

Guide rings and guide strips

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Guide rings and guide strips

Basics

In hydraulic cylinders the most commonly used guides are guide rings and guide strips. They accommodate radial loads of forces acting on the cylinder assembly and guide the rod in the cylinder head as well as the piston in the cylinder bore (**→ fig. 1**).

Guides are made of polymer materials and prevent metal-to-metal contact between moving parts in a working hydraulic cylinder. Compared to metal guides, polymer guides provide the following advantages in hydraulic cylinders:

- significantly longer service life
- work more smoothly against the cylinder bore and the sealing surfaces
- avoid wear of cylinder surfaces despite the presence of contamination particles

- high resistance to insufficient lubrication at low speeds
- larger contact area (**→ fig. 2, page 251** and **fig. 4, page 254**) due to higher degree of elastic deformation distributes the load and reduces stress to counter-surface
- certain self-lubricating properties

SKF supplies different precision machined guide rings with different polymer materials and sizes, which make them appropriate for a wide variety of operating conditions and applications.

Guides of PTFE are also available for applications where start-up friction must be minimized. PTFE guides have limited load carrying capability and should only be used in applications with light loads.

Guide lubrication

The guide must receive ample lubrication at all times. Rod guides are typically placed inward of both the rod and buffer seal and should be lubricated on assembly with the same medium as used in the system. SKF recommends to place guides not outside of the rod seal, means between the wiper and rod seal. However, in certain conditions, PTFE guides may be used outside the rod seal due to their certain self-lubricating properties.

More information

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Fig. 1

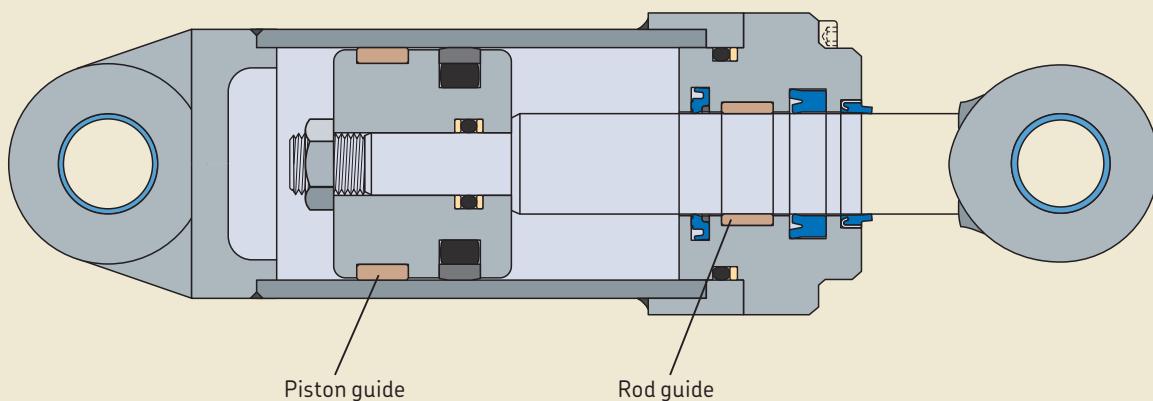
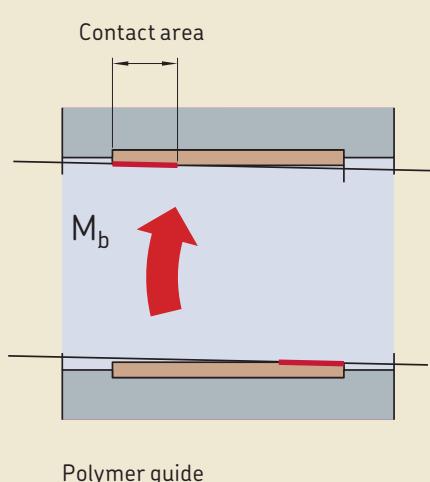
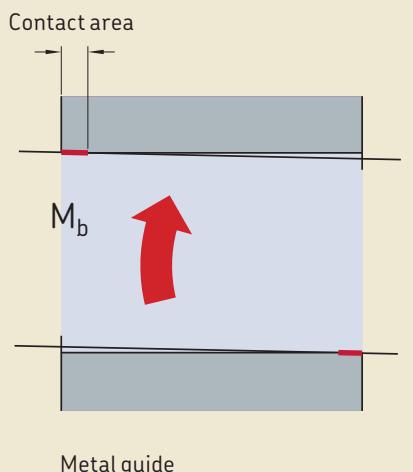


Fig. 2



Materials

The demands on reliability are continuously increasing. At the same time, the service conditions are getting tougher to match the development towards higher effectiveness of the hydraulic systems. Therefore, it is very important to be familiar with the operating conditions and parameters, such as operating temperature and pressure, load, speed, and fluid when choosing the most appropriate guide material. The most common materials for guides listed in this catalogue are:

- glass fibre reinforced polyamide
- fabric reinforced phenolic resin
- PTFE

Polyamide

Glass fibre reinforced polyamide guides are suitable for medium and heavy duty applications and are characterized by the following properties:

- wide temperature range
- wear resistant
- reduce vibrations
- protect seals from particles
- protect components from diesel effect
- easy to install
- tight tolerances
- withstand heavy side loads
- withstand high cycling speed
- prone to moisture swell before installation

P-2551 is the standard polyamide material for guide rings. Technical specifications are provided in **table 1** (→ page 252).

