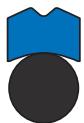
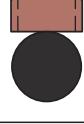
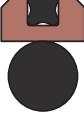


Piston seals

Profile overview	46	Profile data	
Basics	48	2.1 MPV	58
Materials	48	Metric sizes	59
Gap extrusion	48	2.2 DPV	60
Piston guidance	48	Inch sizes	61
Piston drift	49	2.3 LPV.....	62
Sealing between piston and rod.....	49	Metric sizes	63
Double-acting piston seals	50	2.4 CPV	64
Piston seals with polyurethane slide rings	50	Inch sizes	65
MPV profiles	50	2.5 GH	66
DPV profiles	51	Metric sizes	67
LPV profiles	51	Inch sizes	70
CPV profiles	51	2.6 APR	76
Piston seals with PTFE slide rings.....	52	Metric sizes	77
GH profiles	52	Inch sizes	79
APR profiles	52	2.7 LCP.....	82
Piston seals incorporating anti-extrusion rings	53	Metric sizes	83
LCP profiles.....	53	Inch sizes	85
LTP profiles.....	53	2.8 LTP.....	86
Piston seals with rigid split slide rings..	54	Inch sizes	87
CUT profiles	54	2.9 CUT	90
SCP profiles	54	Metric sizes	91
Piston seals with integrated guide rings	55	2.10 SCP.....	94
MD-L profiles	55	Inch sizes	95
Single-acting piston seals	56	2.11 MD-L	98
UNP profiles	56	Metric sizes	99
Single-acting piston seals in double-acting cylinders	56	2.12 UNP	102
Rod seals used as single-acting piston seals	56	Metric sizes	103
		Inch sizes	105
		More piston seals	108
		More PTFE slide ring piston seals	108
		SPECTRASEAL.....	108
		Customized machined seal profiles	108

Piston seals

Profile overview

Profile	Description	Additional information → page	Profile data → page
MPV 	Polyurethane slide ring, nitrile rubber energizer; suitable for medium to heavy duty applications	50	58 (metric)
DPV 	Polyurethane slide ring, nitrile rubber energizer; fits O-ring dash-number housings; suitable for medium to heavy duty applications	51	60 (inch)
LPV 	Polyether-based polyurethane slide ring, nitrile rubber energizer; suitable for light to medium duty applications	51	62 (metric)
CPV 	Polyurethane slide ring, nitrile rubber energizer; fits O-ring dash-number housings; suitable for light to medium duty applications	51	64 (inch)
GH 	PTFE slide ring, nitrile rubber energizer; low breakaway friction; suitable for medium duty applications	52	66 (metric and inch)
APR 	PTFE slide ring with incorporated nitrile rubber X-ring for improved sealing performance, nitrile rubber energizer; suitable for medium to heavy duty applications	52	76 (metric and inch)
LCP 	PTFE slide ring supported by polyamide anti-extrusion rings, nitrile rubber energizer; very good gap extrusion resistance; suitable for heavy duty applications and high pressures	53	82 (metric and inch)
LTP 	Sealing ring made of nitrile rubber, supported by polyamide anti-extrusion rings; good gap extrusion resistance; fits O-ring dash-number housings; suitable for medium to heavy duty applications and high pressures	53	86 (inch)

Profile overview

2

Profile	Description	Additional information → page	Profile data → page
CUT	Step cut polyamide slide ring, nitrile rubber energizer; suitable for heavy duty applications and high pressures	54	90 (metric)
SCP	Step cut polyamide slide ring, oval nitrile rubber energizer; fits wide, shallow inch size housings; suitable for heavy duty applications and high pressures	54	94 (inch)
MD-L	Five-piece compact set consisting of a nitrile rubber sealing ring, integrated polyester elastomer anti-extrusion rings and polyacetal guide rings; suitable for medium duty applications	55	98 (metric)
UNP	Polyurethane U-cup profile; single-acting; may be used in double-acting cylinders when using two seals in back-to-back arrangement; suitable for medium duty applications	56	102 (metric and inch)

Rod seals that can be used as piston seals

PTB	These rod seal profiles are designed with similar inside and outside sealing geometry. Therefore, they can also be used as piston seals (<i>→ Rod seals used as single-acting piston seals, page 56</i>).	→ Rod and buffer seals, page 111	138 (metric and inch)
STD			164 (inch)
DZ			178 (metric and inch)

Piston seals

Basics

Piston seals (**→ fig. 1**) maintain sealing contact between the piston and the cylinder bore. Differential pressures acting on the piston to extend or retract the piston rod can be in excess of 400 bar (5 800 psi). The pressure acting on the piston seal increases contact forces between the piston seal and cylinder surface. Therefore, the surface properties of the sealing surfaces are critical to proper seal performance (**→ Counter-surface finish properties, page 22**).

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

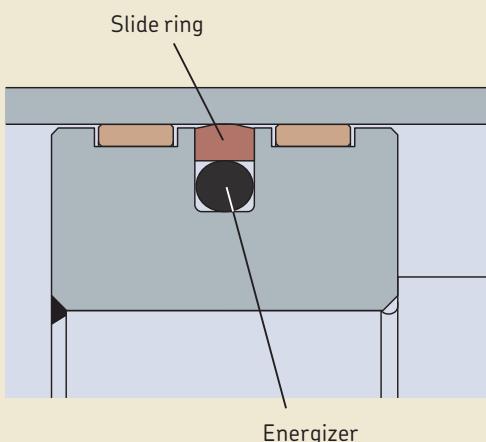
Materials

Depending on the profile and the required characteristics of its components, a piston seal can consist of one or several materials. Common materials used for piston seals are thermoplastic polyurethane (TPU), polytetrafluoroethylene (PTFE), polyamide (PA), and nitrile rubber (NBR). The standard materials used for a specific profile are provided in the *Profile overview* (**→ page 46**) and in the relevant profile sections below.

For additional information, refer to *Materials* (**→ page 26**).

Fig. 1

Typical piston seal arrangement for double-acting cylinders



Gap extrusion

External forces acting on the piston rod, reacted by the fluid inside the cylinder, can result in abrupt pressure peaks. These peaks can be far in excess of the system operating pressure and may press a piston seal into the gap between the piston and bore, thereby causing damage to the seal and adversely affecting seal performance and cylinder operation. Seal materials must be carefully chosen to avoid gap extrusion (**→ Gap extrusion, page 34**). This risk of gap extrusion can also be minimized by using seals with anti-extrusion rings (**→ Piston seals incorporating anti-extrusion rings, page 53**).

Piston guidance

Guide rings avoid sliding metal-to-metal contact between the piston and cylinder bore and accommodate the radial loads of forces acting on the cylinder assembly. Although piston seals are designed to accommodate slight radial motion between the piston and bore, effective guide ring function to accurately centre the piston within the bore is important for piston seal performance. For additional information about piston guidance, refer to *Guide rings and guide strips* (**→ page 249**).

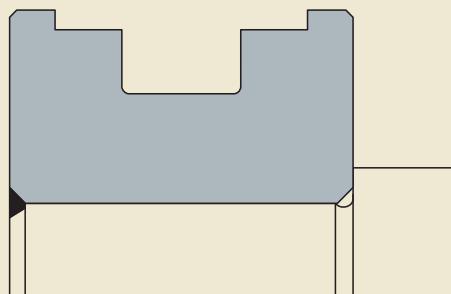
More information

Counter-surface finish properties	22
Materials	26
Hydraulic fluids	31
Gap extrusion	34
Storage	36
Installation and assembly	38

Basics

Fig. 2

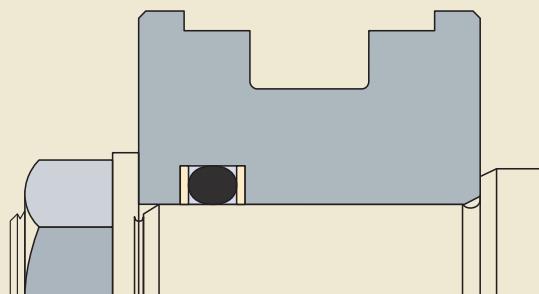
Piston welded to the rod end tap



2

Fig. 3

Piston fixed to the rod by a lock nut and with a static seal and two back-up rings between piston and rod end

**Piston drift**

When the piston rod is at rest and held in position by fluid, any amount of flow passing the piston can result in an unintended movement of the piston rod and cause drift. Although piston seal leakage is a possible source of drift, internal valve leakage, external system leakage and flow between the piston and rod static connections should also be carefully checked. In some applications, a minimal amount of flow passing the piston seal within specified limits is permitted. This accepted flow allows the use of piston seals of low friction designs and materials or split slide rings for easy installation.

Sealing between piston and rod

The piston can be welded to the rod (**→ fig. 2**) if the disassembly of the cylinder can be done by removing the rod end attachment. The piston can also be fixed to the rod end by a lock nut (**→ fig. 3**), which enables removing the piston from the rod during complete disassembly of the cylinder. When using a lock nut, static sealing (**→ O-rings and back-up rings, page 291**) is required between the piston and the rod end.

Piston seals

Double-acting piston seals

Double-acting cylinders are the most widely used cylinder types. They operate with pressure on both sides and, therefore, require double-acting seal arrangements (→ fig. 1, page 48).

Double-acting piston seals have a symmetrical profile (cross section) and identical sealing functions in both directions. Typically, double-acting piston seals consist of a slide ring and an energizer. The deformation of the elastomeric energizer when installed provides adequate force to keep the slide ring in dynamic sealing contact with the cylinder bore, while sealing statically against the seal housing groove.

A double-acting cylinder typically has the same fluid on both sides of the piston. Therefore, a relatively thick lubrication film can be permitted between the piston seal and the cylinder bore to minimize friction and wear. The transportation of fluid occurring during dynamic operation is, however, small and insignificant in most applications.

In some older cylinder designs, O-rings were used as piston seals. To allow easy replacement of O-rings with the equivalent piston seals, the housing dimensions for some double-acting piston seals are the same as those for dash-number O-rings. Therefore, these housings are also called O-ring dash-number housings.

SKF supplies double-acting piston seals in many different profiles and in a wide range of series and sizes, which make them appropriate for a wide variety of operating conditions and applications.

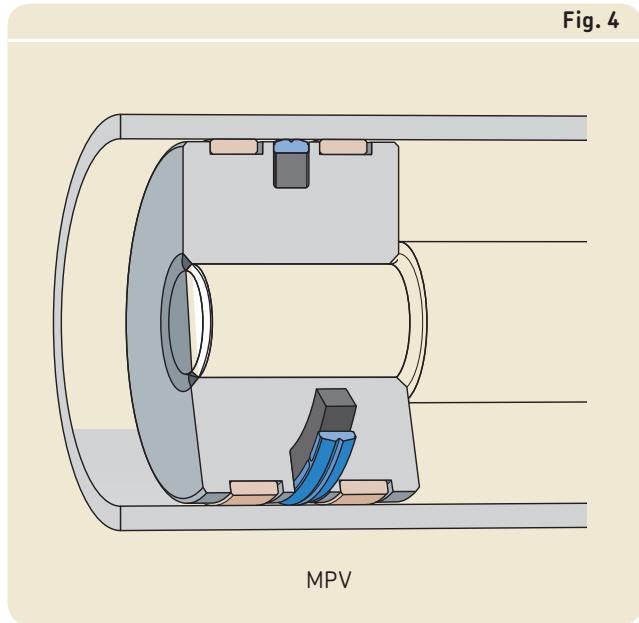
Piston seals with polyurethane slide rings

Piston seals with thermoplastic polyurethane (TPU) slide rings have a nitrile rubber (NBR) energizer. The wear-resistant slide ring has a profiled dynamic sealing surface. Its geometry is optimized to reduce friction and resist gap extrusion. Notches in the slide ring edges ensure rapid pressurization of the seal to react to abrupt changes in pressure. These profiles can usually be installed without special equipment and are resistant to damage during installation and cylinder assembly.

MPV profiles

MPV profiles (→ fig. 4) have slide rings made of X-ECOPUR PS (TPU) developed for pressures up to 400 bar (5 800 psi). They are suitable for high fluid temperatures and in medium to heavy duty applications, such as earthmoving equipment. MPV profiles are available in metric sizes and some fit seal housings in accordance with ISO 7425-1.

Fig. 4



Double-acting piston seals

DPV profiles

DPV profiles (→ fig. 5) have slide rings made of X-ECOPUR PS (TPU) developed for pressures up to 400 bar (5 800 psi). They are suitable for high fluid temperatures and for medium to heavy duty applications such as earthmoving equipment. DPV profiles are available in inch sizes where O-ring dash-number housings are used.

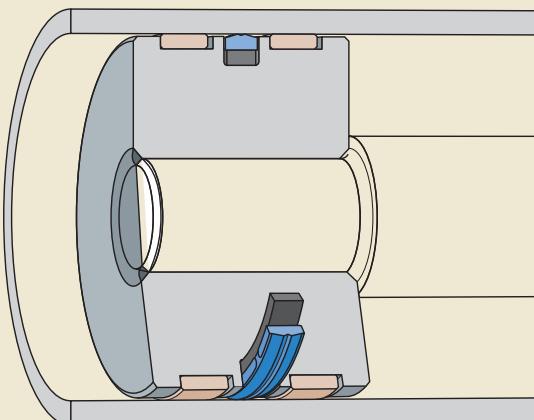
LPV profiles

LPV profiles (→ fig. 6) have a polyether-based polyurethane (EU) slide ring that provides resistance to hydrolysis (attack from moisture) and good low temperature flexibility. The O-ring energizer provides a cost-effective sealing solution. These profiles are developed for pressures up to 250 bar (3 625 psi) and suitable for light to medium duty applications, such as agriculture and material handling applications. They are available in metric sizes and some fit seal housings in accordance with ISO 7425-1.

CPV profiles

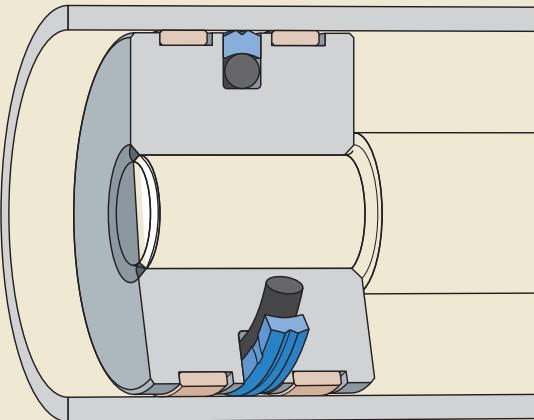
CPV profiles (→ fig. 7) have a polyester-based polyurethane (AU) slide ring. These profiles are developed for pressures up to 345 bar (5 000 psi) and suitable for light to medium duty applications. They are available in inch sizes where O-ring dash-number housings are used.

Fig. 5



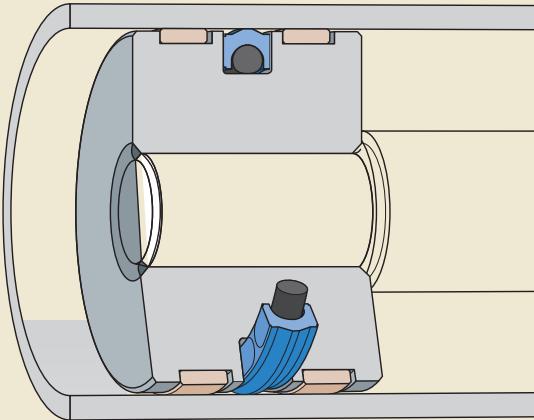
DPV

Fig. 6



LPV

Fig. 7



CPV

Piston seals

Piston seals with PTFE slide rings

PTFE slide rings may be preferred in applications with demands for low breakaway friction and when it comes to chemical and thermal resistance. Notches in the slide ring edges ensure rapid pressurization of the seal to react to abrupt changes in pressure. PTFE is hard and non-elastic when compared with polyurethane and rubber materials. For additional information about piston seal materials, refer to *Materials* (→ page 48).

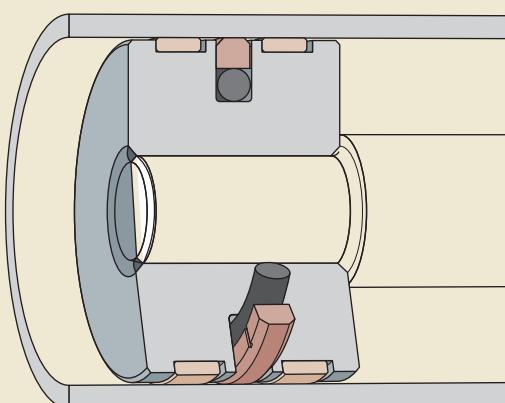
GH profiles

GH profiles (→ fig. 8) have a nitrile rubber (NBR) energizer, which is an O-ring as standard. Rectangular energizers are available on request. These profiles are suitable for pressures up to 400 bar (5 800 psi) in medium to heavy duty applications. GH profiles are available in metric and inch sizes and some metric sizes fit seal housings in accordance with ISO 7425-1.

APR profiles

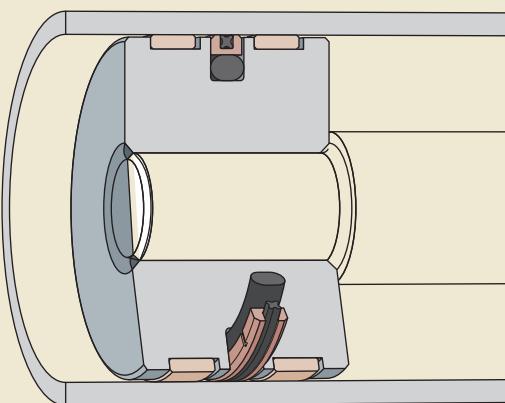
APR profiles (→ fig. 9) have a nitrile rubber (NBR) O-ring energizer. The PTFE slide ring incorporates an NBR X-ring to improve sealing performance. They are suitable for pressures up to 350 bar (5 075 psi) in medium to heavy duty applications. APR profiles are available in metric and inch sizes and some metric sizes fit seal housings in accordance with ISO 7425-1.

Fig. 8



GH

Fig. 9



APR

Double-acting piston seals

Piston seals incorporating anti-extrusion rings

These SKF piston seals incorporate patented locking anti-extrusion rings made of polyamide (PA). They are split for easy installation. Their snap-in design makes it easy to identify the correct installation direction (→ fig. 10), holds them in place when installed and prevents damage during assembly.

Piston seals incorporating anti-extrusion rings have an improved high pressure performance and minimize the risk of gap extrusion at abrupt pressure peaks (→ *Gap extrusion, page 48*).

