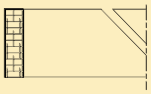
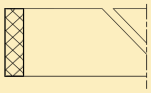
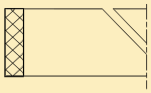
Profile cross-section	Profile reference	Page
Guiding elements		
	F3	53
	FC	59
	FR	61
	FK	67

Guide rings and tapes prevent metallic contact between pistons and cylinders or rods and glands where forces act perpendicular to the direction of movement.
These lateral forces (F) lead to a pressure distribution as shown in fig. 1. In practice, calculation based on the projected surface has proved to be a simple and more useful method. This means that the load carrying area (A) can be calculated from the length (H) multiplied by the diameter (D) (see fig. 2). The surface obtained is about 5 times larger than the assumed bearing area of fig. 1, so that lower specific loads must be reckoned with. In order to obtain the same values for lateral forces “F”, the specific load must be only 1/5 of the max. force shown in fig. 1. The indicated permissible specific forces ($F_{perm.}$) take this into account, and the admissible specific pressure mentioned relates to the projected area as shown in fig. 2.

The values of the gaps (e) or shoulder diameters specified on drawings and Tables guarantee maximum efficiency of the guiding elements.
For operation together with a seal, however, the extrusion gap (e) specified for this particular seal is most important. Especially under high pressure the maximum gap behind the seal must be the basis for the determination of the piston-shoulder diameter between seal and guide tape (refer to chapter “Maximum gap allowance”). If the specified nominal measurements and tolerances are used to calculate the groove bottom diameter of the guide tapes, optimum guidance quality will be obtained and metallic contact prevented.

Figure:
H = Length of the guiding tape

Figure 1:

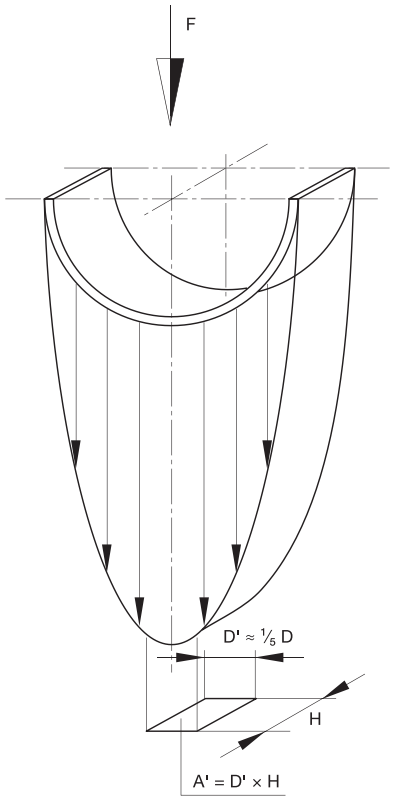
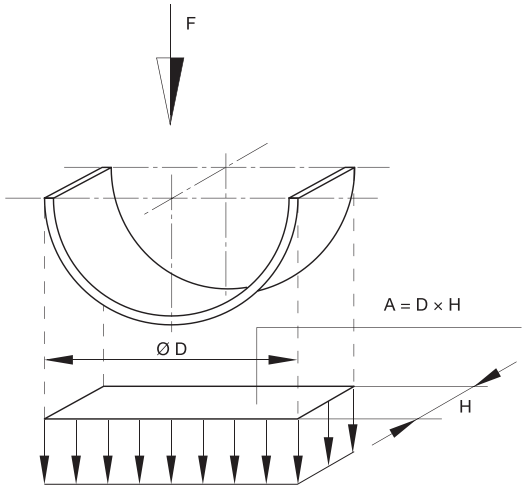


Figure 2:



The guiding tape profile F3 is specially designed for use in hydraulic cylinders.

- Vibration absorption effect.
- Very good emergency running properties in low-lube conditions.
- High load capacity (compressive strength), low wear and reduced friction due to special bronze additive in PTFE material.
- Also available as bulk material.
- Any desired nominal diameter available due to use of machining technique.
- Suitable for cylinder repairs.
- Ideally suited for large-diameters.
- Installation in closed and undercut housings.

Range of application

Operating temperature	-100 °C to +200 °C
Sliding speed	≤ 5 m/s

Compounds

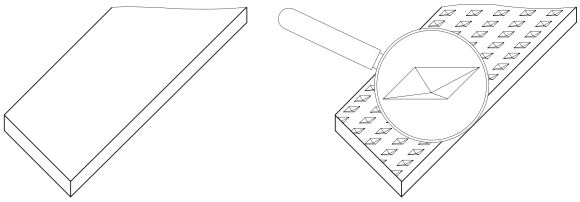
Standard: Polon® 052, PTFE + 40 % bronze.
On request: Polon® 062, PTFE + 60 % bronze.
For cylinders made of alloys, light metal and high-grade steel, we recommend the use of compound Polon® 033 (PTFE + 25 % carbon).

Installation

The gap dimensions “e” guarantee an optimum service life of the guidance tapes. For the seals, however, the gaps “e” as mentioned on the respective catalogue pages are to be considered when it is essential to observe full operating conditions („Range of Application“) for the seals.

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.

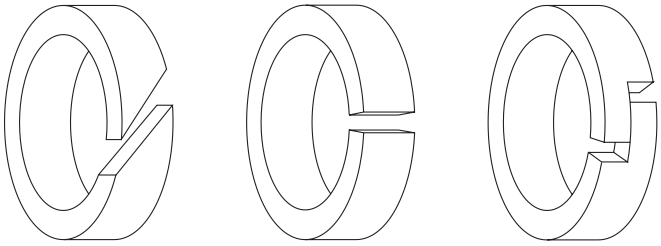
Surfaces



Guiding tape F3:
smooth (standard)

Guiding tape FW:
structured (on request)

Cut types



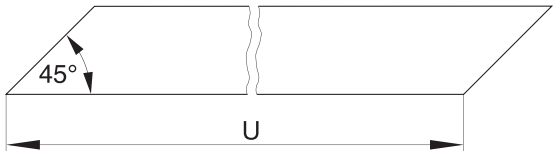
Type A
(angle-cut)

Type S
(straight-cut)

Type Z
(step-cut)

Types A and S are used for bearings where it is imperative that the system pressure is carried on to the seals. They are designed as „open bearings“ with a well defined gap.
Type Z is a closed bearing, which in certain applications is used as a combined seal and bearing.

Calculation of the stretched length „U“



The length „U“ of the tape is to be calculated from the mean circumferential length less the clearance at the joint „k“. The k-values stated in the table are based on a temperature rise of 120 °C. (S = thickness of the guiding tape.)