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

Fabric reinforced composites

Fabric reinforced composites consist of cotton fabric bound with thermoset phenolic resin. Its structure and the ability of the fabric fibres to absorb a certain amount of oil make these phenolic guides almost self-lubricating. However, cotton reinforced phenolic guide rings should not be used at high stroke speeds over 0,5 m/s (1.6 ft/s). They are suitable for medium and heavy duty applications and are characterized by the following properties:

Guide rings and guide strips

- wide temperature range
- wear resistant
- reduce vibrations
- protect seals from particles
- protect components from diesel effect
- low thermal expansion
- easy to install
- tight tolerances
- withstand heavy side loads

Phenolic resin with cotton fabric laminate (PF) is the standard fabric reinforced composite. Technical specifications are provided in **table 1**. SKF also supplies a variety of other thermoset resins and fabrics on request.

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

- chemical resistance
- wide temperature range
- low friction
- anti-adhesive, low breakaway friction
- good wear resistance
- reduce vibrations
- protect seals from particles
- protect components from diesel effect
- tight tolerance machined guide rings available

292 is the standard PTFE material for guides and strips. Technical specifications are provided in **table 1**. SKF also can supply many other PTFE material compounds on request.

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

PTFE

PTFE is typically used in guides where low friction and resistance to chemicals, heat or wear are essential. However, PTFE should only be used in applications with low surface pressure. To obtain optimal wear resistance, PTFE materials are available with different fillers, such as bronze or carbon powder. PTFE guides are characterized by the following properties:

Table 1

Guide ring material comparison					
Material code	Ultimate compressive strength	Maximum recommended linear speed ¹⁾	Maximum recommended operating temperature ¹⁾	Maximum recommended bearing load pressure ¹⁾ at 20 °C (70 °F)	Maximum recommended bearing load pressure ¹⁾ at 80 °C (175 °F)
-	N/mm ² (psi)	m/s (ft/s)	°C (°F)	N/mm ² (psi)	N/mm ² (psi)
P-2551	158 (22 915)	1 (3.3)	120 (250)	40 (5 800)	30 (4 350)
PF	240 (34 805)	0,5 (1.6)	120 (250)	50 (7 250)	30 (4 350)
292	²⁾ (depending on time and temperature)	5 (16.4) (depending on sealing system)	200 (390)	15 (2 175)	7,5 (1 085)

¹⁾ Maximum values are for intermittent exposure and should not be applied simultaneously.

²⁾ PTFE is subject to creep under compression and, therefore, compressive strength depends on time and temperature.

Guide rings

Guide rings

SKF guide rings are precision machined according to tight tolerance specifications on the radial section of the guide. Therefore, they optimize guide load distribution and limit radial misalignment of components for best seal performance. SKF supplies the following guide rings:

- WAT rod or piston guide rings
- RGR rod guide rings
- PGR piston guide rings

All of these precision guide rings are split with an angle cut as standard (**→ fig. 8, page 285**). Other types and designs or angles of cut are available on request.

WAT rod or piston guide rings

These standard guide rings can operate dynamically either on their outside or inside surfaces and, therefore, can be used in piston or rod applications. WAT guide rings are made of glass fibre reinforced polyamide (P-2551) as standard. On request, SKF can supply WAT guide rings in a variety of materials, including P-2552 (self lubricated rings with PTFE fillers).

RGR rod guide rings

RGR guide rings are developed for guiding rods by operating dynamically on their inside surface. They are made of phenolic resin with cotton fabric laminate (PF) as standard. On request, SKF can supply RGR guide rings in a variety of materials.

They are manufactured and packaged to promote an open split before installation and, therefore, are clamped with their outside surface in the cylinder head. This makes it easier to assemble the cylinder later.

PGR piston guide rings

PGR guide rings are developed for guiding pistons by operating dynamically on their outside surface. They are made of phenolic resin with cotton fabric laminate (PF) as standard. On request, SKF can supply PGR guide rings in a variety of materials.

They are manufactured and packaged to promote a narrow split or even closed ring before installation and, therefore, are clamped with their inside surface on the piston. This makes it easier to assemble the cylinder later.

Guide rings and guide strips

Design and calculation model

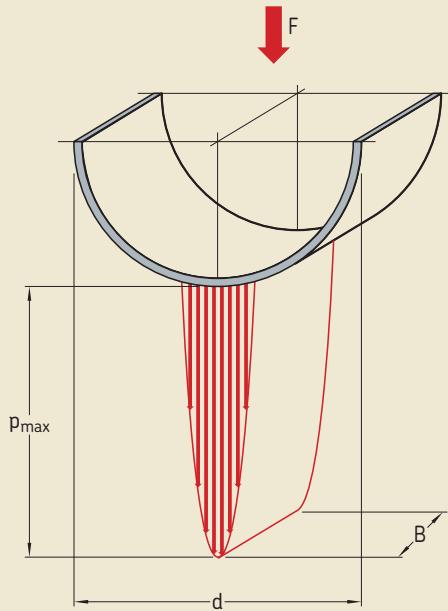
Concentric alignment of cylinder components

Hydraulic cylinders and all their components are designed to minimize radial movements at load or pressure changes. It is also important that the piston and rod remain in a concentric position during the entire stroke to maintain seal effectiveness, especially at low temperatures, and to minimize the buckling loads on the piston rod. This in turn depends on the combined tolerances of the cylinder bore, the rod, the radial thickness of the guide rings or strips, and the housing diameters.

