in various inch and metric sizes.
- STR** Non-split o-ring back-up. Available in TPU and TPC.

O-rings					
Design	Type	Pressure at 90 °C and 0,2 mm gap	Hardness	Material	Material specification
–	–	bar	shore	–	–
 OR	O-ring static seal	100 (without STR)	70A	Nitrile rubber	N70
 STR	O-ring backup	330 (4 750) in TPU 480 (6 950) in TPC	95A 55D	Polyurethane Polyester thermoplastic elastomer	TPU Y95A or TPU 395A or TPC ET55/161



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 services. A global presence provides SKF customers uniform quality standards and worldwide product availability.

® SKF and ECOPUR are registered trademarks of the SKF Group.

© SKF Group 2012

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 46/S2 12112 EN · September 2012

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