Calculation of the stretched length „U“

Cylinder Ø D H8		Stretched length U		Gap
Rod diameter d_{f7} (mm)	Piston	Rod	Tolerance (mm)	k (mm)
≤ 45	U = π × (D – S) – k	U = π × (d S) – k	± 0.25	1.8
> 45			± 0.4	3.5
> 80			± 0.6	4.4
> 100			± 0.8	5.6
> 125			± 1	6.6
> 150			± 1.2	8
> 180			± 1.4	9.5
> 215			± 1.6	12
> 270			± 1.8	15.5
> 330			± 2	19

Selection of the axial guiding width L

Choose the appropriate curve for the applicable guide tolerances. Note that the more precise the guidance, the lower the value for the selected ε.

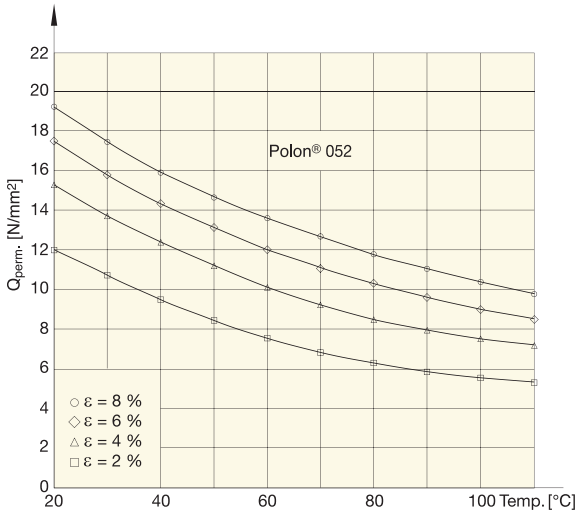
The following formula provides the minimum guidance width:

$$L \geq \frac{F}{Q\,(d_i - k \cdot \sqrt{2})}$$

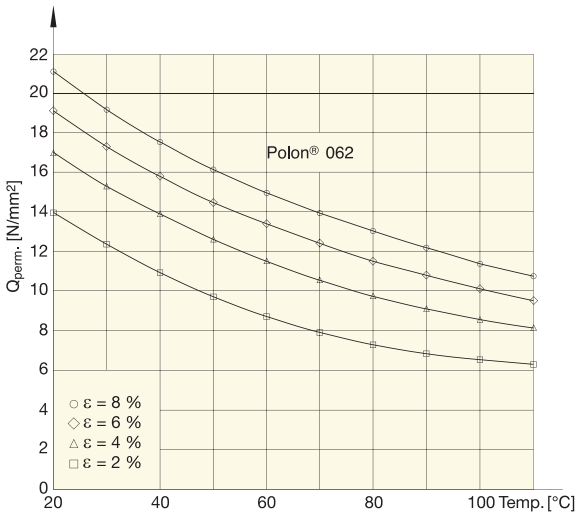
d = inner diameter [mm]
k = gap [mm]
L = guidance width [mm]
$Q_{perm.}$ = permissible specific load [N/mm²]
F = lateral force [N]

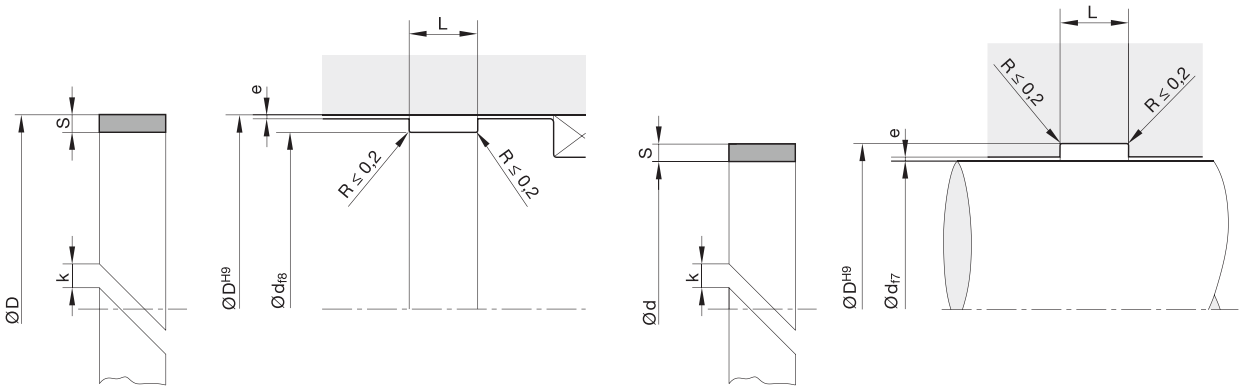
We recommend that the largest possible guidance length always be used even if the calculation yields a smaller value.

Permissible specific load $Q_{perm.}$ in relation to temperature t and the respective permanent set ε for the compounds Polon® 052:



Permissible specific load $Q_{perm.}$ in relation to temperature t and the respective permanent set ε for the compounds Polon® 062:

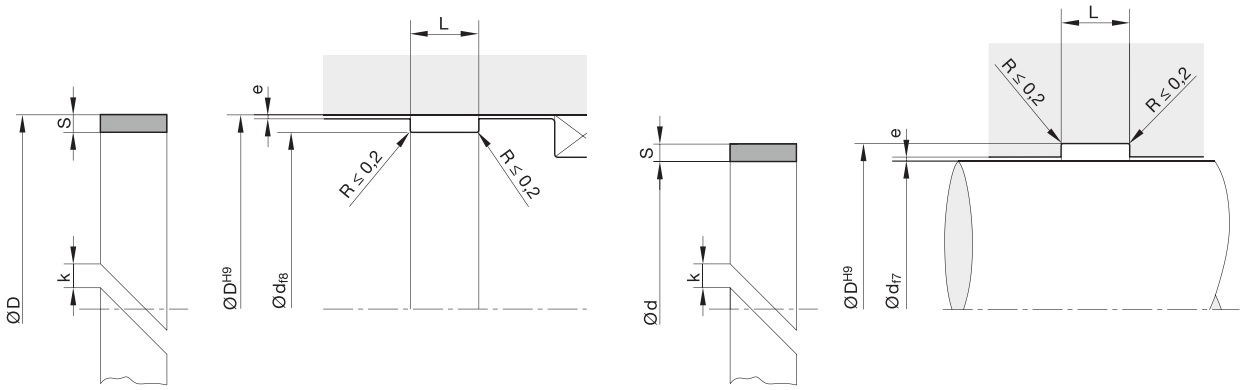




For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines".