Guide distance

The bending moment on the cylinder components and the load on guides at any point in the cylinder stroke are a function of the radial loads and the distance between the rod and piston guides. Therefore, the distance between guides should be considered when designing the cylinder and calculating the guide loads.

Fig. 3
Load distribution with metal guide



Load distribution model

With metal guides, the close machining tolerances would cause narrow contact area and high surface pressure (\rightarrow fig. 3). That could cause damage or wear to the contact surfaces.

The higher degree of elastic deformation of polymer materials provides larger contact surfaces and a better utilization of the guide width (\rightarrow fig. 4). While the guide ring load is realistically not an even distribution, the guide ring load and width requirements are estimated with the projected area of the full dynamic surface (inside diameter for rod guides or outside diameter for piston guides) assuming the load is carried evenly across the surface (\rightarrow fig. 5).

Fig. 4

Load distribution with polymer guides

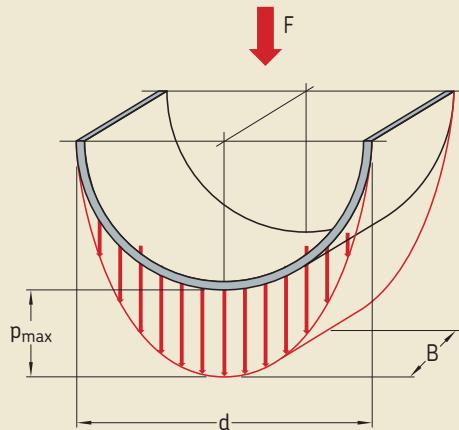
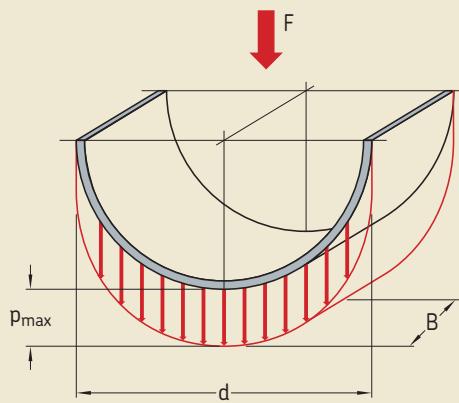


Fig. 5

Theoretical load distribution



Design and calculation model

Calculation considerations

When calculating the requisite guide housing width L, the above assumption should be taken into consideration by using a safety factor. SKF recommends using a safety factor f of at least 2 for operating temperatures up to 80 °C (175 °F). For operating temperatures above 80 °C (175 °F), the safety factor should be increased. However, at temperatures above 120 °C (250 °F), the selection of guide materials is significantly restricted.

The reduced effective load carrying width B of the guide (→ fig. 5) also need to be considered. It is approx. 2 mm (0.08 in.) smaller than the housing groove width due to the manufacturing and installation tolerances and the reduction by the chamfers and radii.

Furthermore, dynamic forces, accelerating forces, vibrations and angular forces should be considered when calculating the transverse forces from the rod ends of the cylinders.

For additional information, contact SKF.

Calculation example

What is the required guide housing width L for a PGR piston guide ring made of phenolic resin with cotton fabric laminate (PF), a cylinder bore diameter of D = 100 mm, considering a radial load of 20 000 N and an operating temperature of 80 °C (normal conditions)?

From **table 1** (→ page 252), the maximum recommended bearing load pressure $p = 30 \text{ N/mm}^2$. The safety factor is chosen with 2. The requisite guide housing width L is

$$L = \frac{20\,000 \times 2}{30 \times 100} + 2 = 15,3 \text{ mm}$$

The requisite guide housing width is 15,3 mm. However, choose a 20 mm housing width, which is the nearest larger housing and guide width L, such as guide ring PGR 100x94x20-PF (→ **product table, page 281**).

Calculating the guide width

The requisite guide width can be calculated for:

- piston guide housing width using

$$L = \frac{F_f}{p D} + 2$$

- rod guide housing width using

$$L = \frac{F_f}{p d} + 2$$

where

L = requisite guide housing width [mm]

D = cylinder bore diameter [mm]

d = rod diameter [mm]

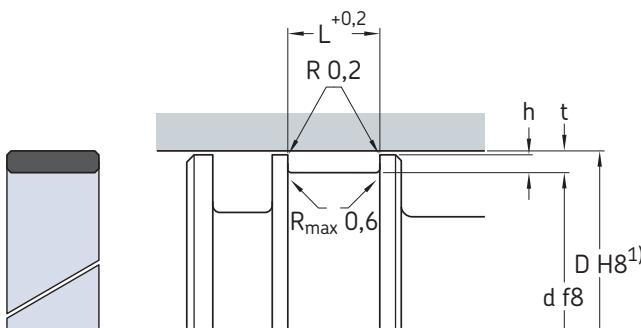
F = radial load [N]

f = safety factor (→ *Calculation considerations*)