LCP profiles

LCP (→ fig. 11) profiles have a PTFE slide ring supported by harder PA anti-extrusion rings (→ fig. 10) and a T-shaped nitrile rubber (NBR) energizer. These capped T-seals are suitable for pressures up to 690 bar (10 000 psi) and available in metric and inch sizes. Some metric sizes fit seal housings in accordance with ISO 5597.

LTP profiles

LTP profiles (→ fig. 12) have a nitrile rubber (NBR) sealing ring supported by harder PA anti-extrusion rings on both sides. These T-seals are suitable for pressures up to 345 bar (5 000 psi) in medium to heavy duty applications and are available in inch sizes where O-ring dash-number housings are used.

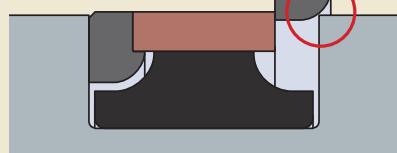
Fig. 10

Patented locking anti-extrusion rings

Correct installation direction and position

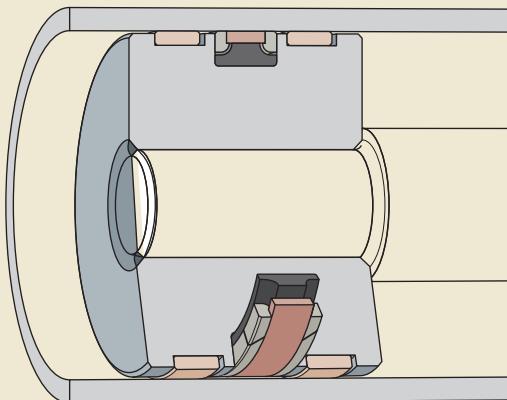


Wrong installation direction



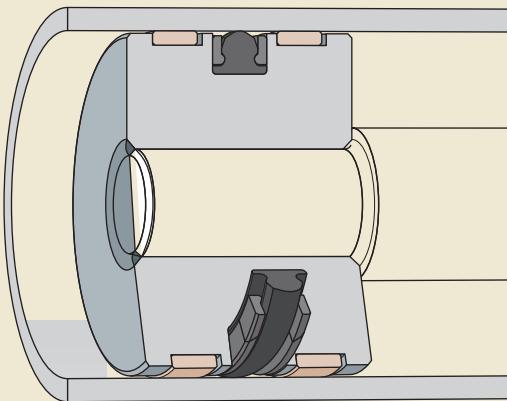
2

Fig. 11



LCP

Fig. 12



LTP

Piston seals

Piston seals with rigid split slide rings

These SKF piston seals have a rigid split slide ring made of glass fibre reinforced polyamide and a nitrile rubber (NBR) energizer. The rigid slide ring has high resistance to wear and gap extrusion. The slide ring also provides low friction, even at high pressures. The split slide ring design facilitates the installation process into a closed housing.

CUT profiles

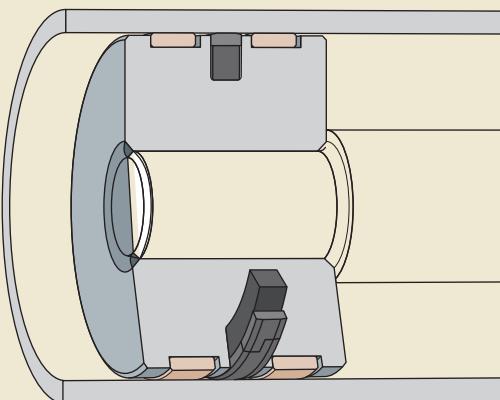
CUT profiles (→ fig. 13) have a step cut slide ring and a rectangular energizer. They are suitable for pressures up to 500 bar (7 250 psi) in heavy duty applications. CUT profiles are available in metric sizes and some fit seal housings in accordance with ISO 7425-1.

They can be used for short pressure pulses and shock loads with proper system design. For additional information, contact SKF.

SCP profiles

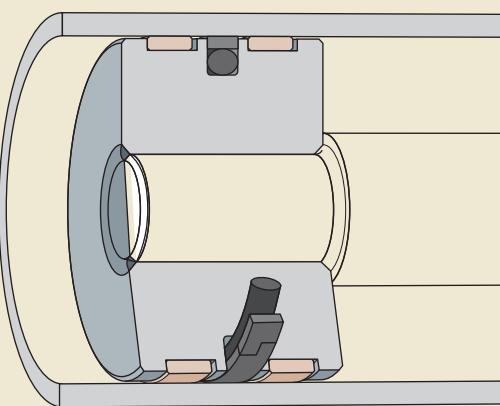
SCP profiles (→ fig. 14) have a step cut slide ring and an oval energizer. They are suitable for pressures up to 690 bar (10 000 psi) in heavy duty applications and are available in inch sizes.

Fig. 13



CUT

Fig. 14



SCP

Double-acting piston seals

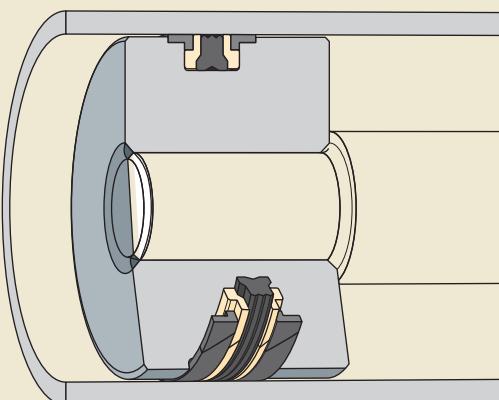
Piston seals with integrated guide rings

These seals are designed as compact sets that incorporate the piston seal and guide rings into one assembly. Typically, they are applied as an all-in-one piston seal solution.

MD-L profiles

MD-L profiles (→ fig. 15) have a nitrile rubber (NBR) sealing ring with thermoplastic polyester elastomer (TPC) anti-extrusion rings on both sides, which incorporate the polyacetal (POM) guide rings. The guide and anti-extrusion rings are split for easy installation. MD-L profiles are suitable for pressures up to 250 bar (3 625 psi) in medium duty applications and are available in metric sizes. Some sizes fit seal housings in accordance with ISO 6547.

Fig. 15



2

Piston seals

Single-acting piston seals

A single-acting piston seal is designed for cylinders where pressure is applied from one side only. The piston in single-acting cylinders may have oil on the pressure side only, while the opposite side is open to atmosphere. Therefore, the piston seal must leave a minimum of oil film when passing along the cylinder bore since the transportation of oil otherwise would result in a leakage to the exterior.

In single-acting cylinders, the open end may push air out and draw air in as the piston reciprocates. This air may carry moisture and contaminants into the cylinder, which can lead to seal damage. Vent filters may be fitted to the open side of the cylinder to reduce contaminants entering the inside of the cylinder. The cylinder bore may be hard chromium plated to prevent corrosion.

In addition, to prevent damage to the cylinder bore or piston seals, SKF can supply special piston wiper seals on request. For additional information, contact SKF.

UNP profiles

UNP profiles (→ fig. 16) are single-acting U-cup seals made of thermoplastic polyurethane (TPU). They are suitable for pressures up to 350 bar (5 075 psi) and are available in metric and inch sizes. In case of higher pressures, SKF provides full-face anti-extrusion rings on request. For additional information, contact SKF.

Single-acting piston seals in double-acting cylinders

Two single-acting U-cup profile seals, facing in opposite directions, can be used in a double-acting cylinder. It is important to select seal designs which can relieve reverse pressure for such arrangements to prevent build-up of pressure between the two seals. UNP profiles are suitable for such double-acting arrangements because the dynamic seal lip can flex to relieve reverse pressure.

Rod seals used as single-acting piston seals

Some rod seal profiles are designed with similar inside and outside sealing geometry and, therefore, can also be used as single-acting piston seals in single- or double-acting cylinders (→ fig. 17). PTB, STD and DZ rod seal profiles (→ Rod and buffer seals, page 111) can be used for those applications.

Rod seals with loaded-lip U-cup profiles may not relieve reverse pressure, but it is possible to remove their energizer (X-ring) from one of the seals to allow reverse pressure relief (→ fig. 17).

Fig. 16

UNP profile piston seal with a wiper seal

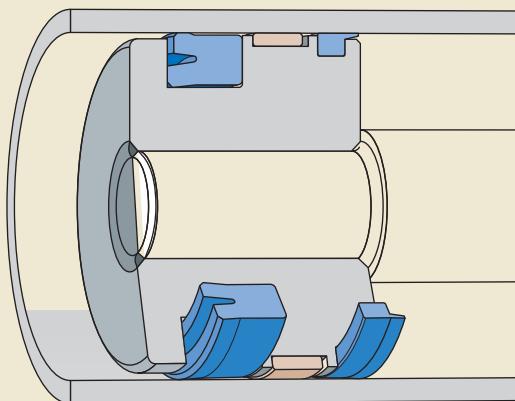
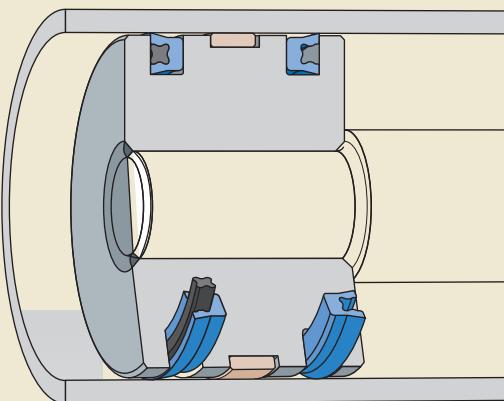


Fig. 17

STD profiles used as piston seals (in a double-acting arrangement)



Single-acting piston seals

2

2.1 MPV profile

MPV profile data

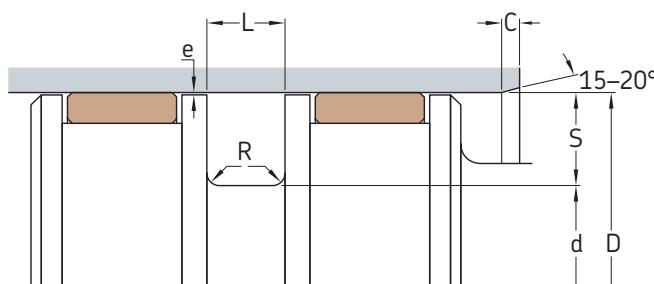


Material codes	Slide ring: X-ECOPUR PS Energizer: N80/198 For additional information → page 26
Pressure	Up to 400 bar (5 800 psi)
Speed	Up to 1 m/s (3.2 ft/s)
Temperature range	<p> -60 -50 -40 110 120 130 [°C] -75 -60 -40 230 250 265 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> █ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range █ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) █ Recommended operating temperature range for this profile and material █ Temperatures above the recommended operating range: acceptable only with reduced pressure, speed, and/or e-gap █ Extreme high temperature range: only occasional short-term exposure (e.g. cylinder in curing oven of a powder coating process)
Dimension standards	Some sizes fit seal housings in accordance with ISO 7425-1.
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature, e-gap) should not be applied continuously nor simultaneously.

2.1 MPV profile piston seals, metric sizes

D 50 – 200 mm



Maximum extrusion gap e

Radial depth S mm	e_{\max} at 80 °C (175 °F) for pressures		
	160 bar	250 bar	400 bar
3,75	0,4	0,4	–
5,5	0,5	0,4	0,3
7,75	0,6	0,45	0,3
10,5	0,7	0,55	0,4

For additional information → page 34

2.1

Dimensions

Designation

D H9	d h9	L +0,2	S	R max.	C min.	Designation
50	34,5	6,3	7,75	1,3	5	• MPV-50x34.5x6.3
55	39,5	6,3	7,75	1,3	5	MPV-55x39.5x6.3
60	44,5	6,3	7,75	1,3	5	MPV-60x44.5x6.3
63	47,5	6,3	7,75	1,3	5	• MPV-63x47.5x6.3
65	49,5	6,3	7,75	1,3	5	MPV-65x49.5X6.3
70	54,5 59	6,3 4,2	7,75 5,5	1,3 1,3	5	MPV-70x54.5X6.3 MPV-70x59X4.2
75	59,5	6,3	7,75	1,3	5	MPV-75x59.5x6.3
80	59 64,5	8,1 6,3	10,5 7,75	1,8 1,8	6	MPV-80x59x8.1 • MPV-80x64.5x6.3
85	64	8,1	10,5	1,8	6	MPV-85x64x8.1
90	69	8,1	10,5	1,8	6	MPV-90x69x8.1
100	79	8,1	10,5	1,8	6	MPV-100x79x8.1
110	89	8,1	10,5	1,8	6	MPV-110x89x8.1
120	99	8,1	10,5	1,8	6	MPV-120x99x8.1
125	104	8,1	10,5	1,8	6	MPV-125x104x8.1
130	109	8,1	10,5	1,8	6	MPV-130x109x8.1
150	129	8,1	10,5	1,8	6	MPV-150x129x8.1
160	139	8,1	10,5	1,8	6	• MPV-160x139x8.1
180	159	8,1	10,5	1,8	6	MPV-180x159x8.1
200	179	8,1	10,5	1,8	6	• MPV-200x179x8.1

Other sizes are available on request

• Seal housing dimensions in accordance with ISO 7425-1

2.2 DPV profile

DPV profile data

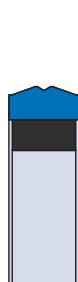


Material codes	Slide ring: X-ECOPUR PS Energizer: A-8501 For additional information → page 26
Pressure	Up to 400 bar (5 800 psi)
Speed	Up to 1 m/s (3.2 ft/s)
Temperature range	<p> -60 -40 -30 110 120 130 [°C] </p> <p> -75 -40 -20 230 250 265 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> █ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range █ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) █ Recommended operating temperature range for this profile and material █ Temperatures above the recommended operating range: acceptable only with reduced pressure, speed, and/or e-gap █ Extreme high temperature range: only occasional short-term exposure (e.g. cylinder in curing oven of a powder coating process)
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature, e-gap) should not be applied continuously nor simultaneously.

2.2 DPV profile piston seals, inch sizes

D 1 – 6.002 in.



Maximum extrusion gap e

Radial depth S	Series	e _{max} at 80 °C (175 °F) for pressures	2 300 psi	3 600 psi	5 800 psi
in.	-	in.			
0.125	2	0.012	0.008	–	
0.187	3	0.018	0.012	0.008	
0.25	4	0.022	0.016	0.01	

For additional information → page 34

2.2

Dimensions

Designation

D +0.002	d Tolerance	L +0.005	S	R max.	C min.	Designation
1	0.758 -0.002	0.187	0.125	0.02	0.125	DPV-210-KOM
1.5	1.258 -0.002	0.187	0.125	0.02	0.125	DPV-218-KOM
1.75	1.508 -0.002	0.187	0.125	0.02	0.125	DPV-222-KOM
2	1.63 -0.002	0.281	0.187	0.025	0.156	DPV-326-KOM
2.25	1.88 -0.002	0.281	0.187	0.025	0.156	DPV-328-KOM
2.5	2.13 -0.002	0.281	0.187	0.025	0.156	DPV-330-KOM
2.75	2.38 -0.002	0.281	0.187	0.025	0.156	DPV-332-KOM
3	2.63 -0.002	0.281	0.187	0.025	0.156	DPV-334-KOM
3.5	3.13 -0.002	0.281	0.187	0.025	0.156	DPV-338-KOM
3.75	3.38 -0.002	0.281	0.187	0.025	0.156	DPV-340-KOM
4	3.63 -0.002	0.281	0.187	0.025	0.156	DPV-342-KOM
4.5	4.13 -0.002	0.281	0.187	0.025	0.156	DPV-346-KOM
5	4.63 -0.002	0.281	0.187	0.025	0.156	DPV-350-KOM
5.502	5.028 -0.004	0.375	0.25	0.032	0.187	DPV-429-KOM
6.002	5.528 -0.004	0.375	0.25	0.032	0.187	DPV-433-KOM

Other sizes are available on request

2.3 LPV profile

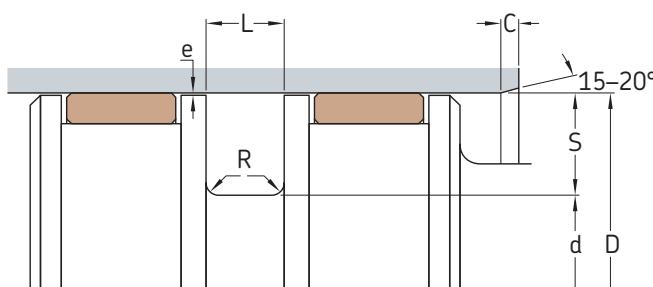
LPV profile data



Material codes	Slide ring: PU54/199 Energizer: N70/6052 For additional information → page 26
Pressure	Up to 250 bar (3 625 psi)
Speed	Up to 0,5 m/s (1.6 ft/s)
Temperature range	<p> -60 -50 -40 90 100 110 [°C] -75 -60 -40 195 210 230 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> █ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range █ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) █ Recommended operating temperature range for this profile and material █ Temperatures above the recommended operating range: acceptable only with reduced pressure, speed, and/or e-gap █ Extreme high temperature range: only occasional short-term exposure (e.g. cylinder in curing oven of a powder coating process)
Dimension standards	Some sizes fit seal housings in accordance with ISO 7425-1.
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature, e-gap) should not be applied continuously nor simultaneously.