Housing dimensions

Series no.	Recommended rod Ø range	Guiding tape	Groove			
	d/D (mm)	S (mm)	L (mm)	d (mm)	D (mm)	e (mm)
15063	≤ 50	$1.50^{+0.02}_{-0.03}$	$6.3^{0.1}$	D - 3.0	d + 3.0	0.25
15081	≤ 50	$1.50^{+0.02}_{-0.03}$	$8.1^{0.1}$	D - 3.0	d + 3.0	0.25
15100	≤ 50	$1.50^{+0.02}_{-0.03}$	$10.0^{0.1}$	D - 3.0	d + 3.0	0.25
15150	≤ 50	$1.50^{+0.02}_{-0.03}$	$15.0^{0.1}$	D - 3.0	d + 3.0	0.25
16025	≤ 50	$1.55^{+0.02}_{-0.03}$	$2.5^{0.1}$	D - 3.1	d + 3.1	0.25
16040	≤ 51	$1.55^{+0.02}_{-0.03}$	$4.0^{0.1}$	D - 3.1	d + 3.1	0.25
20063	≤ 50	$2.00_{-0.05}$	$6.3^{0.1}$	D - 4.0	d + 4.0	0.30
20081	≤ 51	$2.00_{-0.05}$	$8.1^{0.1}$	D - 4.0	d + 4.0	0.30
20097	> 50	$2.00_{-0.05}$	$9.7^{0.1}$	D - 4.0	d + 4.0	0.30
20150	> 50	$2.00_{-0.05}$	$15.0^{0.1}$	D - 4.0	d + 4.0	0.30
20200	> 50	$2.00_{-0.05}$	$20.0^{0.1}$	D - 4.0	d + 4.0	0.30
25042	> 50	$2.50_{-0.05}$	$4.2^{0.1}$	D - 5.0	d + 5.0	0.40
25056	> 50	$2.50_{-0.05}$	$5.6^{0.1}$	D - 5.0	d + 5.0	0.40
25063	> 50	$2.50_{-0.05}$	$6.3^{0.1}$	D - 5.0	d + 5.0	0.40
25081	> 50	$2.50_{-0.05}$	$8.1^{0.1}$	D - 5.0	d + 5.0	0.40
25097	> 50	$2.50_{-0.05}$	$9.7^{0.1}$	D - 5.0	d + 5.0	0.40
25150	> 50	$2.50_{-0.05}$	$15.0^{0.2}$	D - 5.0	d + 5.0	0.40
25200	> 50	$2.50_{-0.05}$	$20.0^{0.2}$	D - 5.0	d + 5.0	0.40
25250	> 50	$2.50_{-0.05}$	$25.0^{0.2}$	D - 5.0	d + 5.0	0.40
25300	> 50	$2.50_{-0.05}$	$30.0^{0.2}$	D - 5.0	d + 5.0	0.40



For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

Ordering example piston guidance

Mating surface	steel
Surface	smooth
Piston diameter	80 mm
Groove	9.7 × 2.5 mm
a) by the metre	F3 0000 052 25097 A (9.7 × 2.5)
b) cut to length	F3 0800 052 25097 A (9.7 × 2.5 × 239)
F3	Profile
0800	Piston diameter × 10 (by the metre: 0000)
052	Compound
25097	Series no.
A	Type of cut

Ordering example rod guidance

Surface	structured
Rod diameter	50 mm
Groove outer diameter	OD = ID + 2S
Groove	6.3 × 2.5 mm

FW 0550 052 25063 A (6.3 × 2.5 × 161.5)

- Minimal play due to extremely small manufacturing tolerances of the guiding elements.
- Vibration absorption effect.
- Extreme wear resistance.
- Improved sliding properties due to surface structure.
- Can be elongated or compressed within limited diameter ranges (preferably ≥ 100 mm).
- Significantly higher permissible loading pressure compared with other guidance tape materials.
- Any desired nominal diameter available due to use of machining technique.
- Suitable for cylinder repairs.
- Ideally suited for large-diameters.
- Bulk material.
- Installation in closed and undercut housings.

FC guiding tapes are extremely wear-resistant and suitable for piston and rod guiding. They can be cut to any desired length (max. 5.5 m). The tapes are wound on flat coils with a core diameter of approximately 120 mm. FC guiding tape stock is sold in packaging units of 5.5-metre rolls (desired length to be cut by the customer).

Range of application

Guiding element for pistons and rods in hydraulic cylinders.

Operating temperature	
FC Q5030T	-40 °C to +120 °C
FC Q5038T	-50 °C to +130 °C
in HFA, HFB and HFC fluids	-30 °C to +80 °C
Pressure resistance acc. to EN ISO 604	
FC Q5030T	270 N/mm²
FC Q5038T	320 N/mm²
Sliding speed	≤ 0.5 m/s

Compounds

Duroplastic synthetic resins with fabric reinforcement.
Q5030T: phenole resin-polyester fabric laminate, colour: grey.
Q5038T: phenole resin-acrylic fabric laminate, colour: brown.

Installation

For piston and rod diameters up to 100 mm, we recommend our FR/FK guide rings.

For surface requirements, see chapter „General Installation Guidelines“.

The installed rings must have a gap „k“ between their diagonally cut ends:
k = 0.008 x d + 2
The calculated values for „k“ are rounded up to the nearest millimetre.

The calculation of the permissible radial force is based on the projected area D × H (cylinder) or d × H (rod).

Example: permissible radial force F_R for a cylinder diameter of D = 80 mm, length L = 15 mm, compound Q5038T and safety factor 4:

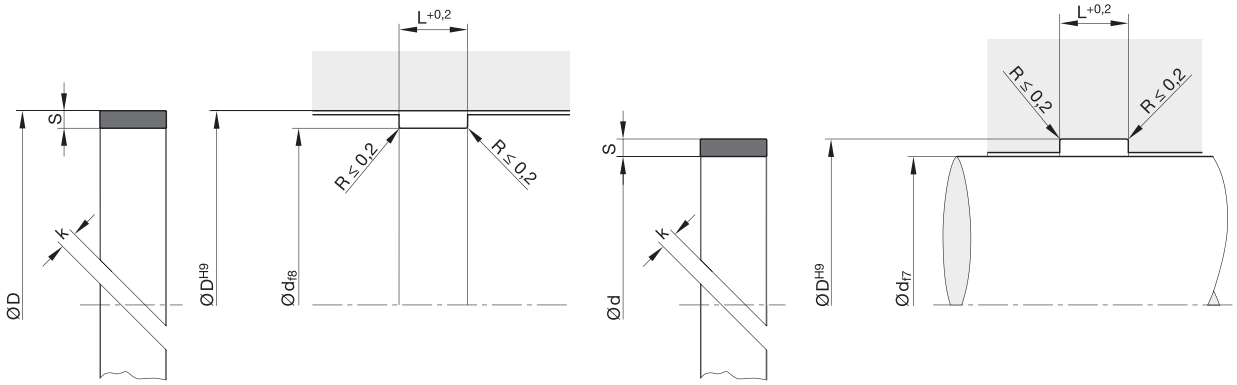
$$F_R = \frac{D \times L \times q}{v} = \frac{80 \times 15 \times 320}{4} = 96\,000 \text{ N}$$

Recommendation for determing the safety factor v: v > 3

Calculation of elongated length
“U“ (piston) = π × (D - S) - k

Calculation of elongated length
“U“ (rod) = π × (d + S) - k

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.