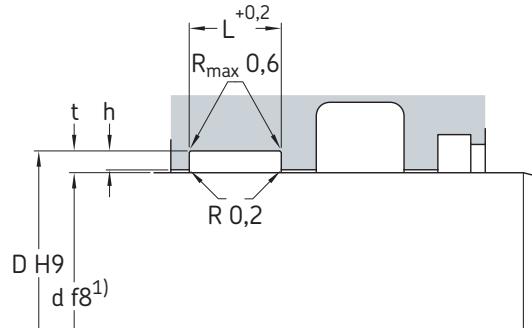
p = maximum recommended bearing load pressure [N/mm²] (→ **table 1, page 252**)

5.1 WAT rod or piston guide rings, metric sizes

D 28 – 86 mm



Piston application
(dynamic on the outside surface)



Rod application
(dynamic on the inside surface)

$$h \geq t/2$$

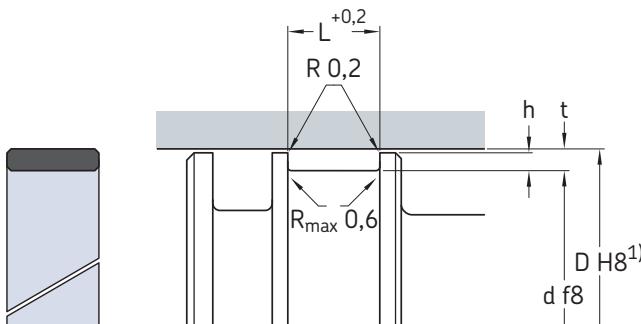
Dimensions				Designation
D	d	L	t	-
mm				
28	25	5,6	1,5	WAT-25x28x5.6-E8D
28,1	25	4	1,55	WAT-25x28.1x4-E8D
30	25	5,6	2,5	WAT-25x30x5.6-E8D
	25	9,7	2,5	WAT-25x30x9.7-E8D
	26	8	2	WAT-26x30x8-E8D
	27	5,6	1,5	WAT-27x30x5.6-E8D
31	27	8	2	WAT-27x31x8-E8D
	28	5,6	1,5	WAT-28x31x5.6-E8D
31,1	28	4	1,55	WAT-28x31.1x4-E8D
32	27	5,6	2,5	WAT-27x32x5.6-E8D
	28	8	2	WAT-28x32x8-E8D
	28,9	4	1,55	WAT-28.9x32x4-E8D
	29	5,6	1,5	WAT-29x32x5.6-E8D
33	28	5,6	2,5	WAT-28x33x5.6-E8D
	29	10	2	WAT-29x33x10-E8D
	30	5,6	1,5	WAT-30x33x5.6-E8D
35	30	15,3	2,5	WAT-30x35x15.3-E8D
	31	8	2	WAT-31x35x8-E8D
	31	10	2	WAT-31x35x10-E8D
	32	5,6	1,5	WAT-32x35x5.6-E8D
36	33	5,6	1,5	WAT-33x36x5.6-E8D
37	32	5,6	2,5	WAT-32x37x5.6-E8D
	32	9,7	2,5	WAT-32x37x9.7-E8D
	32	15	2,5	WAT-32x37x15-E8D
38	34	10	2	WAT-34x38x10-E8D
	35	5,6	1,5	WAT-35x38x5.6-E8D
39	36	5,6	1,5	WAT-36x39x5.6-E8D

Dimensions				Designation
D	d	L	t	-
mm				
40	35	5,6	2,5	WAT-35x40x5.6-E8D
	35	10	2,5	WAT-35x40x10-E8D
	35	15	2,5	WAT-35x40x15-E8D
	36	8	2	WAT-36x40x8-E8D
	36	10	2	WAT-36x40x10-E8D
	36,9	4	1,55	WAT-36.9x40x4-E8D
	37	5,6	1,5	WAT-37x40x5.6-E8D
41	36	5,6	2,5	WAT-36x41x5.6-E8D
	36	9,7	2,5	WAT-36x41x9.7-E8D
	37	15	2	WAT-37x41x15-E8D
	37	15,3	2	WAT-37x41x15.3-E8D
	38	5,6	1,5	WAT-38x41x5.6-E8D
42	37	5,6	2,5	WAT-37x42x5.6-E8D
43	38	15	2,5	WAT-38x43x15-E8D
	38	15,3	2,5	WAT-38x43x15.3-E8D
	40	5,6	1,5	WAT-40x43x5.6-E8D
45	40	5,6	2,5	WAT-40x45x5.6-E8D
	40	8	2,5	WAT-40x45x8-E8D
	40	9,7	2,5	WAT-40x45x9.7-E8D
	40	15	2,5	WAT-40x45x15-E8D
	40	20	2,5	WAT-40x45x20-E8D
47	42	5,6	2,5	WAT-42x47x5.6-E8D
	42	15	2,5	WAT-42x47x15-E8D
50	44	10	3	WAT-44x50x10-E8D
	45	5,6	2,5	WAT-45x50x5.6-E8D
	45	8	2,5	WAT-45x50x8-E8D
	45	9,7	2,5	WAT-45x50x9.7-E8D
	45	15	2,5	WAT-45x50x15-E8D
	45	15,3	2,5	WAT-45x50x15.3-E8D
	46,9	4	1,55	WAT-46.9x50x4-E8D