2.3 LPV profile piston seals, metric sizes D 25 – 100 mm



Maximum extrusion gap e

Radial depth S	e _{max} at 80 °C (175 °F) for pressures 160 bar	e _{max} at 80 °C (175 °F) for pressures 250 bar
mm	mm	mm
3,75	0,3	0,2
5,5	0,4	0,25
7,75	0,4	0,3
10,5	0,5	0,4

For additional information → page 34

2.3

Dimensions

Designation

D H9	d h9	L +0,2	S	R max.	C min.	Designation
25	17,5	3,2	3,75	0,5	2	• LPV 25x17.5x3.2
30	22,5	3,2	3,75	0,5	2	LPV 30x22.5x3.2
32	24,5	3,2	3,75	0,5	2	• LPV 32x24.5x3.2
35	24	4,2	5,5	0,5	2,5	LPV 35x24x4.2
40	29	4,2	5,5	0,5	2,5	• LPV 40x29x4.2
50	39	4,2	5,5	0,5	2,5	• LPV 50x39x4.2
55	44	4,2	5,5	0,5	2,5	LPV 55x44x4.2
60	49	4,2	5,5	0,5	2,5	LPV 60x49x4.2
63	52	4,2	5,5	0,5	2,5	• LPV 63x52x4.2
65	54	4,2	5,5	0,9	2,5	LPV 65x54x4.2
70	59	4,2	5,5	0,9	2,5	LPV 70X59X4.2
80	64,5	6,3	7,75	0,9	4	• LPV 80x64.5x6.3
90	74,5	6,3	7,75	0,9	4	LPV 90x74.5x6.3
100	84,5	6,3	7,75	0,9	4	• LPV 100x84.5x6.3

Other sizes are available on request

• Dimensions in accordance with ISO 7425-1

2.4 CPV profile

CPV profile data

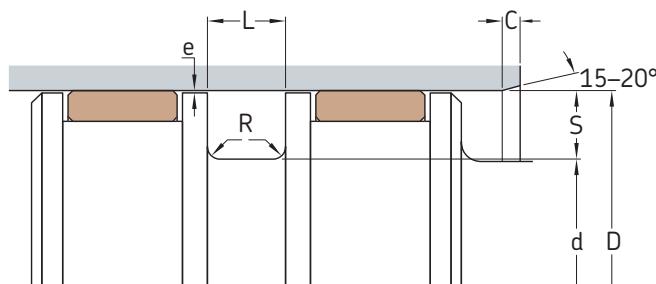
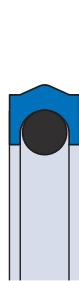


Material codes	Slide ring: U-1003 Energizer: A-8501 For additional information → page 26
Pressure	Up to 345 bar (5 000 psi)
Speed	Pressure ≤ 250 bar (3 625 psi) → up to 1 m/s (3.2 ft/s) Pressure > 250 bar (3 625 psi) → up to 0,5 m/s (1.6 ft/s)
Temperature range	<p> -60 -50 -40 100 110 120 [°C] -75 -60 -40 210 230 250 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> ■ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range ■ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) ■ Recommended operating temperature range for this profile and material ■ Temperatures above the recommended operating range: acceptable only with reduced pressure, speed, and/or e-gap ■ Extreme high temperature range: only occasional short-term exposure (e.g. cylinder in curing oven of a powder coating process)
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature, e-gap) should not be applied continuously nor simultaneously.

2.4 CPV profile piston seals, inch sizes

D 1.5 – 9.002 in.



Maximum extrusion gap e

Radial depth S	Series	e_{max} at 80 °C (175 °F) for pressures		
		2 300 psi	3 600 psi	5 000 psi
in.	–	in.		
0.121	2	0.008	0.006	–
0.185	3	0.012	0.008	0.004
0.237	4	0.014	0.01	0.006

For additional information → page 34

2.4

Dimensions

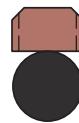
Designation

D +0.002	d Tolerance	L +0.005	S	R max.	C min.	Designation
1.5	1.258 -0.002	0.187	0.121	0.02	0.125	CPV-218-J1S
1.75	1.508 -0.002	0.187	0.121	0.02	0.125	CPV-222-J1S
2	1.63 -0.002	0.281	0.185	0.025	0.156	CPV-326-J1S
2.25	1.88 -0.002	0.281	0.185	0.025	0.156	CPV-328-J1S
2.5	2.13 -0.002	0.281	0.185	0.025	0.156	CPV-330-J1S
2.75	2.38 -0.002	0.281	0.185	0.025	0.156	CPV-332-J1S
3	2.63 -0.002	0.281	0.185	0.025	0.156	CPV-334-J1S
3.125	2.755 -0.002	0.281	0.185	0.025	0.156	CPV-335-J1S
3.25	2.88 -0.002	0.281	0.185	0.025	0.156	CPV-336-J1S
3.5	3.13 -0.002	0.281	0.185	0.025	0.156	CPV-338-J1S
4	3.63 -0.002	0.281	0.185	0.025	0.156	CPV-342-J1S
4.5	4.13 -0.002	0.281	0.185	0.025	0.156	CPV-346-J1S
5	4.63 -0.002	0.281	0.185	0.025	0.156	CPV-350-J1S
5.502	5.028 -0.004	0.375	0.237	0.032	0.187	CPV-429-J1S
6.002	5.528 -0.004	0.375	0.237	0.032	0.187	CPV-433-J1S
6.502	6.028 -0.004	0.375	0.237	0.032	0.187	CPV-437-J1S
7.002	6.528 -0.004	0.375	0.237	0.032	0.187	CPV-439-J1S
7.252	6.778 -0.004	0.375	0.237	0.032	0.187	CPV-440-J1S
8.002	7.528 -0.004	0.375	0.237	0.032	0.187	CPV-443-J1S
9.002	8.528 -0.004	0.375	0.237	0.032	0.187	CPV-446-J1S

Other sizes are available on request

2.5 GH profile

GH profile data

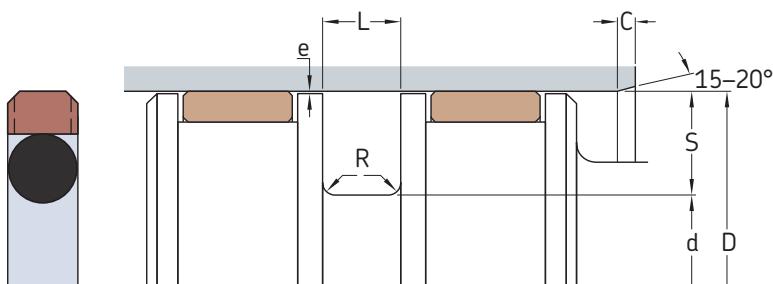


Material codes	Slide ring: metric sizes → 292 inch sizes → 741 Energizer: metric sizes → N70/6052 inch sizes → A-8501 For additional information → page 26
Pressure	Up to 400 bar (5 800 psi)
Speed	Up to 1 m/s (3.2 ft/s)
Temperature range	<p> -60 -50 -40 100 120 140 [°C] -75 -60 -40 210 250 285 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> █ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range █ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) █ Recommended operating temperature range for this profile and material █ Temperatures above the recommended operating range: acceptable only with reduced pressure, speed, and/or e-gap █ Extreme high temperature range: only occasional short-term exposure (e.g. cylinder in curing oven of a powder coating process)
Dimension standards	Some metric sizes fit seal housings in accordance with ISO 7425-1.
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature, e-gap) should not be applied continuously nor simultaneously.

2.5 GH profile piston seals, metric sizes

D 14 – 70 mm



Maximum extrusion gap e

Radial depth S mm	e_{\max} at 80 °C (175 °F) for pressures		
	160 bar	250 bar	400 bar
2,45	0,35	0,25	0,15
3,75	0,35	0,25	0,15
5,5	0,4	0,3	0,2
7,75	0,5	0,35	0,25
10,5	0,6	0,45	0,35

For additional information → page 34

2.5

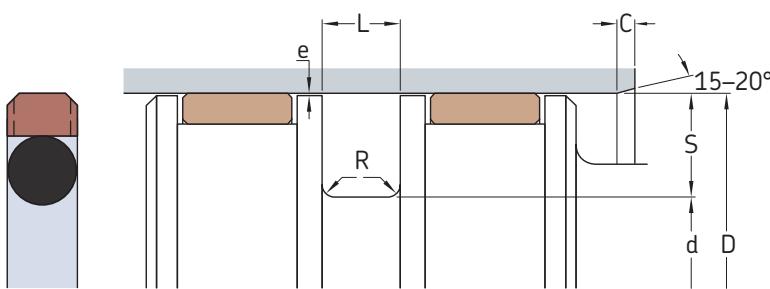
Dimensions

Designation

D H9	d h9	L +0,2	S	R max.	C min.	Designation
14	9,1	2,2	2,45	0,5	3	GH 14x9.1x2.2-AD1
18	10,5	3,2	3,75	0,5	5	GH 18x10.5x3.2-AD1
20	12,5	3,2	3,75	0,5	5	• GH 20x12.5x3.2-AD1
	15,1	2,2	2,45	0,5	3	GH 20x15,1x2.2-AD1
22	14,5	3,2	3,75	0,5	5	GH 22x14.5x3.2-AD1
25	17,5	3,2	3,75	0,5	5	• GH 25x17.5x3.2-AD1
28	20,5	3,2	3,75	0,5	5	GH 28x20.5x3.2-AD1
30	22,5	3,2	3,75	0,5	5	GH 30x22.5x3.2-AD1
32	24,5	3,2	3,75	0,5	5	• GH 32x24.5x3.2-AD1
35	27,5	3,2	3,75	0,5	5	GH 35x27.5x3.2-AD1
36	28,5	3,2	3,75	0,5	5	GH 36x28.5x3.2-AD1
40	29	4,2	5,5	0,5	7	• GH 40x29x4.2-AD1
	32,5	3,2	3,75	0,5	5	• GH 40x32.5x3.2-AD1
45	34	4,2	5,5	0,5	7	GH 45x34x4.2-AD1
	37,5	3,2	3,75	0,5	5	GH 45x37.5x3.2-AD1
50	34,5	6,3	7,75	0,5	10	• GH 50x34.5x6.3-AD1
	39	4,2	5,5	0,5	7	• GH 50x39x4.2-AD1
60	49	4,2	5,5	0,5	7	GH 60x49x4.2-AD1
63	52	4,2	5,5	0,5	7	• GH 63x52x4.2-AD1
65	54	4,2	5,5	0,9	7	GH 65x54x4.2-AD1
70	59	4,2	5,5	0,9	7	GH 70x59x4.2-AD1

• Seal housing dimensions in accordance with ISO 7425-1

2.5 GH profile piston seals, metric sizes D 75 – 200 mm



Maximum extrusion gap e

Radial depth S mm	e_{max} at 80 °C (175 °F) for pressures		
	160 bar	250 bar	400 bar
2,45	0,35	0,25	0,15
3,75	0,35	0,25	0,15
5,5	0,4	0,3	0,2
7,75	0,5	0,35	0,25
10,5	0,6	0,45	0,35

For additional information → page 34

Dimensions

Designation

D H9	d h9	L +0,2	S	R max.	C min.	Designation
75	59,5 64	6,3 4,2	7,75 5,5	0,9 0,9	10 7	GH 75x59.5x6.3-AD1 GH 75x64x4.2-AD1
80	64,5 69	6,3 4,2	7,75 5,5	0,9 0,9	10 7	• GH 80x64.5x6.3-AD1 • GH 80x69x4.2-AD1
85	69,5 74	6,3 4,2	7,75 5,5	0,9 0,9	10 7	GH 85x69.5x6.3-AD1 GH 85x74x4.2-AD1
90	74,5 79	6,3 4,2	7,75 5,5	0,9 0,9	10 7	GH 90x74.5x6.3-AD1 GH 90x79x4.2-AD1
95	79,5 84	6,3 4,2	7,75 5,5	0,9 0,9	10 7	GH 95x79.5x6.3-AD1 GH 95x84x4.2-AD1
100	79 84,5	8,1 6,3	10,5 7,75	0,9 0,9	12 10	GH 100x79x8.1-AD1 • GH 100x84.5x6.3-AD1
105	89,5	6,3	7,75	0,9	10	GH 105x89.5x6.3-AD1
110	94,5	6,3	7,75	0,9	10	GH 110x94.5x6.3-AD1
115	99,5	6,3	7,75	0,9	10	GH 115x99.5x6.3-AD1
120	104,5	6,3	7,75	0,9	10	GH 120x104.5x6.3-AD1
125	104 109,5	8,1 6,3	10,5 7,75	0,9 0,9	12 10	• GH 125x104x8.1-AD1 • GH 125x109.5x6.3-AD1
130	109 114,5	8,1 6,3	10,5 7,75	0,9 0,9	12 10	GH 130x109x8.1-AD1 GH 130x114.5x6.3-AD1
140	119 124,5	8,1 6,3	10,5 7,75	0,9 0,9	12 10	GH 140x119x8.1-AD1 GH 140x124.5x6.3-AD1
150	129 134,5	8,1 6,3	10,5 7,75	0,9 0,9	12 10	GH 150x129x8.1-AD1 GH 150x134.5x6.3-AD1

• Seal housing dimensions in accordance with ISO 7425-1

Dimensions**Designation**

D H9	d h9	L +0,2	S	R max.	C min.	Designation
					–	
160	139 144,5	8,1 6,3	10,5 7,75	0,9 0,9	12 10	• GH 160x139x8.1-AD1 • GH 160x144.5x6.3-AD1
170	149	8,1	10,5	0,9	12	GH 170x149x8.1-AD1
180	159	8,1	10,5	0,9	12	GH 180x159x8.1-AD1
190	169	8,1	10,5	0,9	12	GH 190x169x8.1-AD1
200	179	8,1	10,5	0,9	12	• GH 200x179x8.1-AD1

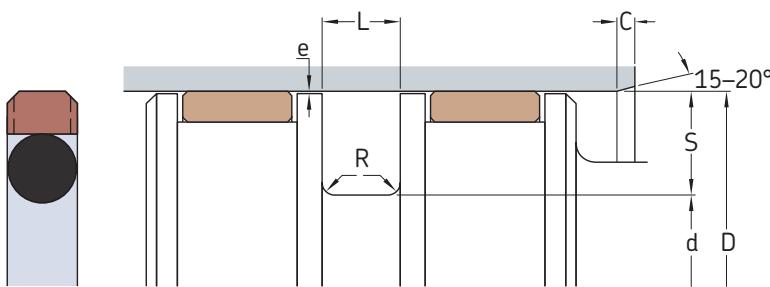
Other sizes are available on request

2.5

- Seal housing dimensions in accordance with ISO 7425-1

2.5 GH profile piston seals, inch sizes

D 0.5 – 2.375 in.



Maximum extrusion gap e

Radial depth S in.	Series e _{max} at 80 °C (175 °F) for pressures			
	2 300 psi	3 600 psi	5 800 psi	in.
0.087	0A	0.014	0.01	0.006
0.13	OD	0.014	0.01	0.006
0.149	1A	0.014	0.01	0.006
0.196	1D	0.015	0.011	0.007
0.212	2A	0.016	0.012	0.008
0.259	2D	0.018	0.013	0.009
0.308	3A	0.02	0.014	0.01
0.415	4A	0.024	0.018	0.014

For additional information → page 34

Dimensions

Designation

D in.	Tolerance	d Tolerance	L ±0.002	S	R max.	C min.	—	
0.5	+0.002 +0.002	0.24 0.326	±0.002 ±0.001	0.083 0.083	0.13 0.087	0.015 0.015	0.1 0.08	GHOD-500-AD1 GHOA-500-AD1
0.562	+0.002 +0.002	0.302 0.388	±0.002 ±0.001	0.083 0.083	0.13 0.087	0.015 0.015	0.1 0.08	GHOD-562-AD1 GHOA-562-AD1
0.625	+0.002 +0.002	0.365 0.451	±0.002 ±0.001	0.083 0.083	0.13 0.087	0.015 0.015	0.1 0.08	GHOD-625-AD1 GHOA-625-AD1
0.687	+0.002 +0.002 +0.002	0.389 0.427 0.513	±0.001 ±0.002 ±0.001	0.128 0.083 0.083	0.149 0.13 0.087	0.015 0.015 0.015	0.125 0.1 0.08	GH1A-687-AD1 GHOD-687-AD1 GHOA-687-AD1
0.75	+0.002 +0.002 +0.002	0.452 0.49 0.576	±0.001 ±0.002 ±0.001	0.128 0.083 0.083	0.149 0.13 0.087	0.015 0.015 0.015	0.125 0.1 0.08	GH1A-750-AD1 GHOD-750-AD1 GHOA-750-AD1
0.812	+0.002 +0.002 +0.002	0.514 0.552 0.638	±0.001 ±0.002 ±0.001	0.128 0.083 0.083	0.149 0.13 0.087	0.015 0.015 0.015	0.125 0.1 0.08	GH1A-812-AD1 GHOD-812-AD1 GHOA-812-AD1
0.875	+0.002 +0.002 +0.002	0.577 0.615 0.701	±0.001 ±0.002 ±0.001	0.128 0.083 0.083	0.149 0.13 0.087	0.015 0.015 0.015	0.125 0.1 0.08	GH1A-875-AD1 GHOD-875-AD1 GHOA-875-AD1
0.937	+0.002 +0.002 +0.002	0.639 0.677 0.763	±0.001 ±0.002 ±0.001	0.128 0.083 0.083	0.149 0.13 0.087	0.015 0.015 0.015	0.125 0.1 0.08	GH1A-937-AD1 GHOD-937-AD1 GHOA-937-AD1
1	+0.002 +0.002 +0.002	0.702 0.74 0.826	±0.001 ±0.002 ±0.001	0.128 0.083 0.083	0.149 0.13 0.087	0.015 0.015 0.015	0.125 0.1 0.08	GH1A-1000-AD1 GHOD-1000-AD1 GHOA-1000-AD1
1.062	+0.002 +0.002 +0.002	0.764 0.802 0.888	±0.001 ±0.002 ±0.001	0.128 0.083 0.083	0.149 0.13 0.087	0.015 0.015 0.015	0.125 0.1 0.08	GH1A-1062-AD1 GHOD-1062-AD1 GHOA-1062-AD1
1.125	+0.002 +0.002 +0.002	0.827 0.865 0.951	±0.001 ±0.002 ±0.001	0.128 0.083 0.083	0.149 0.13 0.087	0.015 0.015 0.015	0.125 0.1 0.08	GH1A-1125-AD1 GHOD-1125-AD1 GHOA-1125-AD1