For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

U	S	L	Order code
FC Q5030T			
5500	2.5	5.6	FC 2556 Q5030T
5500	2.5	9.7	FC 2597 Q5030T
5500	2.5	15	FC 2515 Q5030T
5500	2.5	20	FC 2520 Q5030T
5500	2.5	25	FC 2525 Q5030T
5500	2.5	30	FC 2530 Q5030T
FC Q5038T			
5500	2.5	5.6	FC 2556 Q5038T
5500	2.5	9.7	FC 2597 Q5038T
5500	2.5	15	FC 2515 Q5038T
5500	2.5	20	FC 2520 Q5038T
5500	2.5	25	FC 2525 Q5038T
5500	2.5	30	FC 2530 Q5038T

Further sizes on request.

- Minimal play due to extremely small manufacturing tolerances of the guiding elements.
- Vibration absorption effect.
- Extreme wear resistance.
- Improved sliding properties due to surface structure.
- Significantly higher permissible loading pressure compared with other guidance tape materials.
- Dimensions according to DIN 10766.
- Any desired nominal diameter available due to use of machining technique.
- Installation in closed and undercut housings.

The Profile FR guide ring is open and therefore lends itself to easy assembly. It is extraordinarily wear-resistant and suitable for rod guiding. The use of this guide ring simplifies the design of cylinder heads.

Range of application

Guiding element for rods in hydraulic cylinders.

Operating temperature	
FR Q5029	-50 °C to +120 °C
FR Q5038	-50 °C to +130 °C
in HFA, HFB and HFC fluids	-30 °C to +80 °C
in water max.	+ 100 °C
Pressure resistance acc. to DIN 53454	
FR Q5029	270 N/mm²
FR Q5038	340 N/mm²
Water absorption acc. to DIN 53495	
FR Q5029	1 % to 2 %
FR Q5038	< 0.1 %
Sliding speed	≤ 0.5 m/s

Compounds

Duroplastic synthetic resins with fabric reinforcement.
Q5029: phenole resin-cotton laminate.
Q5038: phenole resin-acrylic fabric laminate.

Installation

For surface requirements, see chapter „General Installation Guidelines“.

For nonferrous and light metal pistons, please use our F3 guidance tape profile (PTFE with carbon filler).

The installed rings must have a gap „k“ between their diagonally cut ends:
k = 0.008 x d + 2
The calculated values for „k“ are rounded up to the nearest millimetre or half-millimetre.

The calculation of the permissible radial force is based on the projected area d × L.

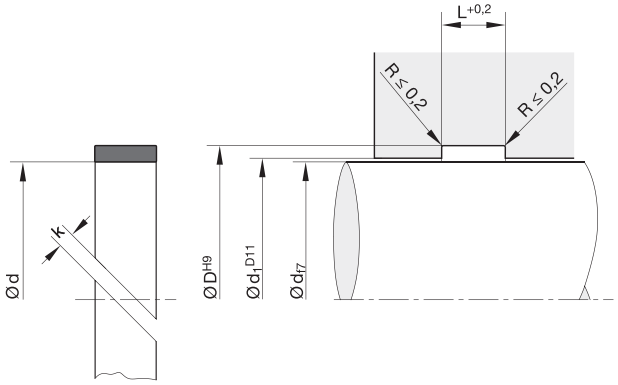
Example: permissible radial force F_R for a rod diameter of d = 80 mm, length L = 15 mm, compound Q5038T and safety factor 4:

$$F_R = \frac{d \times L \times q}{v} = \frac{80 \times 15 \times 270}{4} = 81\,000\ N$$

Recommendation for determing the safety factor v: v > 3

Calculation of elongated length
“U“ (rod) = π × (d + S) - k

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.

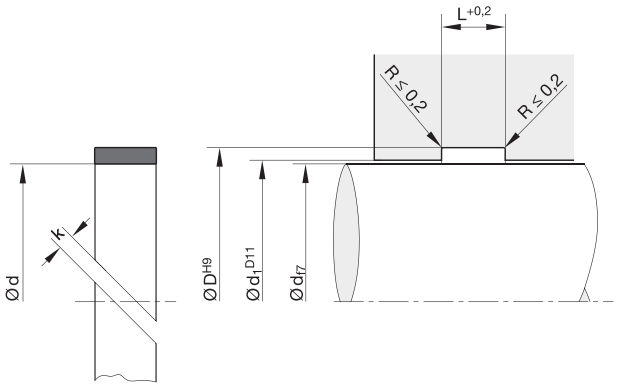


For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

Ordering example

Guide ring profile FR for a rod diameter of 63 mm.

Order code	FR 6370 Q5029 (63 × 68 × 9,7)
FR	Profile reference
6370	Dimension code
Q5029 or Q5038	Standard compound
d × D × L	Nominal dimensions

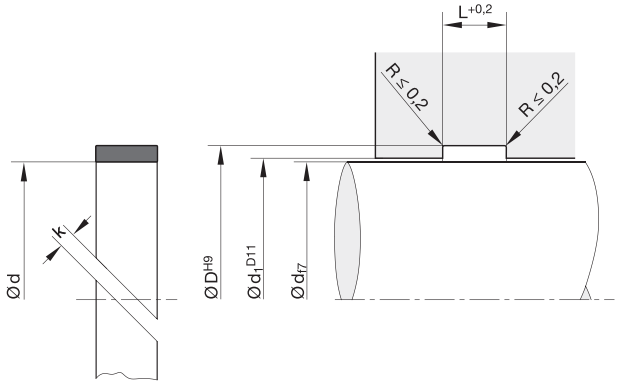


For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

d	D	L	d_1	Order code
11	14	2.6	11.2	FR 1114 Q5038
12	15	3.6	12.2	FR 1215 Q5038
12	15.1	4	12.2	FR 1216 Q5038
14	17	2.5	14.2	FR 1417 Q5038
15	18	2.5	15.2	FR 1518 Q5038
15.5	19	3.6	15.7	FR 1519 Q5038
18	21	2.5	18.2	FR 1823 Q5038
18	21	6	18.2	FR 1821 Q5038
20	25	4	20.2	FR 2025 Q5038
20	25	5.6	20.2	FR 2005 Q5038
20	25	9.7	20.2	FR 2007 Q5038
20	26	5.1	20.2	FR 2008 Q5038
22	25	2.5	22.2	FR 2225 Q5038
22	25.1	4	22.2	FR 2224 Q5038
22	26	5.6	22.2	FR 2226 Q5038
25	30	5.6	25.2	FR 2506 Q5038
25	30	9.7	25.2	FR 2507 Q5038
25.4	28.5	4	25.6	FR 2528 Q5038
27	32	5.6	27.2	FR 2702 Q5038
28	33	5.6	28.2	FR 2823 Q5038
28	33	9.7	28.2	FR 2833 Q5038
30	33	2.5	30.2	FR 3033 Q5038
30	34	9.7	30.2	FR 3034 Q5038
30	35	4	30.2	FR 3002 Q5038
30	35	5.6	30.2	FR 3001 Q5038
30	35	9.7	30.2	FR 3003 Q5038
30	36	5.1	30.2	FR 3036 Q5038
32	37	5.6	32.3	FR 3205 Q5038
32	37	9.7	32.3	FR 3209 Q5038
34	40	5.1	34.3	FR 3440 Q5038
35	40	4	35.3	FR 3505 Q5038
35	40	5.6	35.3	FR 3506 Q5038
35	40	9.7	35.3	FR 3507 Q5038
35	45	15	35.3	FR 3528 Q5038