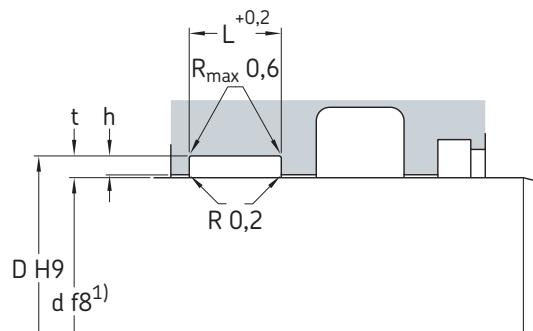
¹⁾ Adjustments according to tolerances provided for rod or piston seals are possible, however, the maximum e-gap also need to be considered (→ Gap extrusion, page 34)

5.1 WAT rod or piston guide rings, metric sizes

D 90–165 mm



Piston application
(dynamic on the outside surface)



Rod application
(dynamic on the inside surface)

$$h \geq t/2$$

Dimensions				Designation
D	d	L	t	-
mm				
90	84	13	3	WAT-84x90x13-E8D
	84	15	3	WAT-84x90x15-E8D
	84	15,3	3	WAT-84x90x15.3-E8D
	84	25	3	WAT-84x90x25-E8D
	84	25,5	3	WAT-84x90x25.5-E8D
	85	9,7	2,5	WAT-85x90x9.7-E8D
	85	10	2,5	WAT-85x90x10-E8D
	85	15	2,5	WAT-85x90x15-E8D
	85	30	2,5	WAT-85x90x30-E8D
93	88	10	2,5	WAT-88x93x10-E8D
	88	13	2,5	WAT-88x93x13-E8D
95	89	13	3	WAT-89x95x13-E8D
	89	15	3	WAT-89x95x15-E8D
	90	9,7	2,5	WAT-90x95x9.7-E8D
	90	10	2,5	WAT-90x95x10-E8D
	90	13	2,5	WAT-90x95x13-E8D
	90	15	2,5	WAT-90x95x15-E8D
	90	20	2,5	WAT-90x95x20-E8D
96	90	10	3	WAT-90x96x10-E8D
	90	13	3	WAT-90x96x13-E8D
	90	19,5	3	WAT-90x96x19.5-E8D
100	94	15	3	WAT-94x100x15-E8D
	94	15,3	3	WAT-94x100x15.3-E8D
	94	25	3	WAT-94x100x25-E8D
	94	25,5	3	WAT-94x100x25.5-E8D
	94	30,5	3	WAT-94x100x30.5-E8D
	95	5,6	2,5	WAT-95x100x5.6-E8D
	95	9,7	2,5	WAT-95x100x9.7-E8D
	95	10	2,5	WAT-95x100x10-E8D
	95	13	2,5	WAT-95x100x13-E8D
	95	15	2,5	WAT-95x100x15-E8D
	95	15,3	2,5	WAT-95x100x15.3-E8D

Dimensions				Designation
D	d	L	t	-
mm				
101	95	13	3	WAT-95x101x13-E8D
	95	19,5	3	WAT-95x101x19.5-E8D
105	99	10	3	WAT-99x105x10-E8D
	99	25	3	WAT-99x105x25-E8D
	100	9,7	2,5	WAT-100x105x9.7-E8D
	100	15	2,5	WAT-100x105x15-E8D
	100	25	2,5	WAT-100x105x25-E8D
	100	30,5	2,5	WAT-100x105x30.5-E8D
107	101	15	3	WAT-101x107x15-E8D
110	102	15	4	WAT-102x110x15-E8D
	102	25	4	WAT-102x110x25-E8D
	104	13	3	WAT-104x110x13-E8D
	104	15	3	WAT-104x110x15-E8D
	104	25	3	WAT-104x110x25-E8D
	104	25,5	3	WAT-104x110x25.5-E8D
	105	8	2,5	WAT-105x110x8-E8D
	105	9,7	2,5	WAT-105x110x9.7-E8D
	105	13	2,5	WAT-105x110x13-E8D
	105	15	2,5	WAT-105x110x15-E8D
112	106	15	3	WAT-106x112x15-E8D
	106	30	3	WAT-106x112x30-E8D
	107	10	2,5	WAT-107x112x10-E8D
	107	13	2,5	WAT-107x112x13-E8D
115	107	13	4	WAT-107x115x13-E8D
	109	19,5	3	WAT-109x115x19.5-E8D
	109	30	3	WAT-109x115x30-E8D
	110	9,7	2,5	WAT-110x115x9.7-E8D
	110	15	2,5	WAT-110x115x15-E8D
	110	20	2,5	WAT-110x115x20-E8D
	110	25	2,5	WAT-110x115x25-E8D
	110	30	2,5	WAT-110x115x30-E8D

¹⁾ Adjustments according to tolerances provided for rod or piston seals are possible, however, the maximum e-gap also need to be considered (→ Gap extrusion, page 34)