Dimensions

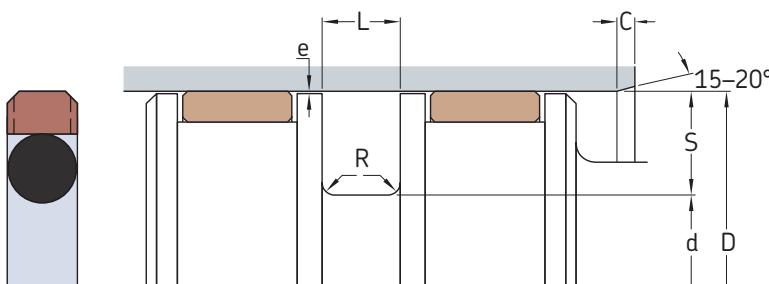
Designation

D	Tolerance	d	Tolerance	L ±0.002	S	R max.	C min.	
in.								-
1.187	+0.002	0.889	±0.001	0.128	0.149	0.015	0.125	GH1A-1187-AD1
	+0.002	0.927	±0.002	0.083	0.13	0.015	0.1	GH0D-1187-AD1
	+0.002	1.013	±0.001	0.083	0.087	0.015	0.08	GH0A-1187-AD1
1.25	+0.002	0.952	±0.001	0.128	0.149	0.015	0.125	GH1A-1250-AD1
	+0.002	0.99	±0.002	0.083	0.13	0.015	0.1	GH0D-1250-AD1
	+0.002	1.076	±0.001	0.083	0.087	0.015	0.08	GH0A-1250-AD1
1.312	+0.002	1.014	±0.001	0.128	0.149	0.015	0.125	GH1A-1312-AD1
	+0.002	1.052	±0.002	0.083	0.13	0.015	0.1	GH0D-1312-AD1
	+0.002	1.138	±0.001	0.083	0.087	0.015	0.08	GH0A-1312-AD1
1.375	+0.002	1.077	±0.001	0.128	0.149	0.015	0.125	GH1A-1375-AD1
	+0.002	1.115	±0.002	0.083	0.13	0.015	0.1	GH0D-1375-AD1
	+0.002	1.201	±0.001	0.083	0.087	0.015	0.08	GH0A-1375-AD1
1.437	+0.002	1.139	±0.001	0.128	0.149	0.015	0.125	GH1A-1437-AD1
	+0.002	1.177	±0.002	0.083	0.13	0.015	0.1	GH0D-1437-AD1
	+0.002	1.263	±0.001	0.083	0.087	0.015	0.08	GH0A-1437-AD1
1.5	+0.002	1.202	±0.001	0.128	0.149	0.015	0.125	GH1A-1500-AD1
	+0.002	1.24	±0.002	0.083	0.13	0.015	0.1	GH0D-1500-AD1
	+0.002	1.326	±0.001	0.083	0.087	0.015	0.08	GH0A-1500-AD1
1.562	+0.002	1.138	±0.002	0.168	0.212	0.015	0.14	GH2A-1562-AD1
	+0.002	1.17	±0.002	0.122	0.196	0.015	0.125	GH1D-1562-AD1
	+0.002	1.264	±0.001	0.128	0.149	0.015	0.125	GH1A-1562-AD1
1.625	+0.002	1.201	±0.002	0.168	0.212	0.015	0.14	GH2A-1625-AD1
	+0.002	1.233	±0.002	0.122	0.196	0.015	0.125	GH1D-1625-AD1
	+0.002	1.327	±0.001	0.128	0.149	0.015	0.125	GH1A-1625-AD1
1.687	+0.002	1.263	±0.002	0.168	0.212	0.015	0.14	GH2A-1687-AD1
	+0.002	1.295	±0.002	0.122	0.196	0.015	0.125	GH1D-1687-AD1
	+0.002	1.389	±0.001	0.128	0.149	0.015	0.125	GH1A-1687-AD1
1.75	+0.002	1.326	±0.002	0.168	0.212	0.015	0.14	GH2A-1750-AD1
	+0.002	1.358	±0.002	0.122	0.196	0.015	0.125	GH1D-1750-AD1
	+0.002	1.452	±0.001	0.128	0.149	0.015	0.125	GH1A-1750-AD1
1.812	+0.002	1.388	±0.002	0.168	0.212	0.015	0.14	GH2A-1812-AD1
	+0.002	1.42	±0.002	0.122	0.196	0.015	0.125	GH1D-1812-AD1
	+0.002	1.514	±0.001	0.128	0.149	0.015	0.125	GH1A-1812-AD1
1.875	+0.002	1.451	±0.002	0.168	0.212	0.015	0.14	GH2A-1875-AD1
	+0.002	1.483	±0.002	0.122	0.196	0.015	0.125	GH1D-1875-AD1
	+0.002	1.577	±0.001	0.128	0.149	0.015	0.125	GH1A-1875-AD1
1.937	+0.002	1.513	±0.002	0.168	0.212	0.015	0.14	GH2A-1937-AD1
	+0.002	1.545	±0.002	0.122	0.196	0.015	0.125	GH1D-1937-AD1
	+0.002	1.639	±0.001	0.128	0.149	0.015	0.125	GH1A-1937-AD1
2	+0.002	1.576	±0.002	0.168	0.212	0.015	0.14	GH2A-2000-AD1
	+0.002	1.608	±0.002	0.129	0.196	0.015	0.125	GH1D-2000-AD1
	+0.002	1.702	±0.001	0.128	0.149	0.015	0.125	GH1A-2000-AD1
2.125	+0.002	1.701	±0.002	0.168	0.212	0.015	0.14	GH2A-2125-AD1
	+0.002	1.733	±0.002	0.129	0.196	0.015	0.125	GH1D-2125-AD1
	+0.002	1.827	±0.001	0.128	0.149	0.015	0.125	GH1A-2125-AD1
2.25	+0.002	1.826	±0.002	0.168	0.212	0.015	0.14	GH2A-2250-AD1
	+0.002	1.858	±0.002	0.129	0.196	0.015	0.125	GH1D-2250-AD1
	+0.002	1.952	±0.001	0.128	0.149	0.015	0.125	GH1A-2250-AD1
2.375	+0.002	1.951	±0.002	0.168	0.212	0.015	0.14	GH2A-2375-AD1
	+0.002	1.983	±0.002	0.129	0.196	0.015	0.125	GH1D-2375-AD1
	+0.002	2.077	±0.001	0.128	0.149	0.015	0.125	GH1A-2375-AD1

2.5

2.5 GH profile piston seals, inch sizes

D 2.5 – 5.625 in.



Maximum extrusion gap e

Radial Series	e _{max} at 80 °C (175 °F)	for pressures		
		depth S	2 300 psi	3 600 psi
in.	–	in.		
0.087	0A	0.014	0.01	0.006
0.13	0D	0.014	0.01	0.006
0.149	1A	0.014	0.01	0.006
0.196	1D	0.015	0.011	0.007
0.212	2A	0.016	0.012	0.008
0.259	2D	0.018	0.013	0.009
0.308	3A	0.02	0.014	0.01
0.415	4A	0.024	0.018	0.014

For additional information → page 34

Dimensions

Designation

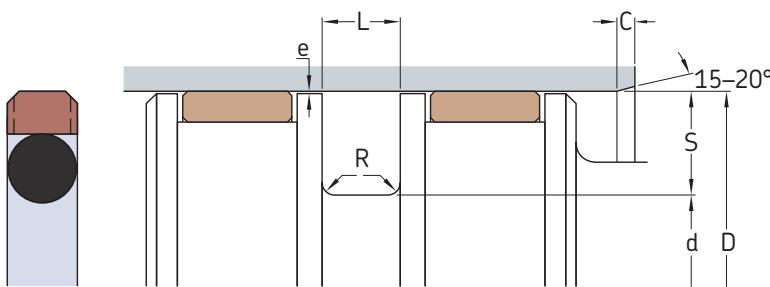
D	d	L	S	R max.	C min.	Designation		
	Tolerance		L ±0.002			–		
in.								
2.5	+0.002	2.076	±0.002	0.168	0.212	0.015	GH2A-2500-AD1	
	+0.002	2.108	±0.002	0.129	0.196	0.015	GH1D-2500-AD1	
	+0.002	2.202	±0.001	0.128	0.149	0.015	GH1A-2500-AD1	
2.625	+0.002	2.201	±0.002	0.168	0.212	0.015	GH2A-2625-AD1	
	+0.002	2.233	±0.002	0.129	0.196	0.015	GH1D-2625-AD1	
	+0.002	2.327	±0.001	0.128	0.149	0.015	GH1A-2625-AD1	
2.75	+0.002	2.326	±0.002	0.168	0.212	0.015	GH2A-2750-AD1	
	+0.002	2.358	±0.002	0.129	0.196	0.015	GH1D-2750-AD1	
	+0.002	2.452	±0.001	0.128	0.149	0.015	GH1A-2750-AD1	
2.875	+0.002	2.451	±0.002	0.168	0.212	0.015	GH2A-2875-AD1	
	+0.002	2.483	±0.002	0.129	0.196	0.015	GH1D-2875-AD1	
	+0.002	2.577	±0.001	0.128	0.149	0.015	GH1A-2875-AD1	
3	+0.002	2.576	±0.002	0.168	0.212	0.015	GH2A-3000-AD1	
	+0.002	2.608	±0.002	0.129	0.196	0.015	GH1D-3000-AD1	
	+0.002	2.702	±0.001	0.128	0.149	0.015	GH1A-3000-AD1	
3.125	+0.002	2.509	±0.003	0.249	0.308	0.025	0.2	GH3A-3125-AD1
	+0.002	2.701	±0.002	0.168	0.212	0.015	0.14	GH2A-3125-AD1
	+0.003	2.733	±0.002	0.129	0.196	0.015	0.125	GH1D-3125-AD1
3.25	+0.002	2.634	±0.003	0.249	0.308	0.025	0.2	GH3A-3250-AD1
	+0.002	2.826	±0.002	0.168	0.212	0.015	0.14	GH2A-3250-AD1
	+0.003	2.858	±0.002	0.129	0.196	0.015	0.125	GH1D-3250-AD1
3.375	+0.002	2.759	±0.003	0.249	0.308	0.025	0.2	GH3A-3375-AD1
	+0.002	2.951	±0.002	0.168	0.212	0.015	0.14	GH2A-3375-AD1
	+0.003	2.983	±0.002	0.129	0.196	0.015	0.125	GH1D-3375-AD1
3.5	+0.002	2.884	±0.003	0.249	0.308	0.025	0.2	GH3A-3500-AD1
	+0.002	3.076	±0.002	0.168	0.212	0.015	0.14	GH2A-3500-AD1
	+0.003	3.108	±0.002	0.129	0.196	0.015	0.125	GH1D-3500-AD1
3.625	+0.002	3.009	±0.003	0.249	0.308	0.025	0.2	GH3A-3625-AD1
	+0.002	3.201	±0.002	0.168	0.212	0.015	0.14	GH2A-3625-AD1
	+0.003	3.233	±0.002	0.129	0.196	0.015	0.125	GH1D-3625-AD1

Dimensions**Designation**

D	Tolerance	d	Tolerance	L ±0.002	S	R max.	C min.	
in.								-
3.75	+0.002	3.134	±0.003	0.249	0.308	0.025	0.2	GH3A-3750-AD1
	+0.002	3.326	±0.002	0.168	0.212	0.015	0.14	GH2A-3750-AD1
	+0.003	3.358	±0.002	0.129	0.196	0.015	0.125	GH1D-3750-AD1
3.875	+0.002	3.259	±0.003	0.249	0.308	0.025	0.2	GH3A-3875-AD1
	+0.002	3.451	±0.002	0.168	0.212	0.015	0.14	GH2A-3875-AD1
	+0.003	3.483	±0.002	0.129	0.196	0.015	0.125	GH1D-3875-AD1
4	+0.002	3.384	±0.003	0.249	0.308	0.025	0.2	GH3A-4000-AD1
	+0.002	3.576	±0.002	0.168	0.212	0.015	0.14	GH2A-4000-AD1
	+0.003	3.608	±0.002	0.129	0.196	0.015	0.125	GH1D-4000-AD1
4.125	+0.002	3.509	±0.003	0.249	0.308	0.025	0.2	GH3A-4125-AD1
	+0.002	3.701	±0.002	0.168	0.212	0.015	0.14	GH2A-4125-AD1
	+0.003	3.733	±0.002	0.129	0.196	0.015	0.125	GH1D-4125-AD1
4.25	+0.002	3.634	±0.003	0.249	0.308	0.025	0.2	GH3A-4250-AD1
	+0.002	3.826	±0.002	0.168	0.212	0.015	0.14	GH2A-4250-AD1
	+0.003	3.858	±0.002	0.129	0.196	0.015	0.125	GH1D-4250-AD1
4.375	+0.002	3.759	±0.003	0.249	0.308	0.025	0.2	GH3A-4375-AD1
	+0.002	3.951	±0.002	0.168	0.212	0.015	0.14	GH2A-4375-AD1
	+0.003	3.983	±0.002	0.129	0.196	0.015	0.125	GH1D-4375-AD1
4.5	+0.002	3.884	±0.003	0.249	0.308	0.025	0.2	GH3A-4500-AD1
	+0.002	4.076	±0.002	0.168	0.212	0.015	0.14	GH2A-4500-AD1
	+0.003	4.108	±0.002	0.129	0.196	0.015	0.125	GH1D-4500-AD1
4.625	+0.002	4.009	±0.003	0.249	0.308	0.025	0.2	GH3A-4625-AD1
	+0.002	4.201	±0.002	0.168	0.212	0.015	0.14	GH2A-4625-AD1
	+0.003	4.233	±0.002	0.129	0.196	0.015	0.125	GH1D-4625-AD1
4.75	+0.002	4.134	±0.003	0.249	0.308	0.025	0.2	GH3A-4750-AD1
	+0.002	4.326	±0.002	0.168	0.212	0.015	0.14	GH2A-4750-AD1
	+0.003	4.358	±0.002	0.129	0.196	0.015	0.125	GH1D-4750-AD1
4.875	+0.002	4.259	±0.003	0.249	0.308	0.025	0.2	GH3A-4875-AD1
	+0.002	4.451	±0.002	0.168	0.212	0.015	0.14	GH2A-4875-AD1
	+0.003	4.483	±0.002	0.129	0.196	0.015	0.125	GH1D-4875-AD1
5	+0.002	4.384	±0.003	0.249	0.308	0.025	0.2	GH3A-5000-AD1
	+0.002	4.576	±0.002	0.168	0.212	0.015	0.14	GH2A-5000-AD1
	+0.003	4.608	±0.002	0.129	0.196	0.015	0.125	GH1D-5000-AD1
5.125	+0.002	4.509	±0.003	0.249	0.308	0.025	0.2	GH3A-5125-AD1
	+0.002	4.701	±0.002	0.168	0.212	0.015	0.14	GH2A-5125-AD1
	+0.003	4.733	±0.002	0.129	0.196	0.015	0.125	GH1D-5125-AD1
5.25	+0.002	4.42	±0.004	0.322	0.415	0.035	0.25	GH4A-5250-AD1
	+0.002	4.634	±0.003	0.249	0.308	0.025	0.2	GH3A-5250-AD1
	+0.003	4.826	±0.002	0.168	0.212	0.015	0.14	GH2A-5250-AD1
	+0.003	4.858	±0.002	0.129	0.196	0.015	0.125	GH1D-5250-AD1
5.375	+0.002	4.545	±0.004	0.322	0.415	0.035	0.25	GH4A-5375-AD1
	+0.002	4.759	±0.003	0.249	0.308	0.025	0.2	GH3A-5375-AD1
	+0.003	4.951	±0.002	0.168	0.212	0.015	0.14	GH2A-5375-AD1
	+0.004	4.983	±0.002	0.129	0.196	0.015	0.125	GH1D-5375-AD1
5.5	+0.002	4.67	±0.004	0.322	0.415	0.035	0.25	GH4A-5500-AD1
	+0.002	4.884	±0.003	0.249	0.308	0.025	0.2	GH3A-5500-AD1
	+0.003	5.076	±0.002	0.168	0.212	0.015	0.14	GH2A-5500-AD1
	+0.004	5.108	±0.002	0.129	0.196	0.015	0.125	GH1D-5500-AD1
5.625	+0.003	4.795	±0.004	0.322	0.415	0.035	0.25	GH4A-5625-AD1
	+0.003	5.009	±0.003	0.249	0.308	0.025	0.2	GH3A-5625-AD1
	+0.004	5.107	±0.004	0.159	0.259	0.015	0.14	GH2D-5625-AD1

2.5

2.5 GH profile piston seals, inch sizes D 5.75 – 16 in.



Maximum extrusion gap e

Radial depth S	Series	e _{max} at 80 °C (175 °F) for pressures		
		2 300 psi	3 600 psi	5 800 psi
in.	–	in.		
0.087	0A	0.014	0.01	0.006
0.13	0D	0.014	0.01	0.006
0.149	1A	0.014	0.01	0.006
0.196	1D	0.015	0.011	0.007
0.212	2A	0.016	0.012	0.008
0.259	2D	0.018	0.013	0.009
0.308	3A	0.02	0.014	0.01
0.415	4A	0.024	0.018	0.014

For additional information → page 34

Dimensions

Designation

D	d	L	S	R	C	Designation		
Tolerance	Tolerance	±0.002		max.	min.	–		
in.	–	–	–	–	–	–		
5.75	+0.003 +0.003 +0.004	4.92 5.134 5.232	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-5750-AD1 GH3A-5750-AD1 GH2D-5750-AD1
5.875	+0.003 +0.003 +0.004	5.045 5.259 5.357	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-5875-AD1 GH3A-5875-AD1 GH2D-5875-AD1
6	+0.003 +0.003 +0.004	5.17 5.384 5.482	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-6000-AD1 GH3A-6000-AD1 GH2D-6000-AD1
6.125	+0.003 +0.003 +0.004	5.295 5.509 5.607	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-6125-AD1 GH3A-6125-AD1 GH2D-6125-AD1
6.25	+0.003 +0.003 +0.004	5.42 5.634 5.732	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-6250-AD1 GH3A-6250-AD1 GH2D-6250-AD1
6.375	+0.003 +0.003 +0.004	5.545 5.759 5.857	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-6375-AD1 GH3A-6375-AD1 GH2D-6375-AD1
6.5	+0.003 +0.003 +0.004	5.67 5.884 5.982	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-6500-AD1 GH3A-6500-AD1 GH2D-6500-AD1
6.75	+0.003 +0.003 +0.004	5.92 6.134 6.232	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-6750-AD1 GH3A-6750-AD1 GH2D-6750-AD1
7	+0.003 +0.003 +0.004	6.17 6.384 6.482	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-7000-AD1 GH3A-7000-AD1 GH2D-7000-AD1
7.25	+0.003 +0.003 +0.004	6.42 6.634 6.732	±0.004 ±0.003 ±0.004	0.322 0.249 0.159	0.415 0.308 0.259	0.035 0.025 0.015	0.25 0.2 0.14	GH4A-7250-AD1 GH3A-7250-AD1 GH2D-7250-AD1