d	D	L	d_1	Order code
36	41	5.6	36.3	FR 3618 Q5038
36	41	9.7	36.3	FR 3620 Q5038
37	42	5.6	37.3	FR 3742 Q5038
38	41	2.5	38.3	FR 3841 Q5038
40	45	5.6	40.4	FR 4004 Q5038
40	45	9.7	40.4	FR 4006 Q5038
40	45	15	40.4	FR 4010 Q5038
40	45.1	5.6	40.4	FR 4047 Q5038
40	46	9.8	40.4	FR 4046 Q5038
44	50	5.1	44.4	FR 4451 Q5038
45	48	2.5	45.4	FR 4548 Q5038
45	50	5.6	45.4	FR 4504 Q5038
45	50	6.3	45.4	FR 4506 Q5038
45	50	9.7	45.4	FR 4505 Q5038
45	50	15	45.4	FR 4508 Q5038
48	53	9.7	48.4	FR 4853 Q5038
50	55	5.6	50.4	FR 5015 Q5038
50	55	6.3	50.4	FR 5063 Q5038
50	55	9.7	50.4	FR 5018 Q5038
50	55	20	50.4	FR 5019 Q5038
50.8	55.8	16	51.2	FR 5079 Q5038
50.8	55.8	25	51.2	FR 5080 Q5038
53	58	9.7	53.4	FR 5309 Q5038
55	58	4	55.4	FR 5558 Q5038
55	60	5.6	55.4	FR 5505 Q5038
55	60	6.3	55.4	FR 5560 Q5038
55	60	9.7	55.4	FR 5507 Q5038
55	60	15	55.4	FR 5510 Q5038
57	60	4	57.4	FR 5760 Q5038
58	63	5.6	58.4	FR 5808 Q5038
58	63	6.3	58.4	FR 5680 Q5038
58	63	9.7	58.4	FR 5805 Q5038
60	65	5.6	60.5	FR 6006 Q5038
60	65	6.3	60.5	FR 6065 Q5038

Further sizes on request.

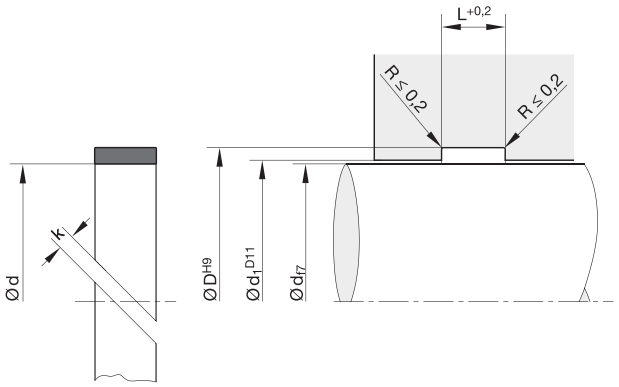


For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

d	D	L	d_1	Order code
60	65	9.7	60.5	FR 6005 Q5038
60	65	15	60.5	FR 6010 Q5038
60	65	25	60.5	FR 6012 Q5038
63	68	5.6	63.5	FR 6305 Q5038
63	68	6.3	63.5	FR 6368 Q5038
63	68	9.7	63.5	FR 6370 Q5038
63	68	15	63.5	FR 6315 Q5038
63	68	25	63.5	FR 6368 Q5038
65	70	5.6	65.5	FR 6501 Q5038
65	70	9.7	65.5	FR 6503 Q5038
65	70	15	65.5	FR 6506 Q5038
70	75	6.3	70.5	FR 7000 Q5038
70	75	9.7	70.5	FR 7005 Q5038
70	75	15	70.5	FR 7004 Q5038
75	80	5.6	75.5	FR 7503 Q5038
75	80	6.3	75.5	FR 7504 Q5038
75	80	9.7	75.5	FR 7506 Q5038
75	80	15	75.5	FR 7505 Q5038
79	84	15	79.5	FR 7984 Q5038
80	84	15	80.5	FR 8009 Q5038
80	85	5.6	80.5	FR 8085 Q5038
80	85	9.7	80.5	FR 8010 Q5038
80	85	15	80.5	FR 8012 Q5038
80	85	25	80.5	FR 8014 Q5038
83	88	9.7	83.5	FR 8388 Q5038
85	90	9.7	85.5	FR 8509 Q5038
85	90	15	85.5	FR 8515 Q5038
85	90	25	85.5	FR 8525 Q5038
85	95	25	85.5	FR 8510 Q5038
86	90	10	86.5	FR 8690 Q5038
90	95	9.7	90.5	FR 9094 Q5038
90	95	15	90.5	FR 9095 Q5038
90	95	20	90.5	FR 9020 Q5038
90	95	25	90.5	FR 9025 Q5038

d	D	L	d_1	Order code
90	95	30	90.5	FR 9030 Q5038
90	100	15	90.5	FR 9010 Q5038
95	100	9.7	95.6	FR 9510 Q5038
95	100	15	95.6	FR 9511 Q5038
100	105	5.6	100.6	FR A003 Q5038
100	105	9.7	100.6	FR A004 Q5038
100	105	15	100.6	FR A005 Q5038
100	105	20	100.6	FR A006 Q5038
100	105	25	100.6	FR A025 Q5038
100	110	25	100.6	FR A027 Q5038
105	110	9.7	105.6	FR A505 Q5038
105	110	15	105.6	FR A511 Q5038
105	110	20	105.6	FR A520 Q5038
105	110	25	105.6	FR A510 Q5038
110	115	9.7	110.6	FR B008 Q5038
110	115	15	110.6	FR B009 Q5038
110	115	25	110.6	FR B011 Q5038
110	120	15	110.6	FR B007 Q5038
110	125	25	110.6	FR B025 Q5038
114	120	10	114.6	FR B040 Q5038
115	120	9.7	115.6	FR B051 Q5038
115	120	15	115.6	FR B053 Q5038
115	120	25	115.6	FR B525 Q5038
120	125	9.7	120.6	FR C051 Q5038
120	125	15	120.6	FR C052 Q5038
120	125	25	120.6	FR C026 Q5038
125	130	9.7	125.6	FR C053 Q5038
125	130	15	125.6	FR C055 Q5038
125	130	25	125.6	FR C030 Q5038
126	130	15	126.6	FR C130 Q5038
130	135	15	130.6	FR D005 Q5038
135	140	9.7	135.6	FR D050 Q5038
135	140	15	135.6	FR D051 Q5038
135	140	25	135.6	FR D052 Q5038

Further sizes on request.