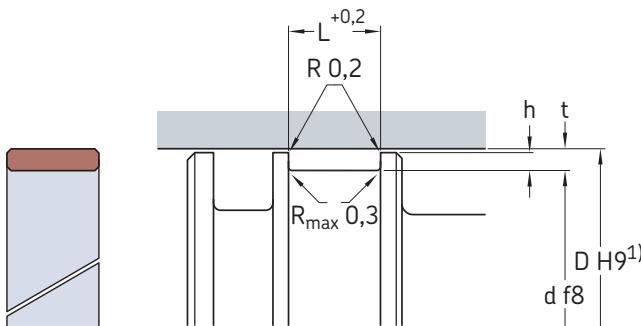
Dimensions				Designation
D	d	L	t	
mm				-
218	210	25	4	WAT-210x218x25-E8D
220	212	50	4	WAT-212x220x50-E8D
	215	9,7	2,5	WAT-215x220x9.7-E8D
	215	15	2,5	WAT-215x220x15-E8D
	215	15,3	2,5	WAT-215x220x15.3-E8D
224	216	25	4	WAT-216x224x25-E8D
	216	50	4	WAT-216x224x50-E8D
225	217	25	4	WAT-217x225x25-E8D
	217	50	4	WAT-217x225x50-E8D
	219	15,3	3	WAT-219x225x15.3-E8D
	220	15	2,5	WAT-220x225x15-E8D
	220	25	2,5	WAT-220x225x25-E8D
230	222	20	4	WAT-222x230x20-E8D
	222	30	4	WAT-222x230x30-E8D
	222	55	4	WAT-222x230x55-E8D
	225	20,3	2,5	WAT-225x230x20.3-E8D
235	229	25,5	3	WAT-229x235x25.5-E8D
240	232	30	4	WAT-232x240x30-E8D
	232	55	4	WAT-232x240x55-E8D
	235	20,3	2,5	WAT-235x240x20.3-E8D
	235	25,5	2,5	WAT-235x240x25.5-E8D
250	242	20,3	4	WAT-242x250x20.3-E8D
	242	30	4	WAT-242x250x30-E8D
	242	55	4	WAT-242x250x55-E8D
	244	15,3	3	WAT-244x250x15.3-E8D
	245	9,7	2,5	WAT-245x250x9.7-E8D
	245	15	2,5	WAT-245x250x15-E8D
255	250	15	2,5	WAT-250x255x15-E8D
	250	25	2,5	WAT-250x255x25-E8D
260	252	20,3	4	WAT-252x260x20.3-E8D
	252	30,5	4	WAT-252x260x30.5-E8D

5.1

5.3

5.4 PGR piston guide rings, metric sizes

D 16 – 220 mm



$h \geq t/2$

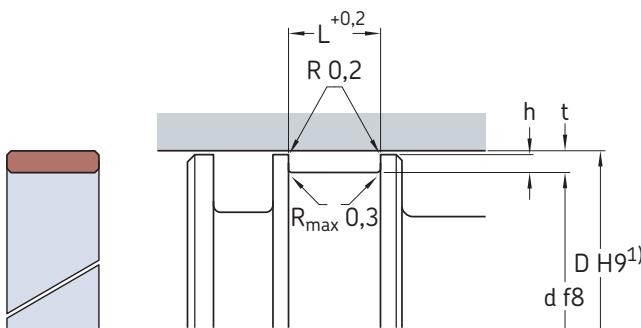
Dimensions				Designation
D	d	L	t	-
mm				
16	11 12,9	5,6 4	2,5 1,55	PGR 16x11x5.6-PF PGR 16x12.9x4-PF
18	13 14,9	5,6 4	2,5 1,55	PGR 18x13x5.6-PF PGR 18x14.9x4-PF
20	15 16,9	5,6 4	2,5 1,55	PGR 20x15x5.6-PF PGR 20x16.9x4-PF
25	20 21,9	5,6 4	2,5 1,55	PGR 25x20x5.6-PF PGR 25x21.9x4-PF
30	24 25 26,9	10 5,6 4	3 2,5 1,55	PGR 30x24x10-PF PGR 30x25x5.6-PF PGR 30x26.9x4-PF
32	27 28,9	5,6 4	2,5 1,55	PGR 32x27x5.6-PF PGR 32x28.9x4-PF
35	30 31,9	5,6 4	2,5 1,55	PGR 35x30x5.6-PF PGR 35x31.9x4-PF
40	34 35 35 36 36,9	10 5,6 9,7 10 4	3 2,5 2,5 2 1,55	PGR 40x34x10-PF PGR 40x35x5.6-PF PGR 40x35x9.7-PF PGR 40x36x10-PF PGR 40x36.9x4-PF
45	39 40 41 41,9	10 5,6 12 4	3 2,5 2 1,55	PGR 45x39x10-PF PGR 45x40x5.6-PF PGR 45x41x12-PF PGR 45x41.9x4-PF