Dimensions**Designation**

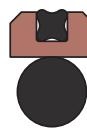
D in.	Tolerance	d Tolerance	L ±0.002	S	R max.	C min.	
7.5	+0.003	6.67 ±0.004	0.322	0.415	0.035	0.25	GH4A-7500-AD1
	+0.003	6.884 ±0.003	0.249	0.308	0.025	0.2	GH3A-7500-AD1
	+0.004	6.982 ±0.004	0.159	0.259	0.015	0.14	GH2D-7500-AD1
7.75	+0.003	6.92 ±0.004	0.322	0.415	0.035	0.25	GH4A-7750-AD1
	+0.003	7.134 ±0.003	0.249	0.308	0.025	0.2	GH3A-7750-AD1
	+0.004	7.232 ±0.004	0.159	0.259	0.015	0.14	GH2D-7750-AD1
8	+0.003	7.17 ±0.004	0.322	0.415	0.035	0.25	GH4A-8000-AD1
	+0.003	7.384 ±0.003	0.249	0.308	0.025	0.2	GH3A-8000-AD1
	+0.004	7.482 ±0.004	0.159	0.259	0.015	0.14	GH2D-8000-AD1
8.25	+0.003	7.42 ±0.004	0.322	0.415	0.035	0.25	GH4A-8250-AD1
	+0.003	7.634 ±0.003	0.249	0.308	0.025	0.2	GH3A-8250-AD1
	+0.004	7.732 ±0.004	0.159	0.259	0.015	0.14	GH2D-8250-AD1
8.5	+0.003	7.67 ±0.004	0.322	0.415	0.035	0.25	GH4A-8500-AD1
	+0.003	7.884 ±0.003	0.249	0.308	0.025	0.2	GH3A-8500-AD1
	+0.004	7.982 ±0.004	0.159	0.259	0.015	0.14	GH2D-8500-AD1
8.75	+0.004	7.92 ±0.004	0.322	0.415	0.035	0.25	GH4A-8750-AD1
9	+0.003	8.17 ±0.004	0.322	0.415	0.035	0.25	GH4A-9000-AD1
	+0.003	8.384 ±0.003	0.249	0.308	0.025	0.2	GH3A-9000-AD1
	+0.004	8.482 ±0.004	0.159	0.259	0.015	0.14	GH2D-9000-AD1
9.5	+0.003	8.67 ±0.004	0.322	0.415	0.035	0.25	GH4A-9500-AD1
	+0.003	8.884 ±0.003	0.249	0.308	0.025	0.2	GH3A-9500-AD1
	+0.004	8.982 ±0.004	0.159	0.259	0.015	0.14	GH2D-9500-AD1
9.75	+0.004	8.92 ±0.004	0.322	0.415	0.035	0.25	GH4A-9750-AD1
10	+0.003	9.17 ±0.004	0.322	0.415	0.035	0.25	GH4A-10000-AD1
	+0.003	9.384 ±0.003	0.249	0.308	0.025	0.2	GH3A-10000-AD1
	+0.004	9.482 ±0.004	0.159	0.259	0.015	0.14	GH2D-10000-AD1
10.5	+0.003	9.67 ±0.004	0.322	0.415	0.035	0.25	GH4A-10500-AD1
	+0.003	9.884 ±0.003	0.249	0.308	0.025	0.2	GH3A-10500-AD1
	+0.004	9.982 ±0.004	0.159	0.259	0.015	0.14	GH2D-10500-AD1
11	+0.003	10.17 ±0.004	0.322	0.415	0.035	0.25	GH4A-11000-AD1
	+0.003	10.384 ±0.003	0.249	0.308	0.025	0.2	GH3A-11000-AD1
	+0.004	10.482 ±0.004	0.159	0.259	0.015	0.14	GH2D-11000-AD1
11.5	+0.003	10.67 ±0.004	0.322	0.415	0.035	0.25	GH4A-11500-AD1
	+0.003	10.884 ±0.003	0.249	0.308	0.025	0.2	GH3A-11500-AD1
	+0.004	10.982 ±0.004	0.159	0.259	0.015	0.14	GH2D-11500-AD1
12	+0.003	11.17 ±0.004	0.322	0.415	0.035	0.25	GH4A-12000-AD1
	+0.003	11.384 ±0.003	0.249	0.308	0.025	0.2	GH3A-12000-AD1
	+0.004	11.482 ±0.004	0.159	0.259	0.015	0.14	GH2D-12000-AD1
12.5	+0.004	11.67 ±0.004	0.322	0.415	0.035	0.25	GH4A-12500-AD1
13	+0.004	12.17 ±0.004	0.322	0.415	0.035	0.25	GH4A-13000-AD1
13.5	+0.004	12.67 ±0.004	0.322	0.415	0.035	0.25	GH4A-13500-AD1
14	+0.004	13.17 ±0.004	0.322	0.415	0.035	0.25	GH4A-14000-AD1
14.5	+0.004	13.67 ±0.004	0.322	0.415	0.035	0.25	GH4A-14500-AD1
15	+0.004	14.17 ±0.004	0.322	0.415	0.035	0.25	GH4A-15000-AD1
15.5	+0.004	14.67 ±0.004	0.322	0.415	0.035	0.25	GH4A-15500-AD1
16	+0.003	15.17 ±0.004	0.322	0.415	0.035	0.25	GH4A-16000-AD1

Other sizes are available on request

2.5

2.6 APR profile

APR profile data

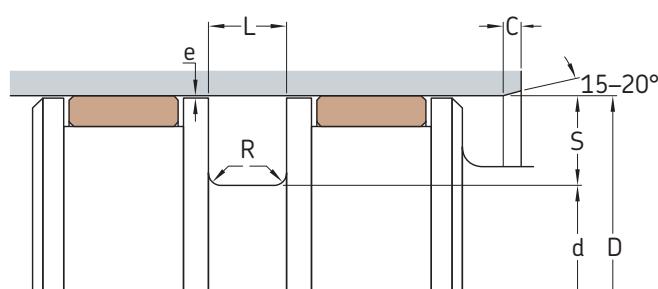
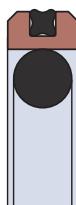


Material codes	Slide ring: 741 X-ring and energizer: A-8501 For additional information → page 26
Pressure	Up to 350 bar (5 075 psi)
Speed	Up to 1 m/s (3.2 ft/s)
Temperature range	<p> -60 -50 -40 100 120 140 [°C] -75 -60 -40 210 250 285 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> █ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range █ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) █ Recommended operating temperature range for this profile and material █ Temperatures above the recommended operating range: acceptable only with reduced pressure, speed, and/or e-gap █ Extreme high temperature range: only occasional short-term exposure (e.g. cylinder in curing oven of a powder coating process)
Dimension standards	Some metric sizes fit seal housings in accordance with ISO 7425-1.
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature, e-gap) should not be applied continuously nor simultaneously.

2.6 APR profile piston seals, metric sizes

D 20 – 90 mm



Maximum extrusion gap e

Radial depth S mm	e_{\max} at 80 °C (175 °F) for pressures		
	70 bar	200 bar	350 bar
5,5	0,46	0,15	0,1
7,75	0,6	0,2	0,13
10,5	0,76	0,25	0,15

For additional information → page 34

2.6

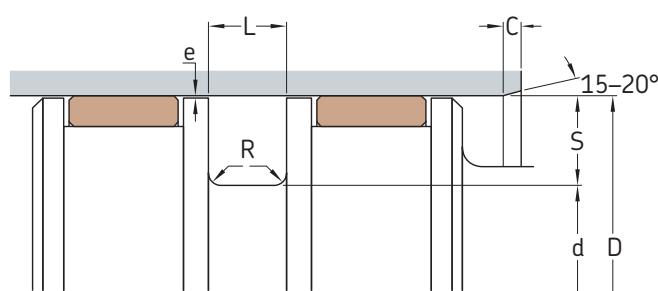
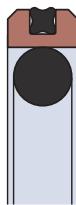
Dimensions

Designation

D H9	d h9	L +0,2	S	R max.	C min.	Designation
20	9	4,2	5,5	0,4	3	APR-20x9x4.2-AD1
22	11	4,2	5,5	0,4	3	APR-22x11x4.2-AD1
25	14	4,2	5,5	0,4	3	• APR-25x14x4.2-AD1
28	17	4,2	5,5	0,4	3	APR-28x17x4.2-AD1
30	19	4,2	5,5	0,4	3	APR-30x19x4.2-AD1
35	24	4,2	5,5	0,4	3	APR-35x24x4.2-AD1
40	29	4,2	5,5	0,4	3	• APR-40x29x4.2-AD1
42	31	4,2	5,5	0,4	3	APR-42x31x4.2-AD1
45	34	4,2	5,5	0,4	3	APR-45x34x4.2-AD1
50	39	4,2	5,5	0,4	3	• APR-50x39x4.2-AD1
55	44	4,2	5,5	0,4	3	APR-55x44x4.2-AD1
60	49	4,2	5,5	0,4	3	APR-60x49x4.2-AD1
63	52	4,2	5,5	0,4	3	• APR-63x52x4.2-AD1
65	54	4,2	5,5	0,4	3	APR-65x54x4.2-AD1
70	59	4,2	5,5	0,4	3	APR-70x59x4.2-AD1
75	64	4,2	5,5	0,4	3	APR-75x64x4.2-AD1
80	69	4,2	5,5	0,4	3	• APR-80x69x4.2-AD1
85	69,5	6,3	7,75	0,6	4	APR-85x69,5x6,3-AD1
90	74,5	6,3	7,75	0,6	4	APR-90x74,5x6,3-AD1

• Seal housing dimensions in accordance with ISO 7425-1

2.6 APR profile piston seals, metric sizes D 95 – 190 mm



Maximum extrusion gap e

Radial depth S mm	e_{\max} at 80 °C (175 °F) for pressures		
	70 bar	200 bar	350 bar
5,5	0,46	0,15	0,1
7,75	0,6	0,2	0,13
10,5	0,76	0,25	0,15

For additional information → page 34

Dimensions

Designation

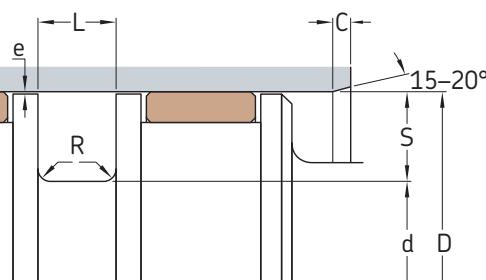
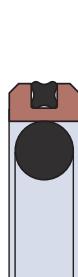
D H9	d h9	L +0,2	S	R max.	C min.	Designation
95	79,5	6,3	7,75	0,6	4	APR-95x79.5x6.3-AD1
100	84,5	6,3	7,75	0,6	4	• APR-100x84.5x6.3-AD1
105	89,5	6,3	7,75	0,6	4	APR-105x89.5x6.3-AD1
110	94,5	6,3	7,75	0,6	4	APR-110x94.5x6.3-AD1
115	99,5	6,3	7,75	0,6	4	APR-115x99.5x6.3-AD1
120	104,5	6,3	7,75	0,6	4	APR-120x104.5x6.3-AD1
125	109,5	6,3	7,75	0,6	4	• APR-125x109.5x6.3-AD1
130	114,5	6,3	7,75	0,6	4	APR-130x114.5x6.3-AD1
132	116,5	6,3	7,75	0,6	4	APR-132x116.5x6.3-AD1
135	119,5	6,3	7,75	0,6	4	APR-135x119.5x6.3-AD1
140	124,5	6,3	7,75	0,6	4	APR-140x124.5x6.3-AD1
145	129,5	6,3	7,75	0,6	4	APR-145x129.5x6.3-AD1
150	134,5	6,3	7,75	0,6	4	APR-150x134.5x6.3-AD1
155	139,5	6,3	7,75	0,6	4	APR-155x139.5x6.3-AD1
160	139	8,1	10,5	0,75	4	• APR-160x139x8.1-AD1
165	144	8,1	10,5	0,75	4	APR-165x144x8.1-AD1
170	149	8,1	10,5	0,75	4	APR-170x149x8.1-AD1
175	154	8,1	10,5	0,75	4	APR-175x154x8.1-AD1
180	159	8,1	10,5	0,75	4	APR-180x159x8.1-AD1
190	169	8,1	10,5	0,75	4	APR-190x169x8.1-AD1

Other sizes are available on request

• Seal housing dimensions in accordance with ISO 7425-1

2.6 APR profile piston seals, inch sizes

D 1 – 6 in.



Maximum extrusion gap e

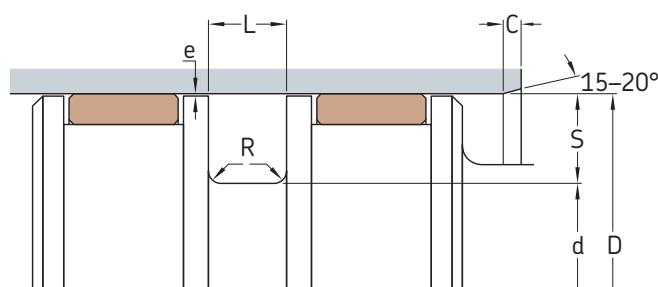
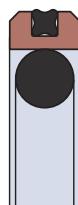
Radial depth S in.	Series	e_{\max} at 80 °C (175 °F) for pressures		
		1 000 psi	3 000 psi	5 075 psi
0.212	APR2	0.018	0.006	0.004
0.308	APR3	0.024	0.008	0.005
0.42	APR4	0.03	0.01	0.006
0.46	APR5	0.03	0.01	0.006

For additional information → page 34

2.6

Dimensions							Designation	
D	Tolerance	d	Tolerance	L	S	R max.	C min.	Designation
in.				+0.005				-
1	+0.003	0.576	-0.003	0.21	0.212	0.015	0.156	APR2-1000-AD1
1.25	+0.003	0.826	-0.003	0.21	0.212	0.015	0.156	APR2-1250-AD1
1.5	+0.003	1.076	-0.003	0.21	0.212	0.015	0.156	APR2-1500-AD1
1.75	+0.003	1.326	-0.003	0.21	0.212	0.015	0.156	APR2-1750-AD1
2	+0.003	1.576	-0.003	0.21	0.212	0.015	0.156	APR2-2000-AD1
2.25	+0.004	1.634	-0.004	0.288	0.308	0.025	0.187	APR3-2250-AD1
2.5	+0.004	1.884	-0.004	0.288	0.308	0.025	0.187	APR3-2500-AD1
2.75	+0.004	2.134	-0.004	0.288	0.308	0.025	0.187	APR3-2750-AD1
3	+0.004	2.384	-0.004	0.288	0.308	0.025	0.187	APR3-3000-AD1
3.25	+0.004	2.634	-0.004	0.288	0.308	0.025	0.187	APR3-3250-AD1
3.5	+0.004	2.884	-0.004	0.288	0.308	0.025	0.187	APR3-3500-AD1
3.75	+0.004	3.134	-0.004	0.288	0.308	0.025	0.187	APR3-3750-AD1
4	+0.004	3.384	-0.004	0.288	0.308	0.025	0.187	APR3-4000-AD1
4.25	+0.004	3.634	-0.004	0.288	0.308	0.025	0.187	APR3-4250-AD1
4.5	+0.004	3.884	-0.004	0.288	0.308	0.025	0.187	APR3-4500-AD1
4.75	+0.004	4.134	-0.004	0.288	0.308	0.025	0.187	APR3-4750-AD1
5	+0.004	4.384	-0.004	0.288	0.308	0.025	0.187	APR3-5000-AD1
5.25	+0.004	4.634	-0.004	0.288	0.308	0.025	0.187	APR3-5250-AD1
5.5	+0.005	4.66	-0.005	0.375	0.42	0.035	0.25	APR4-5500-AD1
5.75	+0.005	4.91	-0.005	0.375	0.42	0.035	0.25	APR4-5750-AD1
6	+0.005	5.16	-0.005	0.375	0.42	0.035	0.25	APR4-6000-AD1

2.6 APR profile piston seals, inch sizes D 6.25 – 14 in.



Maximum extrusion gap e

Radial depth S in.	Series	e_{\max} at 80 °C (175 °F) for pressures		
		1 000 psi	3 000 psi	5 075 psi
0.212	APR2	0.018	0.006	0.004
0.308	APR3	0.024	0.008	0.005
0.42	APR4	0.03	0.01	0.006
0.46	APR5	0.03	0.01	0.006

For additional information → page 34

Dimensions Designation

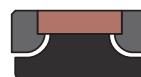
D in.	Tolerance	d Tolerance	L +0.005	S	R max.	C min.	Designation	
6.25	+0.005	5.41	-0.005	0.375	0.42	0.035	0.25	APR4-6250-AD1
6.5	+0.005	5.66	-0.005	0.375	0.42	0.035	0.25	APR4-6500-AD1
6.75	+0.005	5.91	-0.005	0.375	0.42	0.035	0.25	APR4-6750-AD1
7	+0.005	6.16	-0.005	0.375	0.42	0.035	0.25	APR4-7000-AD1
7.25	+0.005	6.41	-0.005	0.375	0.42	0.035	0.25	APR4-7250-AD1
7.5	+0.005	6.66	-0.005	0.375	0.42	0.035	0.25	APR4-7500-AD1
7.75	+0.005	6.91	-0.005	0.375	0.42	0.035	0.25	APR4-7750-AD1
8	+0.006	7.16	-0.006	0.375	0.42	0.035	0.25	APR4-8000-AD1
8.5	+0.006	7.66	-0.006	0.375	0.42	0.035	0.25	APR4-8500-AD1
9	+0.006	8.16	-0.006	0.375	0.42	0.035	0.25	APR4-9000-AD1
9.5	+0.006	8.66	-0.006	0.375	0.42	0.035	0.25	APR4-9500-AD1
10	+0.006	9.16	-0.006	0.375	0.42	0.035	0.25	APR4-10000-AD1
10.5	+0.008	9.58	-0.008	0.375	0.46	0.035	0.25	APR5-10500-AD1
11	+0.008	10.08	-0.008	0.375	0.46	0.035	0.25	APR5-11000-AD1
11.5	+0.008	10.58	-0.008	0.375	0.46	0.035	0.25	APR5-11500-AD1
12	+0.008	11.08	-0.008	0.375	0.46	0.035	0.25	APR5-12000-AD1
12.5	+0.008	11.58	-0.008	0.375	0.46	0.035	0.25	APR5-12500-AD1
13	+0.008	12.08	-0.008	0.375	0.46	0.035	0.25	APR5-13000-AD1
13.5	+0.008	12.58	-0.008	0.375	0.46	0.035	0.25	APR5-13500-AD1
14	+0.008	13.08	-0.008	0.375	0.46	0.035	0.25	APR5-14000-AD1

Other sizes are available on request

2.6

2.7 LCP profile

LCP profile data



Material codes	Slide ring: 741 Energizer: A-8501 Anti-extrusion rings: P-2506 For additional information → page 26
Pressure	Up to 690 bar (10 000 psi)
Speed	Up to 1,5 m/s (4.9 ft/s)
Temperature range	<p> -60 -50 -40 110 120 130 [°C] -75 -60 -40 230 250 265 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> █ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range █ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) █ Recommended operating temperature range for this profile and material █ Temperatures above the recommended operating range: acceptable only with reduced pressure and/or speed █ Extreme high temperature range: only occasional short-term exposure
Dimension standards	Some metric sizes fit seal housings in accordance with ISO 5597.
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature, e-gap) should not be applied continuously nor simultaneously.