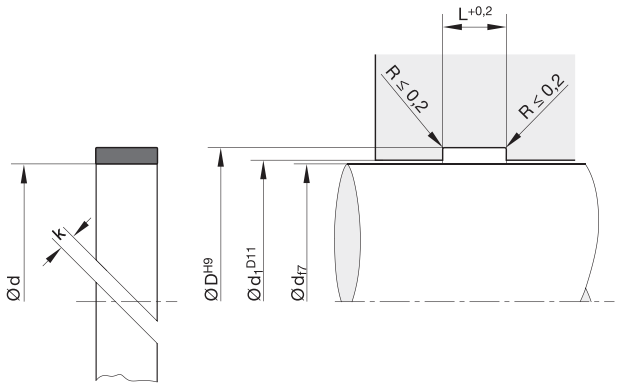


For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

d	D	L	d_1	Order code
136	140	15	136.6	FR D140 Q5038
140	145	9.7	140.7	FR E031 Q5038
140	145	15	140.7	FR E038 Q5038
140	145	25	140.7	FR E032 Q5038
145	150	9.7	145.7	FR E047 Q5038
145	150	15	145.7	FR E050 Q5038
150	155	9.7	150.7	FR F009 Q5038
150	155	15	150.7	FR F050 Q5038
150	155	25	150.7	FR F015 Q5038
155	160	9.7	155.7	FR F051 Q5038
155	160	15	155.7	FR F052 Q5038
155	160	25	155.7	FR F055 Q5038
160	165	9.7	160.7	FR G008 Q5038
160	165	15	160.7	FR G007 Q5038
160	165	25	160.7	FR G025 Q5038
165	170	9.7	165.7	FR G565 Q5038
165	170	15	165.7	FR G570 Q5038
170	175	9.7	170.7	FR H024 Q5038
170	175	15	170.7	FR H015 Q5038
170	175	25	170.7	FR H025 Q5038
175	180	9.7	175.7	FR H050 Q5038
175	180	15	175.7	FR H051 Q5038
175	180	25	175.7	FR H053 Q5038
176	181	38	176.7	FR H062 Q5038
180	185	15	180.7	FR J019 Q5038
180	185	25	180.7	FR J020 Q5038
180	185	38	180.7	FR J021 Q5038
185	190	25	185.7	FR J525 Q5038
186	190	15	186.7	FR J060 Q5038
190	195	15	190.7	FR K012 Q5038
190	200	15	190.7	FR K014 Q5038
192	200	40	192.7	FR K240 Q5038
195	200	9.7	195.7	FR K049 Q5038
195	200	15	195.7	FR K052 Q5038

d	D	L	d_1	Order code
195	200	25	195.7	FR K051 Q5038
200	205	15	200.7	FR L004 Q5038
200	205	25	200.7	FR L025 Q5038
202	210	25	205.7	FR L050 Q5038
205	210	25	205.7	FR L065 Q5038
205	210	25	205.7	FR L075 Q5038
210	215	25	210.7	FR L509 Q5038
215	220	15	215.7	FR L520 Q5038
215	220	20	215.7	FR L524 Q5038
215	220	25	215.7	FR L525 Q5038
220	225	9.7	220.7	FR M004 Q5038
220	225	15	220.7	FR M005 Q5038
220	225	25	220.7	FR M009 Q5038
220	228	25	220.7	FR M012 Q5038
220	230	25	220.7	FR M030 Q5038
222	227	15	222.7	FR M070 Q5038
225	230	15	225.7	FR M125 Q5038
230	235	25	230.7	FR M525 Q5038
235	240	9.7	235.7	FR M554 Q5038
235	240	15	235.7	FR M550 Q5038
235	240	25	235.7	FR M560 Q5038
235	240	35	235.7	FR M558 Q5038
235	250	25	235.7	FR M600 Q5038
245	250	15	245.7	FR N042 Q5038
245	250	20	245.7	FR N043 Q5038
245	250	25	245.7	FR N045 Q5038
250	255	15	250.7	FR N520 Q5038
250	255	25	250.7	FR N525 Q5038
250	258	25	250.7	FR N530 Q5038
260	265	15	260.7	FR O008 Q5038
260	265	25	260.7	FR O010 Q5038
260	266	30	260.7	FR O011 Q5038
265	270	15	265.7	FR O515 Q5038
265	270	25	265.7	FR O520 Q5038

Further sizes on request.



For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

d	D	L	d_1	Order code
270	275	25	270.7	FR O706 Q5038
275	280	15	275.8	FR O715 Q5038
275	280	20	275.8	FR O720 Q5038
275	280	25	275.8	FR O725 Q5038
280	270	23	280.8	FR P023 Q5038
280	285	15	280.8	FR P015 Q5038
280	285	25	280.8	FR P024 Q5038
280	290	25	280.8	FR P025 Q5038
295	300	15	295.8	FR P551 Q5038
295	300	24	295.8	FR P550 Q5038
300	305	25	301	FR Q005 Q5038
305	310	15	306	FR Q002 Q5038
310	315	25	311	FR Q010 Q5038
312	320	25	313	FR Q130 Q5038
314	320	30	315	FR Q011 Q5038
315	320	15	316	FR Q014 Q5038
315	320	25	316	FR Q015 Q5038
320	325	15	321	FR Q215 Q5038
320	325	25	321	FR Q217 Q5038
325	330	20	326	FR Q230 Q5038
325	330	25	326	FR Q233 Q5038
330	335	15	331	FR Q335 Q5038
330	335	25	331	FR Q336 Q5038
335	340	15	336	FR Q334 Q5038
345	350	25	346	FR Q425 Q5038
350	355	15	351	FR Q050 Q5038
350	355	15	351	FR Q515 Q5038
350	355	25	351	FR Q051 Q5038
350	360	25	351	FR Q060 Q5038
355	360	20	356	FR Q552 Q5038
355	360	40	356	FR Q555 Q5038
375	380	15	376	FR Q715 Q5038
375	380	25	376	FR Q725 Q5038
390	395	25	391	FR Q900 Q5038

d	D	L	d_1	Order code
440	445	15	441	FR R024 Q5038
442	450	25	443	FR R410 Q5038
445	450	25	446	FR R025 Q5038
460	465	9.5	461	FR R465 Q5038
465	470	15	466	FR R615 Q5038
495	500	15	496	FR R915 Q5038
575	580	25	576	FR S075 Q5038
600	605	25	601	FR S610 Q5038

Further sizes on request.