Dimensions				Designation
D	d	L	t	-
mm				
50	44 45 45 45 46 46,9	10 5,6 6,3 9,7 12 4	3 2,5 2,5 2,5 2 1,55	PGR 50x44x10-PF PGR 50x45x5.6-PF PGR 50x45x6.3-PF PGR 50x45x9.7-PF PGR 50x46x12-PF PGR 50x46.9x4-PF
55	50 50 50 50	4 5,6 9,7 25	2,5 2,5 2,5 2,5	PGR 55x50x4-PF PGR 55x50x5.6-PF PGR 55x50x9.7-PF PGR 55x50x25-PF
60	54 54 54 54 55 55 55	10 13 20 30 5,6 6,3 9,7	3 3 3 3 2,5 2,5 2,5	PGR 60x54x10-PF PGR 60x54x13-PF PGR 60x54x20-PF PGR 60x54x30-PF PGR 60x55x5.6-PF PGR 60x55x6.3-PF PGR 60x55x9.7-PF
63	57 57 58 58 58 58	13 20 5,6 6,3 9,7 10	3 3 2,5 2,5 2,5 2,5	PGR 63x57x13-PF PGR 63x57x20-PF PGR 63x58x5.6-PF PGR 63x58x6.3-PF PGR 63x58x9.7-PF PGR 63x58x10-PF
65	59 59 60 60	13 20 5,6 9,7	3 3 2,5 2,5	PGR 65x59x13-PF PGR 65x59x20-PF PGR 65x60x5.6-PF PGR 65x60x9.7-PF

¹⁾ Adjustments according to tolerance provided for piston seal are possible, however, the maximum e-gap also need to be considered
(→ Gap extrusion, page 34)

5.4 PGR piston guide rings, metric sizes

D 230 – 400 mm



$$h \geq t/2$$

Dimensions				Designation
D	d	L	t	
mm				-
230	225	15	2,5	PGR 230x225x15-PF
240	232	25	4	PGR 240x232x25-PF
	232	40	4	PGR 240x232x40-PF
	235	9,7	2,5	PGR 240x235x9,7-PF
	235	15	2,5	PGR 240x235x15-PF
250	242	20	4	PGR 250x242x20-PF
	242	25	4	PGR 250x242x25-PF
	242	40	4	PGR 250x242x40-PF
	244	19,5	3	PGR 250x244x19,5-PF
	244	50	3	PGR 250x244x50-PF
	245	9,7	2,5	PGR 250x245x9,7-PF
	245	15	2,5	PGR 250x245x15-PF
260	255	9,7	2,5	PGR 260x255x9,7-PF
	255	15	2,5	PGR 260x255x15-PF
270	262	25	4	PGR 270x262x25-PF
	262	30	4	PGR 270x262x30-PF
280	272	25	4	PGR 280x272x25-PF
	275	15	2,5	PGR 280x275x15-PF
	275	25	2,5	PGR 280x275x25-PF
300	292	20	4	PGR 300x292x20-PF
	292	25	4	PGR 300x292x25-PF
	292	40	4	PGR 300x292x40-PF
	295	15	2,5	PGR 300x295x15-PF
	295	25	2,5	PGR 300x295x25-PF
400	392	30	4	PGR 400x392x30-PF

¹⁾ Adjustments according to tolerance provided for piston seal are possible, however, the maximum e-gap also need to be considered
→ Gap extrusion, page 34)

5.4

Guide rings and guide strips

Guide strips

SKF guide strips are made of PTFE as standard and should only be used in light duty applications or when fluid, temperature, friction, or speed do not allow any other material. They are typically used with PTFE sealing systems (→ **fig. 6**). At system operating pressures over 200 bar (2 900 psi), contact SKF.

PTFE guide strips are available with different designs (→ **fig. 7**) and can be cut with different configurations (→ **fig. 8**).

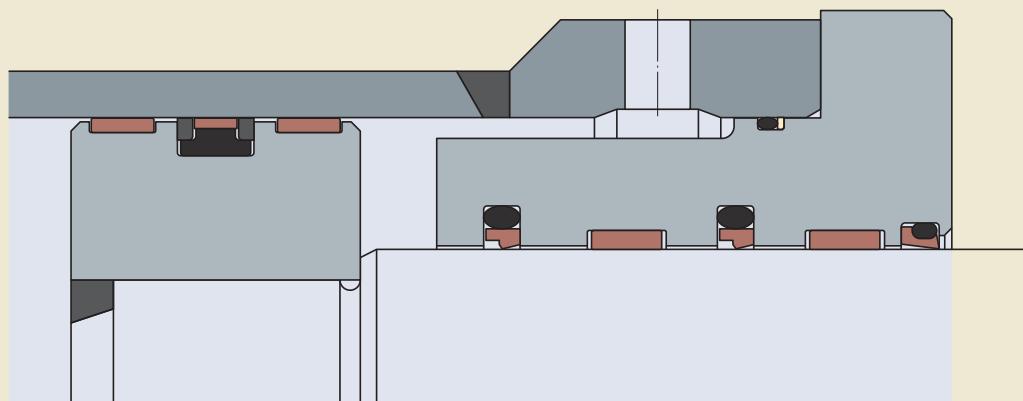
Guide strips cut to length

Based on the hardware dimensions, SKF can supply guide strips with specified lengths. They are designated according to a system that states the type and design, dynamic diameter, housing groove diameter, housing groove width, type of cut and material (→ **table 2, page 286**).

For additional information and order assistance, contact SKF.