2.7 LCP profile piston seals, metric sizes

D 25 – 200 mm

Maximum extrusion gap e

Radial depth S	e_{\max} at 80 °C (175 °F) for pressures	160 bar	250 bar	400 bar	690 bar
mm	mm				
5	0,7	0,45	0,25	0,15	
6,15	0,7	0,45	0,25	0,15	
7,5	1	0,65	0,4	0,2	
9,25	1,4	0,9	0,55	0,25	
10	1,4	0,9	0,55	0,25	

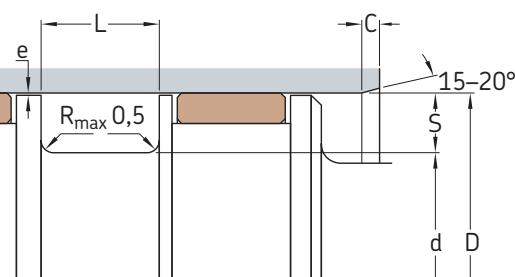
For additional information → page 34

2.7

Dimensions					Designation
D H9	d h9	L +0,2	S	C min.	-
25	15	8	5	4	• LCP-25x15x8-ND1
32	22	8	5	4	• LCP-32x22x8-ND1
40	30	8	5	4	• LCP-40x30x8-ND1
50	40	8	5	4	• LCP-50x40x8-ND1
60	50	8	5	4	LCP-60x50x8-ND1
80	65	12,5	7,5	5	• LCP-80x65x12.5-ND1
90	75	12,5	7,5	5	LCP-90x75x12.5-ND1
100	85	12,5	7,5	5	• LCP-100x85x12.5-ND1
110	95 97,7	12,5 14,7	7,5 6,15	5	LCP-110x95x12.5-ND1 LCP-110x97.7x14.7-ND1
120	105	12,5	7,5	6,5	LCP-120x105x12.5-ND1
125	110	12,5	7,5	6,5	LCP-125x110x12.5-ND1
140	121,5 125	19 12,5	9,25 7,5	6,5 6,5	LCP-140x121.5x19-ND1 LCP-140x125x12.5-ND1
150	135	12,5	7,5	6,5	LCP-150x135x12.5-ND1
160	141,5 145	19 12,5	9,25 7,5	6,5 6,5	LCP-160x141.5x19-ND1 LCP-160x145x12.5-ND1
170	155	12,5	7,5	6,5	LCP-170x155x12.5-ND1
180	165	12,5	7,5	6,5	LCP-180x165x12.5-ND1
200	180 181,5	16 19	10 9,25	6,5 6,5	LCP-200x180x16-ND1 LCP-200x181.5x19-ND1

• Seal housing dimensions in accordance with ISO 5597

2.7 LCP profile piston seals, metric sizes D 250 – 290 mm



Maximum extrusion gap e

Radial depth S	e_{\max} at 80 °C (175 °F) for pressures			
	160 bar	250 bar	400 bar	690 bar
mm	mm			
5	0,7	0,45	0,25	0,15
6,15	0,7	0,45	0,25	0,15
7,5	1	0,65	0,4	0,2
9,25	1,4	0,9	0,55	0,25
10	1,4	0,9	0,55	0,25

For additional information → page 34

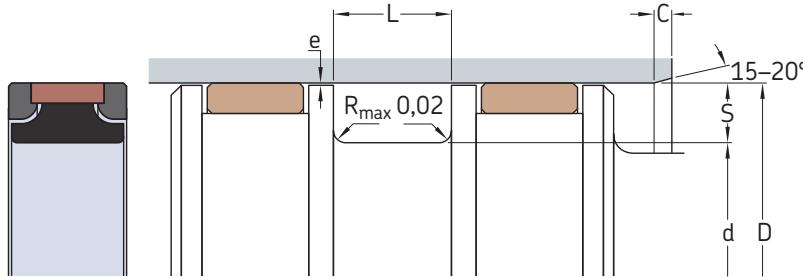
Dimensions

Designation

D H9	d h9	L +0,2	S	C min.	Designation
250	230	16	10	6,5	LCP-250x230x16-ND1
290	270	16	10	7,5	LCP-290x270x16-ND1

Other sizes are available on request

2.7 LCP profile piston seals, inch sizes D 3 – 16 in.



Maximum extrusion gap e

Radial depth S in.	Series LCP3 LCP4 LCP6 LCP8	e _{max} at 80 °C (175 °F) for pressures			
		2 300 psi	3 600 psi	5 800 psi	10 000 psi
0.187	LCP3	0.026	0.017	0.01	0.006
0.24	LCP4	0.04	0.025	0.016	0.009
0.365	LCP6	0.053	0.034	0.021	0.012
0.42	LCP8	0.067	0.043	0.027	0.015

For additional information → page 34

Dimensions						Designation
D Tolerance in.	d Tolerance	L +0.01	S	C min.	–	–
3	+0.003	2.52 –0.003	0.579	0.24	0.2	LCP4-3000-ND1
4	+0.003	3.52 –0.003	0.579	0.24	0.2	LCP4-4000-ND1
4.5	+0.003	4.02 –0.003	0.579	0.24	0.2	LCP4-4500-ND1
5	+0.004	4.27 –0.004	0.75	0.365	0.25	LCP6-5000-ND1
5.5	+0.004	4.77 –0.004	0.75	0.365	0.25	LCP6-5500-ND1
6	+0.004	5.27 –0.004	0.75	0.365	0.25	LCP6-6000-ND1
7	+0.004	6.27 –0.004	0.75	0.365	0.25	LCP6-7000-ND1
8	+0.004	7.27 –0.004	0.75	0.365	0.25	LCP6-8000-ND1
9	+0.004	8.27 –0.004	0.75	0.365	0.25	LCP6-9000-ND1
10	+0.004	9.27 –0.004	0.75	0.365	0.25	LCP6-10000-ND1
13	+0.004	12.27 –0.004	0.75	0.365	0.25	LCP6-13000-ND1
14	+0.004	13.27 –0.004	0.75	0.365	0.25	LCP6-14000-ND1
16	+0.004	15.27 –0.004	0.75	0.365	0.25	LCP6-16000-ND1

Other sizes are available on request

2.8 LTP profile

LTP profile data

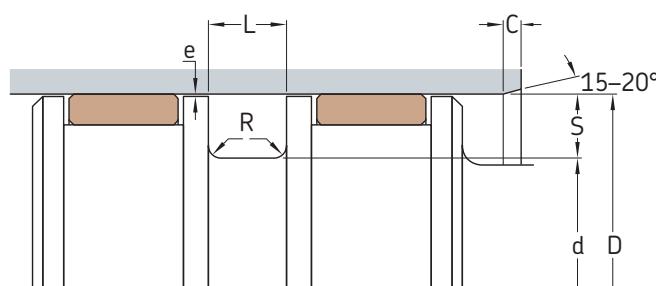


Material codes	Sealing ring: A-8501 Anti-extrusion rings: P-2506 For additional information → page 26
Pressure	Up to 345 bar (5 000 psi)
Speed	Pressure ≤ 250 bar (3 625 psi) → up to 1 m/s (3.2 ft/s) Pressure > 250 bar (3 625 psi) → up to 0,5 m/s (1.6 ft/s)
Temperature range	<p> -60 -50 -40 100 110 120 [°C] -75 -60 -40 210 230 250 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> ■ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range ■ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) ■ Recommended operating temperature range for this profile and material ■ Temperatures above the recommended operating range: acceptable only with reduced pressure, speed, and/or e-gap ■ Extreme high temperature range: only occasional short-term exposure (e.g. cylinder in curing oven of a powder coating process)
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature, e-gap) should not be applied continuously nor simultaneously.

2.8 LTP profile piston seals, inch sizes

D 0.625 – 2.875 in.



Maximum extrusion gap e

Radial depth S in.	Series	e_{\max} at 80 °C (175 °F) for pressures		
		1 000 psi	3 000 psi	5 000 psi
0.125	2	0.025	0.008	0.005
0.187	3	0.03	0.012	0.007
0.25	4	0.035	0.017	0.01

For additional information → page 34

2.8

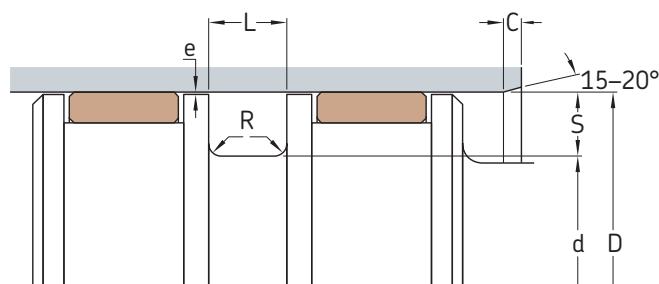
Dimensions

Designation

D +0.002	d Tolerance	L +0.005	S	R max.	C min.	Designation
in.					–	
0.625	0.383 –0.002	0.187	0.125	0.02	0.125	LTP-204-E3R
0.75	0.508 –0.002	0.187	0.125	0.02	0.125	LTP-206-E3R
0.875	0.633 –0.002	0.187	0.125	0.02	0.125	LTP-208-E3R
0.937	0.695 –0.002	0.187	0.125	0.02	0.125	LTP-209-E3R
1	0.758 –0.002	0.187	0.125	0.02	0.125	LTP-210-E3R
1.062	0.82 –0.002	0.187	0.125	0.02	0.125	LTP-211-E3R
1.125	0.883 –0.002	0.187	0.125	0.02	0.125	LTP-212-E3R
1.25	1.008 –0.002	0.187	0.125	0.02	0.125	LTP-214-E3R
1.375	1.133 –0.002	0.187	0.125	0.02	0.125	LTP-216-E3R
1.5	1.258 –0.002	0.187	0.125	0.02	0.125	LTP-218-E3R
1.625	1.383 –0.002	0.187	0.125	0.02	0.125	LTP-220-E3R
1.75	1.508 –0.002	0.187	0.125	0.02	0.125	LTP-222-E3R
1.875	1.505 –0.002	0.281	0.187	0.025	0.125	LTP-325-E3R
2	1.63 –0.002	0.281	0.187	0.025	0.125	LTP-326-E3R
2.125	1.755 –0.002	0.281	0.187	0.025	0.125	LTP-327-E3R
2.25	1.88 –0.002	0.281	0.187	0.025	0.125	LTP-328-E3R
2.375	2.005 –0.002	0.281	0.187	0.025	0.125	LTP-329-E3R
2.5	2.13 –0.002	0.281	0.187	0.025	0.125	LTP-330-E3R
2.625	2.255 –0.002	0.281	0.187	0.025	0.125	LTP-331-E3R
2.75	2.38 –0.002	0.281	0.187	0.025	0.125	LTP-332-E3R
2.875	2.505 –0.002	0.281	0.187	0.025	0.125	LTP-333-E3R

2.8 LTP profile piston seals, inch sizes

D 3 – 12.002 in.



Maximum extrusion gap e

Radial depth S	Series	e_{\max} at 80 °C (175 °F) for pressures		
		1 000 psi	3 000 psi	5 000 psi
in.	in.			
0.125	2	0.025	0.008	0.005
0.187	3	0.03	0.012	0.007
0.25	4	0.035	0.017	0.01

For additional information → page 34

Dimensions

Designation

D +0.002	d	Tolerance	L +0.005	S	R max.	C min.	Designation
in.							–
3	2.63	-0.002	0.281	0.187	0.025	0.125	LTP-334-E3R
3.125	2.755	-0.002	0.281	0.187	0.025	0.125	LTP-335-E3R
3.25	2.88	-0.002	0.281	0.187	0.025	0.125	LTP-336-E3R
3.5	3.13	-0.002	0.281	0.187	0.025	0.125	LTP-338-E3R
3.75	3.38	-0.002	0.281	0.187	0.025	0.125	LTP-340-E3R
3.875	3.505	-0.002	0.281	0.187	0.025	0.125	LTP-341-E3R
4	3.63	-0.002	0.281	0.187	0.025	0.125	LTP-342-E3R
4.125	3.755	-0.002	0.281	0.187	0.025	0.125	LTP-343-E3R
4.25	3.88	-0.002	0.281	0.187	0.025	0.125	LTP-344-E3R
4.5	4.13	-0.002	0.281	0.187	0.025	0.125	LTP-346-E3R
4.75	4.38	-0.002	0.281	0.187	0.025	0.125	LTP-348-E3R
4.875	4.505	-0.002	0.281	0.187	0.025	0.125	LTP-349-E3R
5	4.63	-0.002	0.281	0.187	0.025	0.125	LTP-350-E3R
5.252	4.778	-0.004	0.375	0.25	0.032	0.187	LTP-427-E3R
5.377	4.903	-0.004	0.375	0.25	0.032	0.187	LTP-428-E3R
5.502	5.028	-0.004	0.375	0.25	0.032	0.187	LTP-429-E3R
5.627	5.153	-0.004	0.375	0.25	0.032	0.187	LTP-430-E3R
5.752	5.278	-0.004	0.375	0.25	0.032	0.187	LTP-431-E3R
6.002	5.528	-0.004	0.375	0.25	0.032	0.187	LTP-433-E3R
6.377	6.028	-0.004	0.375	0.25	0.032	0.187	LTP-437-E3R
7.002	6.528	-0.004	0.375	0.25	0.032	0.187	LTP-439-E3R

Dimensions**Designation**

D +0.002	d	Tolerance	L +0.005	S	R max.	C min.	
in.							-
7.752	7.278	-0.004	0.375	0.25	0.032	0.187	LTP-442-E3R
9.502	9.028	-0.004	0.375	0.25	0.032	0.187	LTP-447-E3R
10.002	9.528	-0.004	0.375	0.25	0.032	0.187	LTP-448-E3R
12.002	11.528	-0.004	0.375	0.25	0.032	0.187	LTP-452-E3R

Other sizes are available on request**2.8**

2.9 CUT profile

CUT profile data

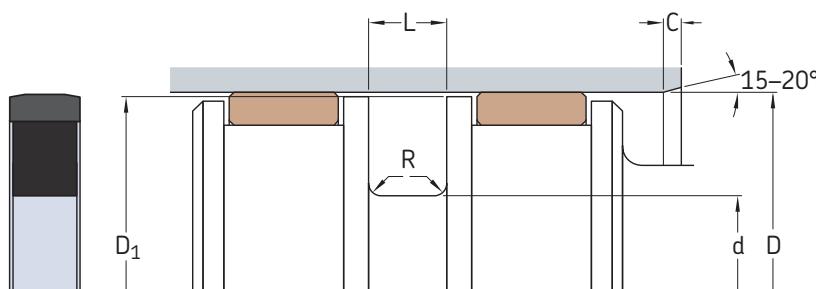


Material codes	Slide ring: PA66/011 Energizer: N70/015 For additional information → page 26
Pressure	Up to 500 bar (7 250 psi)
Speed	Up to 1 m/s (3.2 ft/s)
Temperature range	<p> -60 -40 -30 110 120 130 [°C] -75 -40 -20 230 250 265 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> █ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range █ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) █ Recommended operating temperature range for this profile and material █ Temperatures above the recommended operating range: acceptable only with reduced pressure and/or speed █ Extreme high temperature range: only occasional short-term exposure
Dimension standards	Some sizes fit seal housings in accordance with ISO 7425-1.
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature) should not be applied continuously nor simultaneously.

2.9 CUT profile piston seals, metric sizes

D 40 - 140 mm



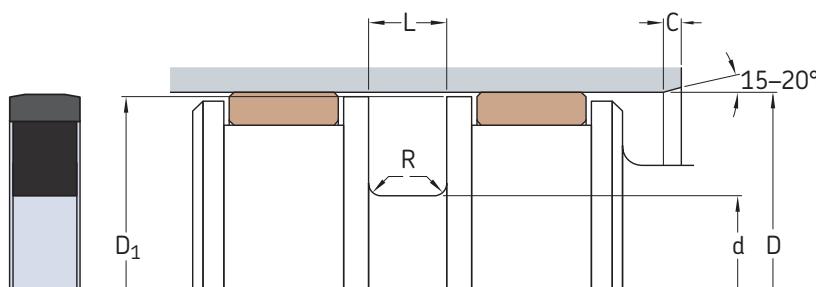
2.9

Dimensions						Designation
D H9	d h9	L +0,2	D ₁	R max.	C min.	
40	29	4,2	39,2	0,3	7	• CUT 40x29x4.2
50	34,5	6,3	49	0,5	10	• CUT 50x34.5x6.3
	39	4,2	49,2	0,3	7	• CUT 50x39x4.2
60	41,7	7,0	59	0,5	10	CUT 60x41.7x7.0
63	44,7	7,0	62	0,5	10	CUT 63x44.7x7
	47,5	6,3	62	0,5	10	• CUT 63x47.5x6.3
65	49,5	6,3	64	0,5	10	CUT 65x49.5x6.3
70	51,7	7,0	69	0,5	10	CUT 70x51.7x7
75	54	8,1	73,8	0,9	12	CUT 75x54x8.1
	59,5	6,3	74	0,5	10	CUT 75x59.5x6.3
80	59	8,1	78,8	0,9	12	CUT 80x59x8.1
	64,5	6,3	79	0,5	10	• CUT 80x64.5x6.3
90	69	8,1	88,8	0,9	12	CUT 90x69x8.1
	74,5	6,3	89	0,5	10	CUT 90x74.5x6.3
100	79	8,1	98,8	0,9	12	CUT 100x79x8.1
	84,5	6,3	99	0,5	10	• CUT 100x84.5x6.3
110	89	8,1	108,8	0,9	12	CUT 110x89x8.1
115	94	8,1	113,8	0,9	12	CUT 115x94x8.1
120	99	8,1	118,8	0,9	12	CUT 120x99x8.1
125	104	8,1	123,8	0,9	12	• CUT 125x104x8.1
	109,5	6,3	124	0,5	10	• CUT 125x109.5x6.3
130	109	8,1	128,8	0,9	12	CUT 130x109x8.1
140	119	8,1	138,8	0,9	12	CUT 140x119x8.1

• Seal housing dimensions in accordance with ISO 7425-1

2.9 CUT profile piston seals, metric sizes

D 150 – 320 mm



Dimensions						Designation
D H9	d h9	L +0,2	D ₁	R max.	C min.	-
<hr/>						
150	129	8,1	148,8	0,9	12	CUT 150x129x8.1
160	139	8,1	158,8	0,9	12	• CUT 160x139x8.1
170	149	8,1	168,8	0,9	12	CUT 170x149x8.1
180	159	8,1	178,8	0,9	12	CUT 180x159x8.1
190	169	8,1	188,8	0,9	12	CUT 190x169x8.1
200	179	8,1	198,8	0,9	12	• CUT 200x179x8.1
210	189	8,1	208,8	0,9	12	CUT 210x189x8.1
220	199	8,1	218,8	0,9	12	CUT 220x199x8.1
230	209	8,1	228,8	0,9	12	CUT 230x209x8.1
240	219	8,1	238,8	0,9	12	CUT 240x219x8.1
	225	8,1	239	0,9	12	CUT 240x225x8.1
250	229	8,1	248,8	0,9	12	• CUT 250x229x8.1
260	239	8,1	258,8	0,9	12	CUT 260x239x8.1
280	255,5	8,1	278,8	0,9	12	CUT 280x255.5x8.1
320	292	9,5	318,4	0,9	15	CUT 320x292x9.5

Other sizes are available on request

• Seal housing dimensions in accordance with ISO 7425-1

2.9

2.10 SCP profile

SCP profile data

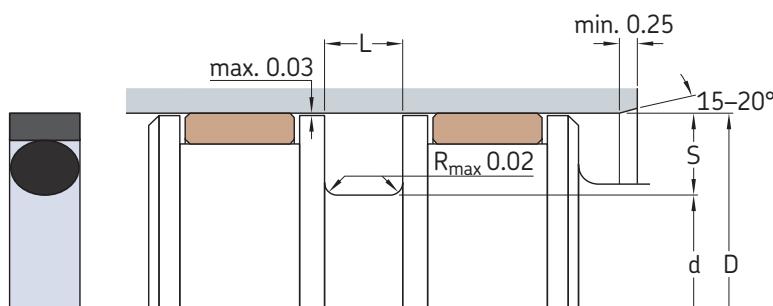


Material codes	Slide ring: suffix E5E → P-2501 suffix E5D → P-2551 Energizer: A-8526 For additional information → page 26
Pressure	Up to 690 bar (10 000 psi)
Speed	Up to 1 m/s (3.2 ft/s)
Temperature range	<p>  For temperature limits depending on fluid compatibility → table 8, page 32 </p> <ul style="list-style-type: none"> █ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range █ Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) █ Recommended operating temperature range for this profile and material █ Temperatures above the recommended operating range: acceptable only with reduced pressure and/or speed █ Extreme high temperature range: only occasional short-term exposure
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature) should not be applied continuously nor simultaneously.