- Minimal play due to extremely small manufacturing tolerances of the guiding elements.
- Vibration absorption effect.
- Extreme wear resistance.
- Improved sliding properties due to surface structure.
- Easy snap assembly on a single-part piston.
- Significantly higher permissible loading pressure compared with other guidance tape materials.
- Dimensions according to DIN 10766.
- Also available as bulk material.
- Any desired nominal diameter available due to use of machining technique.
- Installation in closed and undercut housings.

The Profile FK guide ring is open and therefore lends itself to easy assembly. It is extraordinarily wear-resistant and suitable for piston guiding. The use of this guide ring simplifies the design of pistons.

Range of application

Guiding element for pistons and piston rods in hydraulic cylinders.

Operating temperature	
FKS525Q5038	-50 °C to +130 °C
FK Q5029	-50 °C to +120 °C
in HFA, HFB and HFC fluids	-30 °C to +80 °C
in water max.	+ 100 °C
Pressure resistance acc. to DIN 53454	
FKS525Q5038	340 N/mm²
FK Q5029	270 N/mm²
Water absorption acc. to DIN 53495	
FKS525Q5038	< 0.1 %
FK Q5029	1 % to 2 %
Sliding speed	≤ 0.5 m/s

Compounds

Duroplastic synthetic resins with fabric reinforcement.
Q5029: phenole resin-cotton laminate.
Q5038: phenole resin-acrylic fabric laminate.

Installation

For surface requirements, see chapter „General Installation Guidelines“.

For nonferrous and light metal pistons, please use our F3 guidance tape profile (PTFE with carbon filler).

The installed rings must have a gap „k“ between their diagonally cut ends:
k = 0.008 x d + 2
The calculated values for „k“ are rounded up to the nearest millimetre or half-millimetre.

The calculation of the permissible radial force is based on the projected area D × L.

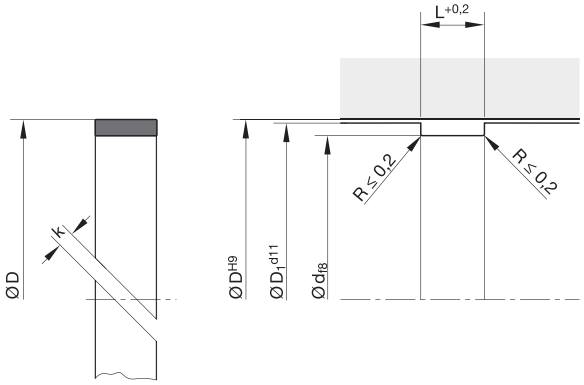
Example: permissible radial force F_R for a cylinder diameter of D = 80 mm, length L = 15 mm, compound Q5038T and safety factor 4:

$$F_R = \frac{D \times L \times q}{v} = \frac{80 \times 15 \times 270}{4} = 81\,000\ N$$

Recommendation for determing the safety factor v: v > 3

Calculation of elongated length
“U“ (piston) = π × (D - S) - k

In case of special operating conditions (specific pressure loads, temperature, speed, use in water, HFA, HFB fluids etc.), please contact our consultancy service for a selection of the material and design best suiting your particular application requirements.

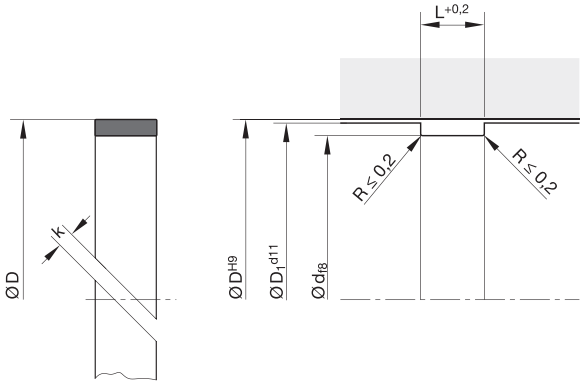


For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

Ordering example

Guide ring profile FK for a piston diameter of 100 mm.

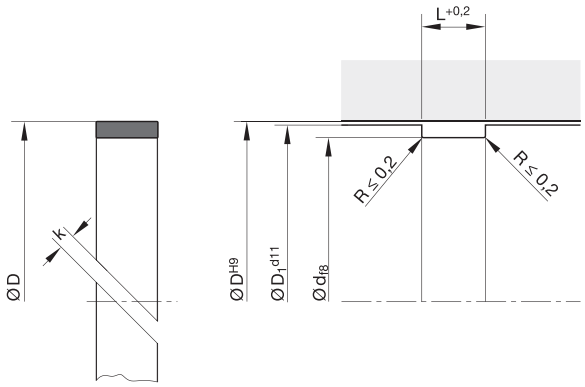
Order code	FK A095 Q5029 (100 × 95 × 9.7)
FK	Profile reference
A095	Dimension code
Q5029 or Q5038	Standard compound
D × d × L	Nominal dimensions