Fig. 6

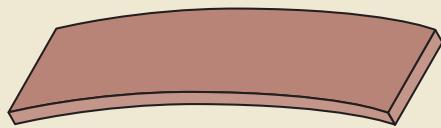
PTFE sealing system



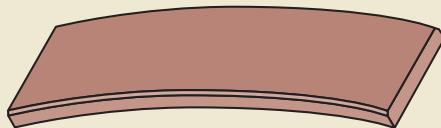
Guide strips

Fig. 7

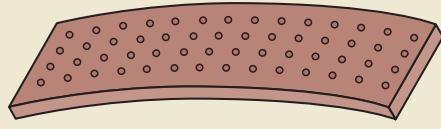
Guide strip types and designs



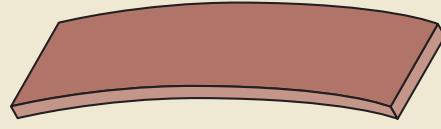
Type SB with a basic design



Type SB/C with four chamfered edges



Type SBC with a coined surface

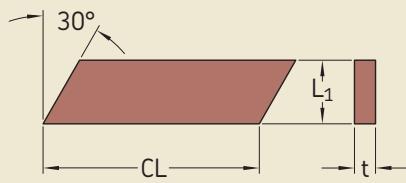
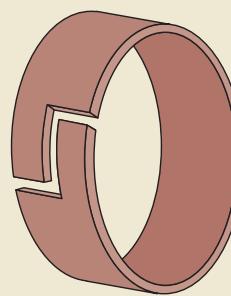
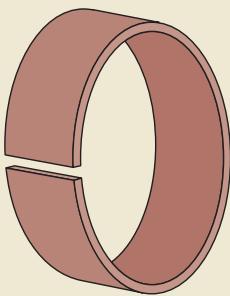
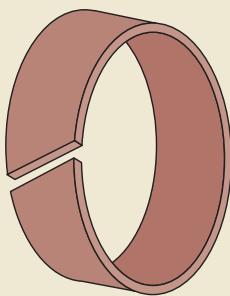


Type SBE etched on both surfaces

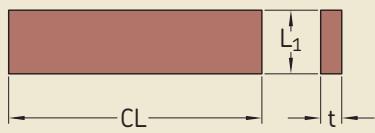
5

Fig. 8

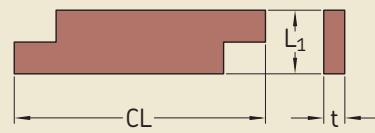
Guide strips cut configurations



A cut forming an angle of 30° is the basic design for applications with reciprocating movements.



A straight cut is used in applications with rotating movements, designation suffix O.



A stepped cut is used in special applications and when the guide strip also has a sealing function, designation suffix S.

Guide rings and guide strips**Table 2****Designation system for guide strips with individual length****SB 200×195×12×45-292**

Type and design _____

Dynamic diameter [mm] _____

Housing groove diameter [mm] _____

Housing groove width [mm] _____

Type of cut _____

no value = 30° angle cut (→ fig. 8)

value = angle cut (other than 30°)

0 = straight cut (→ fig. 8)

S = stepped cut (→ fig. 8)

Material code (→ table 6, page 29) _____

Guide strips

Guide strips uncut

SKF can also supply uncut guide strips. They are designated by the type and design (→ **fig. 7, page 285**), guide strip thickness t and housing groove width in millimetres, material code, and length in metres, such as SB 2x8,1-292 / 25 m.

For additional information and order assistance, contact SKF.

Calculating the guide strip length

The individual guide strip length CL can be calculated using the formulas provided in **table 3**.

Table 3

Guide strip length CL

Material code	Guide strip for piston applications	Guide strip for rod applications
PTFE 292		

PTFE 292

$$CL = 3,11 (D - t) - 0,8$$

$$CL = 3,11 (d + t) - 0,8$$

CL = guide strip length [mm]

D = cylinder bore diameter or guide ring groove diameter in the head [mm]

d = guide ring groove diameter in the piston or rod diameter [mm]

t = guide strip thickness [mm]

Guide rings and guide strips

More guides

Spark rings

Spark rings (also known as contamination rings, → **fig. 9**) are not technically guide rings, as they are not intended to accommodate radial loads. They rather protect the guides and piston seals from damage due to contamination particles or combustion of gases in the fluid media (diesel effect). SKF supplies spark rings in a variety of PTFE materials.

Customized machined guide profiles

SKF can manufacture a wide variety of guide profiles (→ **fig. 10**) with different materials and customized sizes with its industry-leading SKF SEAL JET production system. SKF can supply customized machined guide rings in close partnership with customers from the design phase to serial production.

For additional information about customized machined profiles, contact SKF.

Fig. 9

Guide rings combined with spark rings

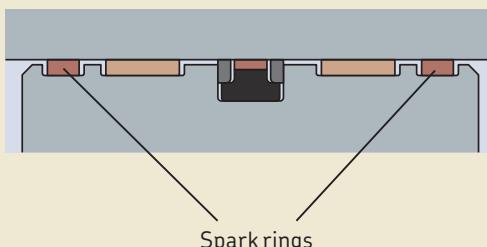
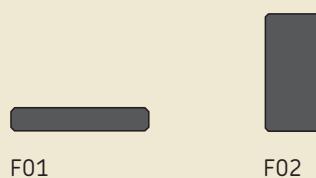


Fig. 10

Examples of SKF SEAL JET guide profiles



More guides