2.10 SCP profile piston seals, inch sizes

D 2 – 5.025 in.

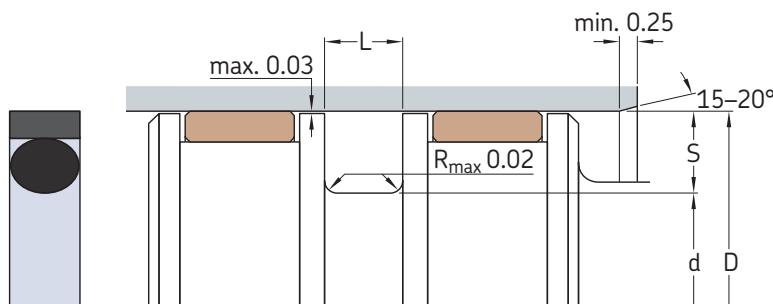


2.10

Dimensions					Designation	
D	Tolerance	d	Tolerance	L	S	
in.				+0.005	-	
2	+0.002	1.462	-0.002	0.282	0.269	SCP1-2000-E5E
2.25	+0.002	1.712	-0.002	0.282	0.269	SCP1-2250-E5E
2.5	+0.003	1.908	-0.002	0.312	0.296	SCP5-2500-E5E
	+0.003	1.962	-0.002	0.282	0.269	SCP1-2500-E5E
2.75	+0.003	2.212	-0.002	0.282	0.269	SCP1-2750-E5D
3	+0.003	2.408	-0.002	0.312	0.296	SCP5-3000-E5E
	+0.003	2.442	-0.003	0.282	0.279	SCP2-3000-E5E
3.25	+0.003	2.692	-0.003	0.282	0.279	SCP2-3250-E5E
3.5	+0.003	2.908	-0.003	0.312	0.296	SCP5-3500-E5E
	+0.003	2.942	-0.003	0.282	0.279	SCP2-3500-E5E
3.75	+0.003	3.192	-0.003	0.282	0.279	SCP2-3750-E5D
4	+0.003	3.408	-0.003	0.312	0.296	SCP5-4000-E5E
	+0.003	3.442	-0.003	0.282	0.279	SCP2-4000-E5E
4.025	+0.003	3.467	-0.003	0.282	0.279	SCP2-4025-E5D
4.25	+0.003	3.692	-0.003	0.282	0.279	SCP2-4250-E5D
4.265	+0.003	3.707	-0.003	0.282	0.279	SCP2-4265-E5D
4.5	+0.003	3.74	-0.003	0.377	0.38	SCP3-4500-E5D
	+0.003	3.908	-0.003	0.312	0.296	SCP5-4500-E5E
	+0.003	3.942	-0.003	0.282	0.279	SCP2-4500-E5E
4.525	+0.003	3.967	-0.003	0.282	0.279	SCP2-4525-E5D
4.75	+0.003	3.99	-0.004	0.377	0.38	SCP3-4750-E5D
	+0.003	4.192	-0.004	0.282	0.279	SCP2-4750-E5E
5	+0.004	4.24	-0.004	0.377	0.38	SCP3-5000-E5E
	+0.004	4.442	-0.004	0.282	0.279	SCP2-5000-E5E
5.025	+0.004	4.265	-0.004	0.377	0.38	SCP3-5025-E5D

2.10 SCP profile piston seals, inch sizes

D 5.25 – 12 in.



Dimensions					Designation	
D in.	Tolerance	d	Tolerance	L +0.005	S	
5.25	+0.004	4.49	-0.004	0.377	0.38	SCP3-5250-E5D
5.5	+0.004	4.74	-0.004	0.377	0.38	SCP3-5500-E5E
5.75	+0.004	4.99	-0.004	0.377	0.38	SCP3-5750-E5D
6	+0.004	5.24	-0.004	0.377	0.38	SCP3-6000-E5E
6.025	+0.004	5.265	-0.004	0.377	0.38	SCP3-6025-E5D
6.5	+0.004	5.74	-0.004	0.377	0.38	SCP3-6500-E5D
7	+0.004	6.24	-0.004	0.377	0.38	SCP3-7000-E5E
7.025	+0.004	6.265	-0.004	0.377	0.38	SCP3-7025-E5D
7.5	+0.004	6.74	-0.004	0.377	0.38	SCP3-7500-E5D
8	+0.004	7.24	-0.004	0.377	0.38	SCP3-8000-E5D
8.5	+0.004	7.74	-0.004	0.377	0.38	SCP3-8500-E5D
9	+0.004	8.124	-0.004	0.377	0.438	SCP4-9000-E5D
9.5	+0.004	8.624	-0.004	0.377	0.438	SCP4-9500-E5D
10	+0.004	9.124	-0.004	0.377	0.438	SCP4-10000-E5D
12	+0.004	11.124	-0.004	0.377	0.438	SCP4-12000-E5D

Other sizes are available on request

2.10

2.11 MD-L profile

MD-L profile data

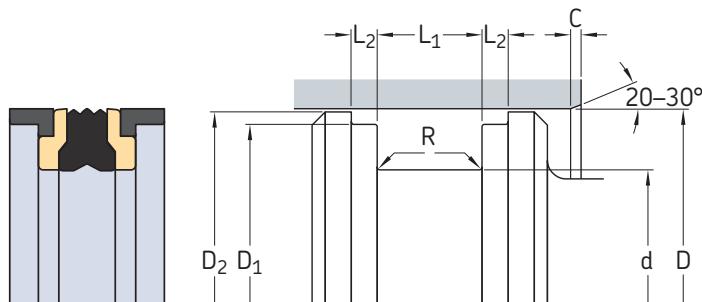


Material codes	Sealing ring: N80/047 Guide rings: POM/076 Support rings: TPC-ET72/075 For additional information → page 26
Pressure	Up to 250 bar (3 625 psi)
Speed	Up to 1 m/s (3.2 ft/s)
Temperature range	<p> -40 -30 -20 100 110 120 [°C] -40 -20 -5 210 230 250 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> █ Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range █ Temperatures below the recommended operating range: seal performance depends on system design █ Recommended operating temperature range for this profile and material █ Temperatures above the recommended operating range: acceptable only with reduced pressure and/or speed █ Extreme high temperature range: only occasional short-term exposure (e.g. cylinder in curing oven of a powder coating process)
Dimension standards	Some sizes fit seal housings in accordance with ISO 6547.
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature) should not be applied continuously nor simultaneously.

2.11 MD-L profile piston seals, metric sizes

D 25 – 63 mm



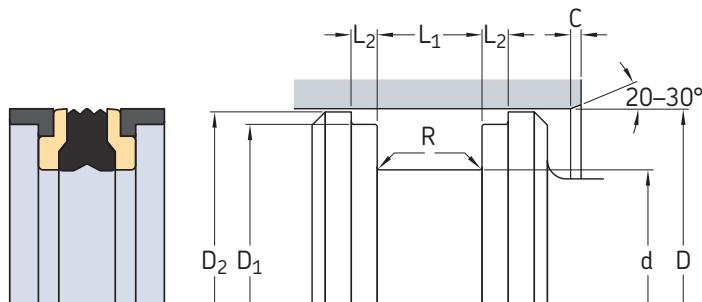
2.11

Dimensions								Designation
D H9	d h9	L ₁ +0,1/+0,35	L ₂ +0,1	D ₁ h9	D ₂ h11	R max.	C min.	
mm								-
25	15	12,4	4	21	23	0,4	2,5	MD 25x15x12.4-L
30	21	13,5	2,1	27	29	0,4	2,5	MD 30x21x13.5-L
32	22	12,5	4	29	31	0,4	2,5	• MD 32x22x12.5-L
	24	10	4	29	31	0,4	2	• MD 32x24x10-L
	24	15,5	3,2	28	31,4	0,4	2	MD 32x24x15.5-L
35	25	15,5	2,6	31	34	0,4	2,5	MD 35x25x15.5-L
	25	16,4	6,4	31,4	33,5	0,4	2,5	MD 35x25x16.4-L
40	24	18,4	6,4	35,4	38,7	0,4	4	MD 40x24x18.4-L
	30	12,4	4	36	38	0,4	2,5	MD 40x30x12.4-L
	30	12,5	4	37	39	0,4	2,5	• MD 40x30x12.5-L
	30	16,4	6,4	35,4	38,7	0,4	2,5	MD 40x30x16.4-L
	32	15,5	3,2	36	39,4	0,4	2	MD 40x32x15.5-L
45	29	18,4	6,4	40,4	43,7	0,4	4	MD 45x29x18.4-L
	37	15,5	3,2	41,0	43,5	0,4	2	MD 45x37x15.5-L
50	34	18,4	6,4	45,4	48,7	0,4	4	MD 50x34x18.4-L
	35	20	5	46	48,5	0,4	4	• MD 50x35x20-L
	38	20,5	4,2	46	49,4	0,4	3	MD 50x38x20.5-L
	40	12,5	4	47	49	0,4	2,5	• MD 50x40x12.5-L
55	39	18,4	6,4	50,4	53,7	0,4	4	MD 55x39x18.4-L
	39	20,5	3,1	51	54	0,4	4	MD 55x39x20.5-L
	45	12,5	4	52	54	0,4	2,5	MD 55x45x12.5-L
60	44	18,4	6,4	55,4	58,7	0,4	4	MD 60x44x18.4-L
	48	20,5	4,2	56	59,4	0,4	3	MD 60x48x20.5-L
	50	17	4	56	59,4	0,4	2,5	MD 60x50x17-L
63	47	18,4	6,4	58,4	61,5	0,4	4	MD 63x47x18.4-L
	47	19,4	6,4	58,4	61,7	0,4	4	MD 63x47x19.4-L
	47	20,5	3,1	59	62	0,4	4	MD 63x47x20.5-L
	48	20	5,0	59	61,5	0,4	4	• MD 63x48x20-L
	51	20,5	4,2	59	62,4	0,4	3	MD 63x51x20.5-L
	53	12,5	4	60	62	0,4	2,5	• MD 63x53x12.5-L

• Dimensions in accordance with ISO 6547

2.11 MD-L profile piston seals, metric sizes

D 65 – 280 mm



Dimensions								Designation
D H9	d h9	L ₁ +0,1/+0,35	L ₂ +0,1	D ₁ h9	D ₂ h11	R max.	C min.	-
mm								
65	50	18,4	6,4	60,4	63,7	0,4	4	MD 65x50x18.4-L
70	50	22,4	6,4	64,2	68,3	0,8	5	MD 70x50x22.4-L
	54	20,5	3,1	66	69	0,4	4	MD 70x54x20.5-L
	55	20	5	66	68,5	0,4	4	MD 70x55x20-L
	58	20,5	4,2	66	69,4	0,4	3	MD 70x58x20.5-L
75	55	22,4	6,4	69,2	73,3	0,8	5	MD 75x55x22.4-L
80	60	22,4	6,4	74,2	78,3	0,8	5	MD 80x60x22.4-L
	60	25	6,3	75	78	0,8	5	• MD 80x60x25-L
	62	22,5	3,6	76	79	0,4	4,5	MD 80x62x22.5-L
	65	20	5	76	78,5	0,4	4	• MD 80x65x20-L
	66	22,5	5,2	76	79,4	0,4	3,5	MD 80x66x22.5-L
85	65	22,4	6,4	79,2	83,3	0,8	5	MD 85x65x22.4-L
90	70	22,4	6,4	84,2	88,3	0,8	5	MD 90x70x22.4-L
	72	22,5	3,6	86	89	0,4	4,5	MD 90x72x22.5-L
	75	20	5	86	88,5	0,4	4	MD 90x75x20-L
95	75	22,4	6,4	89	93,3	0,8	5	MD 95x75x22.4-L
100	75	22,4	6,4	93,2	98	0,8	6,5	MD 100x75x22.4-L
	80	25	6,3	95	98	0,8	5	• MD 100x80x25-L
	85	20	5	96	98,5	0,4	4	• MD 100x85x20-L
	86	22,5	5,2	96	99,4	0,4	3,5	MD 100x86x22.5-L
105	92,5	14,0	5,2	99,0	103,5	0,4	3,5	MD 105x92.5x14-L
110	85	22,4	6,4	103,1	108	0,8	6,5	MD 110x85x22.4-L
	85	25,4	6,4	103,1	108	0,8	6,5	MD 110x85x25.4-L
	95	20	5	106	108,5	0,4	4	MD 110x95x20-L
	96	22,5	5,2	106	109,4	0,4	3,5	MD 110x96x22.5-L
115	90	22,4	6,4	108,1	113	0,8	6,5	MD 115x90x22.4-L
120	95	22,4	6,4	113,1	118	0,8	6,5	MD 120x95x22.4-L

• Dimensions in accordance with ISO 6547

Dimensions**Designation**

D H9	d h9	L ₁ +0,1/+0,35	L ₂ +0,1	D ₁ h9	D ₂ h11	R max.	C min.	
mm								-
125	100	25,4	6,4	118,1	123	0,8	6,5	MD 125x100x25.4-L
	100	32	10	119	123	0,8	6,5	• MD 125x100x32-L
	105	25	6,3	120	123	0,8	5	• MD 125x105x25-L
	105	25,4	6,4	119,1	123,3	0,8	5	MD 125x105x25.4-L
	108	26,5	7,2	121	124,4	0,4	4,5	MD 125x108x26.5-L
130	105	25,4	6,4	123,1	128	0,8	6,5	MD 130x105x25.4-L
	105	25,4	9,5	124,1	128,3	0,8	6,5	MD 130x105x25.4x9.5-L
140	115	25,4	6,4	133	138	0,8	6,5	MD 140x115x25.4-L
	115	25,4	9,5	132,6	137,5	0,8	6,5	MD 140x115x25.4x9.5-L
	120	25	6,3	135	138	0,8	5	MD 140x120x25-L
145	120	25,4	6,4	138,3	143	0,8	6,5	MD 145x120x25.4-L
150	125	25,4	6,4	143	148	0,8	6,5	MD 150x125x25.4-L
	125	25,4	9,5	142,6	147,5	0,8	6,5	MD 150x125x25.4x9.5-L
160	130	25,4	6,4	153	157,9	0,8	7,5	MD 160x130x25.4-L
	135	25,4	9,5	152,6	157,5	0,8	6,5	MD 160x135x25.4x9.5-L
	140	25	6,3	155	158	0,8	5	• MD 160x140x25-L
165	140	25,4	9,5	157,6	162,5	0,8	6,5	MD 165x140x25.4x9.5-L
170	145	25,4	12,7	161,7	167,1	0,8	6,5	MD 170x145x25.4x12.7-L
180	150	35,4	6,4	173	178	0,8	7,5	MD 180x150x35.4-L
	155	25,4	12,7	171,7	177,7	0,8	6,5	MD 180x155x25.4x12.7-L
190	165	25,4	12,7	181,7	187	0,8	6,5	MD 190x165x25.4x12.7-L
200	170	35,4	6,4	193	198	0,8	7,5	MD 200x170x35.4-L
	170	36	12,5	192	197	0,8	7,5	• MD 200x170x36-L
	175	25,4	12,7	192	197	0,8	6,5	MD 200x175x25.4x12.7-L
	180	31,5	9,2	196	199,4	0,8	5	MD 200x180x31.5-L
220	190	35,4	6,4	213	218	0,8	7,5	MD 220x190x35.4-L
	195	25,4	12,7	211,6	217	0,8	6,5	MD 220x195x25.4x12.7-L
230	205	25,4	12,7	221,6	227	0,8	6,5	MD 230x205x25.4x12.7-L
240	215	25,4	12,7	231,6	237	0,8	6,5	MD 240x215x25.4x12.7-L
250	220	35,4	6,4	243	248	0,8	7,5	MD 250x220x35.4-L
	225	25,4	12,7	241,6	247	0,8	6,5	MD 250x225x25.4x12.7-L
280	250	35,4	9,5	273	277	0,8	7,5	MD 280x250x35.4x9.5-L

Other sizes are available on request

2.11

• Dimensions in accordance with ISO 6547

2.12 UNP profile

UNP profile data

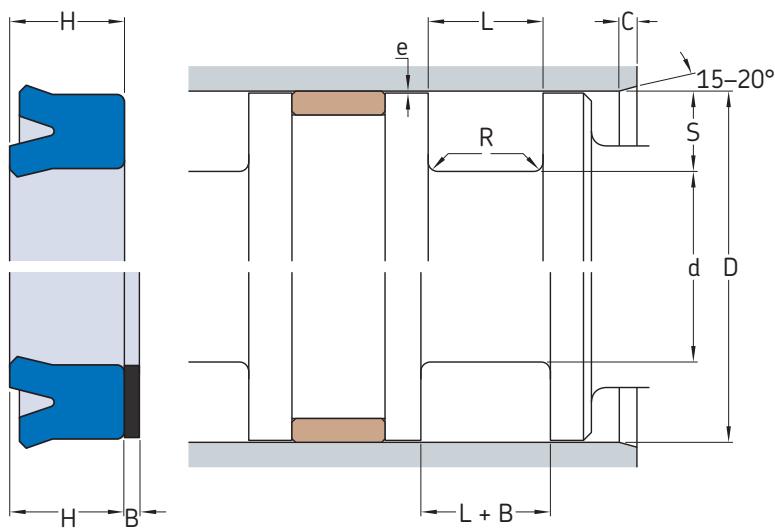


Material codes	Metric sizes → U-1029 Inch sizes → U-1023 For additional information → page 26
Pressure	Up to 350 bar (5 075 psi)
Speed	Pressure ≤ 250 bar (3 625 psi) → up to 1 m/s (3.2 ft/s) Pressure > 250 bar (3 625 psi) → up to 0,5 m/s (1.6 ft/s)
Temperature range	<p> -60 -40 -35 100 120 130 [°C] -75 -40 -30 210 250 265 [°F] </p> <p>For temperature limits depending on fluid compatibility → table 8, page 32</p> <ul style="list-style-type: none"> Extreme low temperature range: may be intermittently exposed (e.g. cold start-up) without seal damage, but seal performance may be compromised while in this range Temperatures below the recommended operating range: seal performance depends on system design (precision guiding arrangement recommended) Recommended operating temperature range for this profile and material Temperatures above the recommended operating range: acceptable only with reduced pressure, speed, e-gap and/or with the use of a full-face anti-extrusion ring Extreme high temperature range: only occasional short-term exposure (e.g. cylinder in curing oven of a powder coating process)
Counter-surface	→ page 22

Maximum values of application parameters (e.g. pressure, speed, temperature, e-gap) should not be applied continuously nor simultaneously.