For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

D	d	L	D_1	Order code
25	20	5.6	24.8	FK 2520 Q5038
25	20	9.7	24.8	FK 2597 Q5038
28	23	6.3	27.8	FK 2923 Q5038
32	27	5.6	31.8	FK 3227 Q5038
32	27	9.7	31.8	FK 3228 Q5038
35	30	5.6	34.8	FK 3530 Q5038
35	30	9.7	34.8	FK 3597 Q5038
36	31	5.6	35.8	FK 3631 Q5038
40	35	5.6	39.7	FK 4035 Q5038
40	35	9.7	39.7	FK 4097 Q5038
42	37	5.6	41.7	FK 4237 Q5038
45	40	5.6	44.6	FK 4540 Q5038
45	40	9.7	44.6	FK 4597 Q5038
50	45	5.6	49.6	FK 5043 Q5038
50	45	9.7	49.6	FK 5045 Q5038
55	50	5.6	54.6	FK 5550 Q5038
55	50	9.7	54.6	FK 5597 Q5038
60	55	5.6	59.6	FK 6055 Q5038
60	55	9.7	59.6	FK 6097 Q5038
63	58	5.6	62.6	FK 5356 Q5038
63	58	6.3	62.6	FK 6359 Q5038
63	58	9.7	62.6	FK 6397 Q5038
65	60	5.6	64.5	FK 6561 Q5038
65	60	6.3	64.5	FK 6560 Q5038
65	60	9.7	64.5	FK 6597 Q5038
70	65	5.6	69.5	FK 7030 Q5038
70	65	6.3	69.5	FK 7065 Q5038
70	65	9.7	69.5	FK 7097 Q5038
70	65	15	69.5	FK 7015 Q5038
75	70	5.6	74.5	FK 7569 Q5038
75	70	9.7	74.5	FK 7570 Q5038
75	70	15	74.5	FK 7515 Q5038
80	75	6.3	79.5	FK 8075 Q5038
80	75	9.7	79.5	FK 8076 Q5038
80	75	15	79.5	FK 8015 Q5038
80	75	25	79.5	FK 8077 Q5038
85	80	6.3	84.5	FK 8580 Q5038
85	80	9.7	84.5	FK 8581 Q5038
85	80	15	84.5	FK 8515 Q5038
90	85	5.6	89.5	FK 9084 Q5038
90	85	9.7	89.5	FK 9086 Q5038
90	85	15	89.5	FK 9015 Q5038
90	85	25	89.5	FK 9085 Q5038
95	90	5.6	94.5	FK 9591 Q5038
95	90	9.7	94.5	FK 9590 Q5038
95	90	15	94.5	FK 9515 Q5038
100	95	5.6	99.4	FK A094 Q5038
100	95	9.7	99.4	FK A095 Q5038
100	95	15	99.4	FK 9513 Q5038
105	100	9.7	104.4	FK A500 Q5038
105	100	15	104.4	FK A515 Q038
110	105	9.7	109.4	FK B005 Q5038
110	105	15	109.4	FK B015 Q5038
115	110	9.7	114.4	FK B510 Q5038
115	110	15	114.4	FK B110 Q5038
120	115	9.7	119.4	FK C115 Q5038
120	115	15	119.4	FK C120 Q5038
125	120	9.7	124.4	FK C520 Q5038
125	120	15	124.4	FK C525 Q5038
130	125	9.7	129.4	FK D026 Q5038
130	125	15	129.4	FK D045 Q5038
140	135	9.7	139.4	FK E035 Q5038
140	135	15	139.4	FK E015 Q5038
145	140	9.7	144.3	FK E540 Q5038
145	140	15	144.3	FK E550 Q5038
150	145	9.7	149.3	FK F045 Q5038
150	145	15	149.3	FK F050 Q5038
155	150	9.7	154.3	FK F550 Q5038

Further sizes on request.

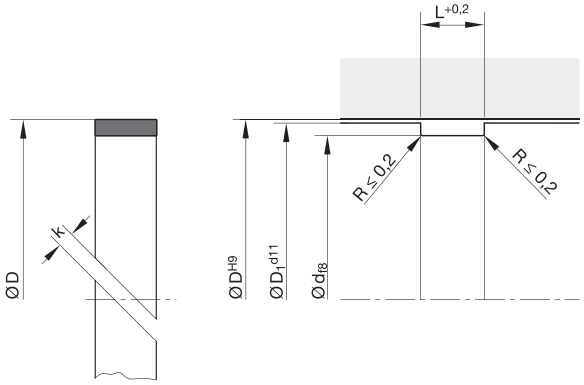


For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

D	d	L	D_1	Order code
155	150	15	154.3	FK F551 Q5038
155	150	25	154.3	FK F525 Q5038
160	155	9.7	159.3	FK G055 Q5038
160	155	15	159.3	FK G056 Q5038
160	155	20	159.3	FK G025 Q5038
165	160	9.7	164.3	FK G560 Q5038
165	160	15	164.3	FK G561 Q5038
165	160	25	164.3	FK G525 Q5038
170	165	9.7	169.3	FK H065 Q5038
170	165	15	169.3	FK H066 Q5038
170	165	25	169.3	FK H075 Q5038
175	170	9.7	174.3	FK H570 Q5038
175	170	15	174.3	FK H571 Q5038
175	170	25	174.3	FK H525 Q5038
180	175	9.7	179.3	FK J075 Q5038
180	175	15	179.3	FK J175 Q5038
180	175	25	179.3	FK J025 Q5038
190	185	9.7	189.3	FK K165 Q5038
190	185	15	189.3	FK K175 Q5038
190	185	25	189.3	FK K185 Q5038
200	195	9.7	199.3	FK L095 Q5038
200	195	15	199.3	FK L096 Q5038
200	195	25	199.3	FK L195 Q5038
205	200	15	204.3	FK L500 Q5038
205	200	25	204.3	FK L525 Q5038
210	205	15	209.3	FK L005 Q5038
210	205	25	209.3	FK L026 Q5038
215	210	15	214.3	FK L520 Q5038
215	210	25	214.3	FK L526 Q5038
220	215	15	219.3	FK M015 Q5038
220	215	25	219.3	FK M016 Q5038
225	220	15	224.3	FK M520 Q5038
225	220	25	224.3	FK M525 Q5038
230	225	15	229.3	FK M025 Q5038

D	d	L	D_1	Order code
230	225	25	229.3	FK M225 Q5038
240	235	15	239.3	FK N036 Q5038
240	235	25	239.3	FK N050 Q5038
250	245	15	249.3	FK N046 Q5038
250	245	25	249.3	FK N245 Q5038
255	250	15	254.3	FK N550 Q5038
255	250	25	254.3	FK N525 Q5038
260	255	15	259.3	FK O015 Q5038
260	255	25	259.3	FK O025 Q5038
265	260	15	264.3	FK O660 Q5038
265	260	25	264.3	FK O625 Q5038
270	265	15	269.3	FK O065 Q5038
270	265	25	269.3	FK O075 Q5038
275	270	15	274.3	FK O515 Q5038
275	270	25	274.3	FK O525 Q5038
280	275	15	279.2	FK P076 Q5038
280	275	25	279.2	FK P025 Q5038
285	280	15	284.2	FK P580 Q5038
285	280	25	284.2	FK P525 Q5038
290	285	15	289.2	FK P085 Q5038
290	285	25	289.2	FK P095 Q5038
300	295	15	299.2	FK Q001 Q5038
300	295	25	299.2	FK Q000 Q5038
310	305	15	309	FK Q010 Q5038
310	305	25	309	FK Q025 Q5038
320	315	15	319	FK Q020 Q5038
320	315	25	319	FK Q021 Q5038
330	325	15	329	FK Q015 Q5038
330	325	25	329	FK Q030 Q5038
350	345	15	349	FK Q315 Q5038
350	345	25	349	FK Q346 Q5038
380	375	15	379	FK Q070 Q5038
380	375	25	379	FK Q080 Q5038
400	395	15	399	FK R015 Q5038

Further sizes on request.



For surface finish, lead in chamfer and other installation dimensions see „General installation guidelines“.

D	d	L	D_1	Order code
400	395	25	399	FK R025 Q5038
450	445	25	449	FK R445 Q5038
450	445	25	449	FK R450 Q5038
500	495	15	499	FK S500 Q5038
500	495	25	499	FK S525 Q5038

Further sizes on request.