2.12 UNP profile piston seals, metric sizes

D 45 – 250 mm



Maximum extrusion gap e

Radial depth S mm	e_{\max} at 80 °C (175 °F) for pressures		
	160 bar	250 bar	350 bar
5	0,45	0,25	0,1
7,5	0,5	0,3	0,15
10	0,55	0,3	0,15
12,5 to 15	0,6	0,3	0,2

For additional information → page 34

2.12

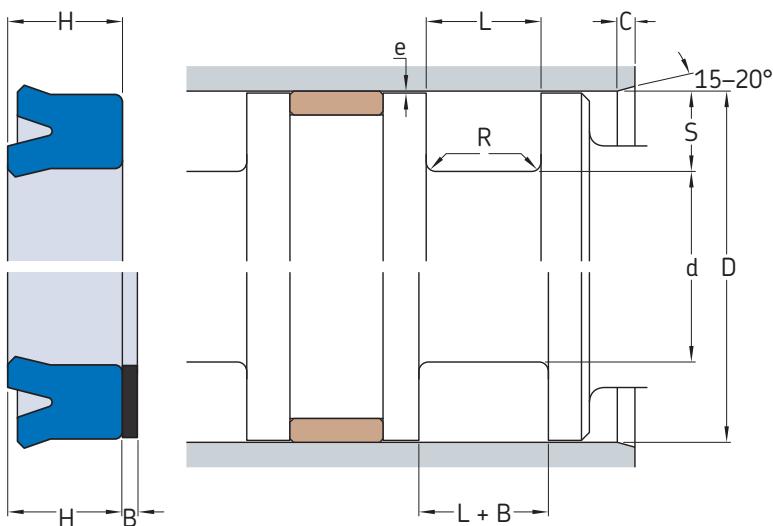
With and without full-face anti-extrusion ring¹⁾

Dimensions								Designation
D H9	d h9	L +0,2	L + B +0,2	H nom.	S	R max.	C min.	–
mm	mm							–

45	35	7	9	6	5	0,4	5	UNP-45x35x7-E6W
50	40	7	9	6	5	0,4	5	UNP-50x40x7-E6W
	40	8,3	10,3	7,3	5	0,4	5	UNP-50x40x8.3-E6W
63	48	11	13	10	7,5	0,5	7	UNP-63x48x11-E6W
	53	7	9	6	5	0,4	5	UNP-63x53x7-E6W
	53	8,3	10,3	7,3	5	0,4	5	UNP-63x53x8.3-E6W
75	65	7	9	6	5	0,4	5	UNP-75x65x7-E6W
130	115	10	12	9	7,5	0,5	7	UNP-130x115x10-E6W
140	120	16,5	18,5	15	10	0,75	7	UNP-140x120x16.5-E6W
150	135	10	12	9	7,5	0,6	7	UNP-150x135x10-E6W
160	140	16	18	14,5	10	0,75	7	UNP-160x140x15.5-E6W
170	150	13,2	15,2	12	10	0,75	7	UNP-170x150x13-E6W
	155	10	12	9	7,5	0,5	7	UNP-170x155x10-E6W
180	150	20	22	18	15	0,75	7	UNP-180x150x19.5-E6W
	165	10	12	9	7,5	0,5	7	UNP-180x165x10-E6W
190	175	10	12	9	7,5	0,5	7	UNP-190x175x10-E6W
200	175	20,2	22,2	18,2	12,5	0,75	12	UNP-200x175x19.7-E6W
210	190	13,2	15,2	12	10	0,75	7	UNP-210x190x13-E6W
220	200	16,5	18,5	15	10	0,75	7	UNP-220x200x16.5-E6W
230	205	22	24	20	12,5	0,75	12	UNP-230x205x22-E6W
240	220	13,2	15,2	12	10	0,75	7	UNP-240x220x13-E6W
250	230	16,5	18,5	15	10	0,75	7	UNP-250x230x16.5-E6W

¹⁾ In case of higher pressures, SKF provides full-face anti-extrusion rings on request. For additional information, contact SKF.

2.12 UNP profile piston seals, metric sizes D 280 – 300 mm



Maximum extrusion gap e

Radial depth S mm	e_{\max} at 80 °C (175 °F) for pressures		
	160 bar	250 bar	350 bar
5	0,45	0,25	0,1
7,5	0,5	0,3	0,15
10	0,55	0,3	0,15
12,5 to 15	0,6	0,3	0,2

For additional information → page 34

With and without full-face anti-extrusion ring¹⁾

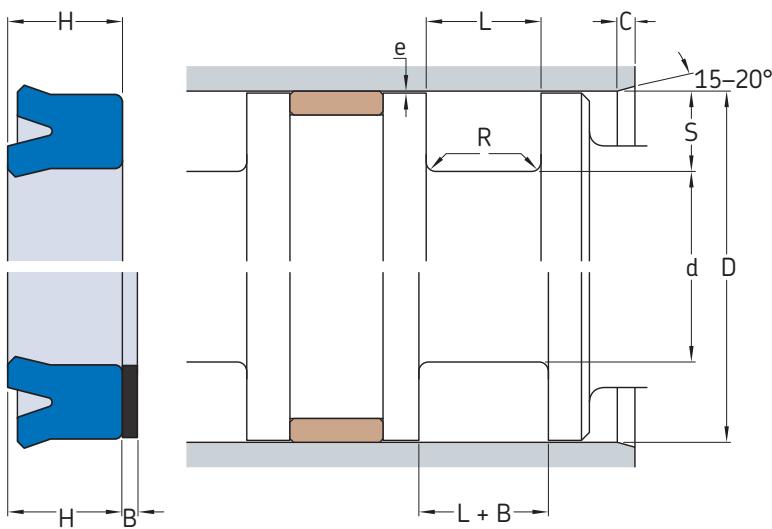
Dimensions								Designation
D H9	d h9	L +0,2	L + B +0,2	H nom.	S	R max.	C min.	–
mm								
280	255	21	23	19	12,5	0,75	12	UNP-280x255x20.5-E6W
290	265	21	23	19	12,5	0,75	12	UNP-290x265x20.5-E6W
300	275	17,6	19,6	16	12,5	0,75	12	UNP-300x275x17.5-E6W

Other sizes are available on request

¹⁾ In case of higher pressures, SKF provides full-face anti-extrusion rings on request. For additional information, contact SKF.

2.12 UNP profile piston seals, inch sizes

D 1.125 – 5 in.



Maximum extrusion gap e

Radial depth S in.	e_{\max} at 80 °C (175 °F) for pressures		
	2 300 psi	3 600 psi	5 075 psi
0.125	0.008	0.004	–
0.187	0.014	0.008	–
0.25	0.018	0.01	0.004
0.375	0.02	0.012	0.006
0.5	0.022	0.012	0.006

For additional information → page 34

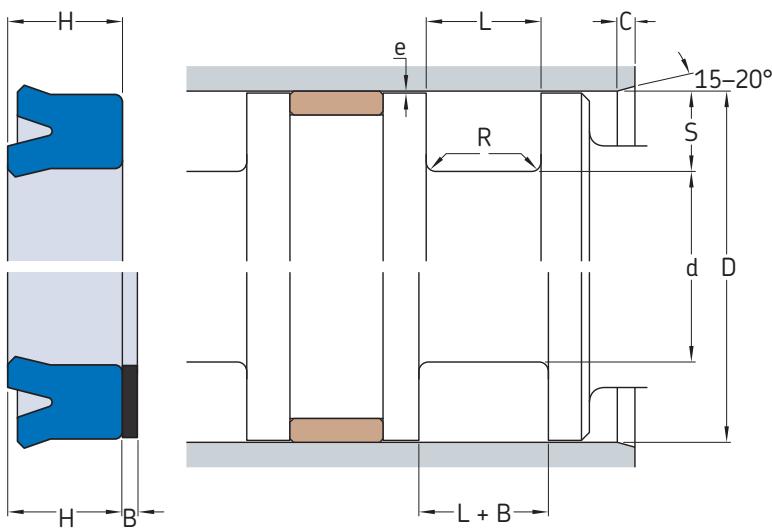
2.12

With and without full-face anti-extrusion ring¹⁾

Dimensions								Designation		
D	Tolerance	d	Tolerance	L +0.01	L+B +0.01	H nom.	S	R max.	C min.	–
in.										–
1.125	+0.002	0.75	-0.002	0.343	0.437	0.312	0.187	0.015	0.25	UNP187-750-312-H9J
1.5	+0.002	1.125	-0.002	0.275	0.369	0.25	0.187	0.015	0.25	UNP187-1125-250-H9J
	+0.002	1.25	-0.002	0.275	0.338	0.25	0.125	0.01	0.25	UNP125-1250-250-H9J
1.75	+0.002	1.375	-0.002	0.275	0.369	0.25	0.187	0.015	0.25	UNP187-1375-250-H9J
2	+0.002	1.625	-0.002	0.206	0.299	0.187	0.187	0.015	0.25	UNP187-1625-187-H9J
	+0.002	1.625	-0.002	0.343	0.437	0.312	0.187	0.015	0.25	UNP187-1625-312-H9J
2.25	+0.002	1.875	-0.002	0.343	0.437	0.312	0.187	0.015	0.25	UNP187-1875-312-H9J
2.5	+0.003	2	-0.003	0.413	0.538	0.375	0.25	0.02	0.312	UNP250-2000-375-H9J
	+0.002	2.125	-0.002	0.275	0.369	0.25	0.187	0.015	0.25	UNP187-2125-250-H9J
	+0.002	2.125	-0.002	0.413	0.506	0.375	0.187	0.015	0.25	UNP187-2125-375-H9J
2.625	+0.002	2.25	-0.002	0.343	0.437	0.312	0.187	0.015	0.25	UNP187-2250-312-H9J
2.75	+0.003	2.25	-0.003	0.413	0.538	0.375	0.25	0.02	0.312	UNP250-2250-375-H9J
3	+0.002	2	-0.007	0.550	0.800	0.5	0.5	0.04	0.375	UNP500-2000-500-H9J
	+0.003	2.5	-0.003	0.343	0.468	0.312	0.25	0.02	0.312	UNP250-2500-312-H9J
	+0.003	2.5	-0.003	0.413	0.538	0.375	0.25	0.02	0.312	UNP250-2500-375-H9J
	+0.002	2.625	-0.002	0.413	0.506	0.375	0.187	0.015	0.25	UNP187-2625-375-H9J
3.25	+0.005	2.25	-0.007	0.550	0.800	0.5	0.5	0.04	0.375	UNP500-2250-500-H9J
	+0.002	2.875	-0.002	0.413	0.506	0.375	0.187	0.015	0.25	UNP187-2875-375-H9J
3.5	+0.004	2.75	-0.005	0.688	0.875	0.625	0.375	0.032	0.375	UNP375-2750-625-H9J
	+0.003	3	-0.003	0.413	0.538	0.375	0.25	0.02	0.312	UNP250-3000-375-H9J
4	+0.005	3	-0.007	0.550	0.800	0.5	0.5	0.04	0.375	UNP500-3000-500-H9J
	+0.003	3.5	-0.003	0.413	0.538	0.375	0.25	0.02	0.312	UNP250-3500-375-H9J
4.5	+0.004	3.75	-0.005	0.688	0.875	0.625	0.375	0.032	0.375	UNP375-3750-625-H9J
5	+0.004	4.25	-0.005	0.550	0.738	0.5	0.375	0.032	0.375	UNP375-4250-500-H9J
	+0.003	4.5	-0.003	0.413	0.538	0.375	0.25	0.02	0.312	UNP250-4500-375-H9J

¹⁾ In case of higher pressures, SKF provides full-face anti-extrusion rings on request. For additional information, contact SKF.

2.12 UNP profile piston seals, inch sizes D 5.5 – 6.5 in.



Maximum extrusion gap e

Radial depth S in.	e_{\max} at 80 °C (175 °F) for pressures		
	2 300 psi	3 600 psi	5 075 psi
0.125	0.008	0.004	–
0.187	0.014	0.008	–
0.25	0.018	0.01	0.004
0.375	0.02	0.012	0.006
0.5	0.022	0.012	0.006

For additional information → page 34

With and without full-face anti-extrusion ring¹⁾

Dimensions								Designation		
D Tolerance in.	d Tolerance	L +0.01	L+B +0.01	H nom.	S	R max.	C min.	–		
5.5	+0.004	4.75	-0.005	0.688	0.875	0.625	0.375	0.032	0.375	UNP375-4750-625-H9J
6	+0.004	5.25	-0.005	0.413	0.600	0.375	0.375	0.032	0.375	UNP375-5250-375-H9J
6.5	+0.004	5.75	-0.005	0.688	0.875	0.625	0.375	0.032	0.375	UNP375-5750-625-H9J

Other sizes are available on request

¹⁾ In case of higher pressures, SKF provides full-face anti-extrusion rings on request. For additional information, contact SKF.

2.12

Piston seals

More piston seals

The piston seals listed in this catalogue represent the preferred profiles in common sizes. SKF supplies many additional sizes and profiles. The following profiles are also manufactured in series production. SKF can provide customized sealing solutions also for the toughest application conditions. For additional information about these profiles or if the application requires a solution outside of what is provided in this catalogue, contact SKF.

More PTFE slide ring piston seals

Piston seals with PTFE slide rings are available in a wide variety of profiles and materials (→ fig. 18). For additional information about material options, contact SKF.

SPECTRASEAL

SPECTRASEAL is a PTFE seal that can be used as a single-acting piston seal (→ fig. 19). The metal spring energizer adds radial load to the seal lip contact areas. SPECTRASEAL is intended for extreme condition applications including high temperature or aggressive media. For additional information, contact SKF.

Customized machined seal profiles

SKF can manufacture a broad variety of piston seal profiles with different materials and sizes with its industry-leading SKF SEAL JET production system (→ fig. 20). For additional information about customized machined profiles, refer to publication *Customized machined seals – Product range* or contact SKF.

Fig. 18

PTFE slide ring piston seals, profile examples

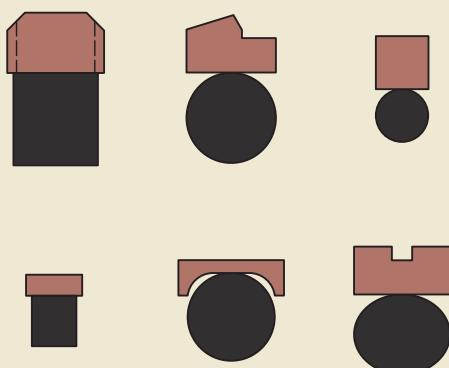
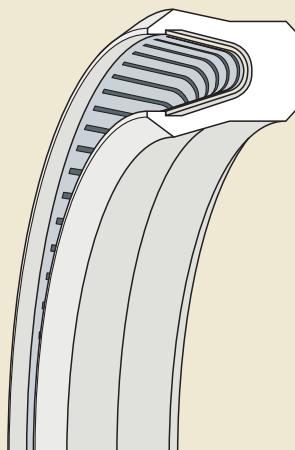


Fig. 19

SPECTRASEAL



More piston seals

Fig. 20

SKF SEAL JET profile examples



K01-P



K01-PE



K01-R



K01-RE



K02-P



K02-PD



K02-R



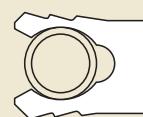
K02-RD



K03-P



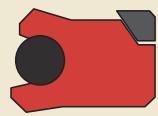
K03-F



K03-5



K04-P



K04-PD



K05-P



K05-R



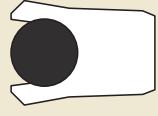
K06-P



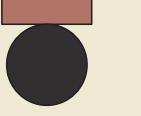
K06-R



K07-P



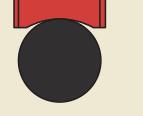
K07-F



K08-E



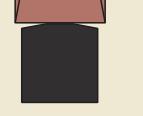
K08-D



K08-P



K08-ES



K08-D5



K09-N



K09-D



K09-H



K09-F



K1012-T



K1012-M



K1315-T



K16-A



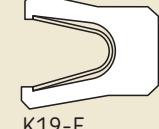
K16-B



K17-P



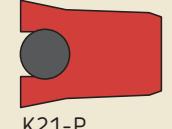
K17-R



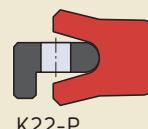
K19-F



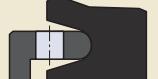
K20-R



K21-P



K22-P



K22-R



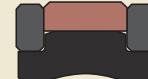
K23-N



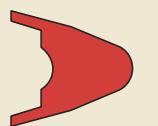
K23-D



K23-H



K23-F



K24-P



K32-P



K35-P

2

