



Merkel Sealing Technology

Seals and Sealing Systems for Presses

Leading the way.







Seals and Sealing Systems for Presses

Installation recommendations for sealing systems plus descriptions with dimension tables of products used predominantly in all kinds of presses applications.



Leading the way.





The figures indicated in the catalog are based on experiences gathered within the Freudenberg Group in the field of research over several decades for the development and manufacture of seals and they are in line with today's state-of-the-art expertise. However, the sealing effect provided by numerous products mentioned in the catalog is not only generated by the component proper. It is rather based to a very large extent – depending on the specific application involved – on other parameters such as the place of installation and counter rotation, the pressure applied, the operating temperature, the media to be sealed, the lubrication, vibration-related influences and possible dirt from outside. These

and further unknown factors are likely to exert a tangible influence on the function of seals in practical applications.

Against this background, no standard statements can be made about the function of the products mentioned in the catalog. The data stated in the latter merely represent general, non-binding reference values which cannot be applied to every case of application. As a result, we recommend that you discuss concrete cases of application with our consulting services.

In the event of higher and special stresses, e.g. exerted by aggressive media, the seal should be selected in cooperation with us, as functional reliability tests are frequently indispensable.

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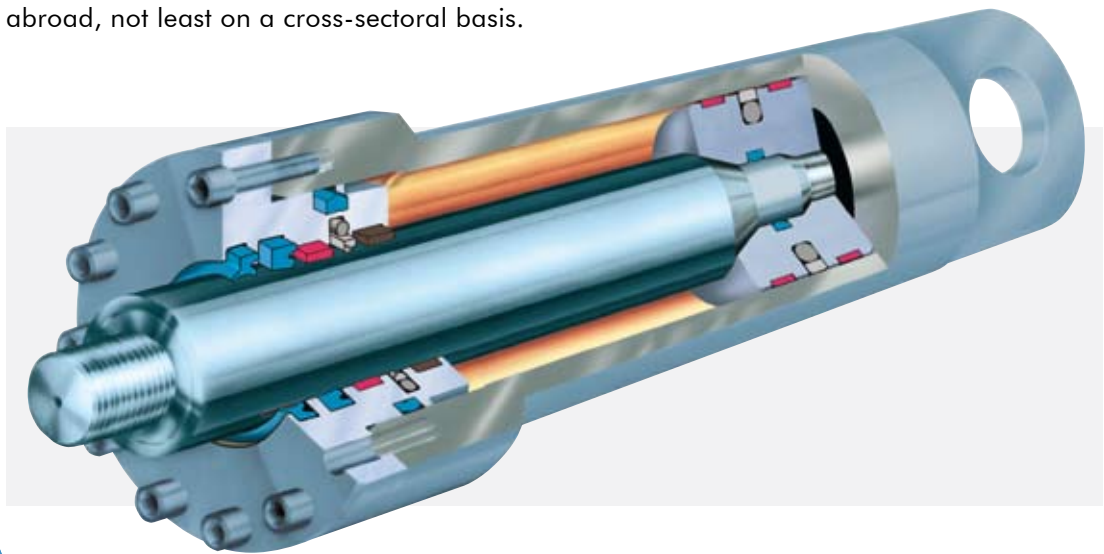
Merkel Seals and Sealing Systems for Presses

Merkel: sealing technology acknowledge worldwide

Merkel is the market leader in the field of seals for heavy industry. With innovative solutions and definitive products for all sectors, we rank among the world's best-thought-of experts on sealing technology. The quality of Merkel seals is recognized worldwide.

Their high functional reliability, coupled with excellent static and dynamic sealing effects, is regularly confirmed in comparative tests by all our customers at home and abroad, not least on a cross-sectoral basis.

For customized solutions to challenging problems, take advantage of our expertise in applications engineering, our profound expertise in material selection in conjunction with Freudenberg Research Services, and our sophisticated production technology.



Merkel seals: meeting all requirements

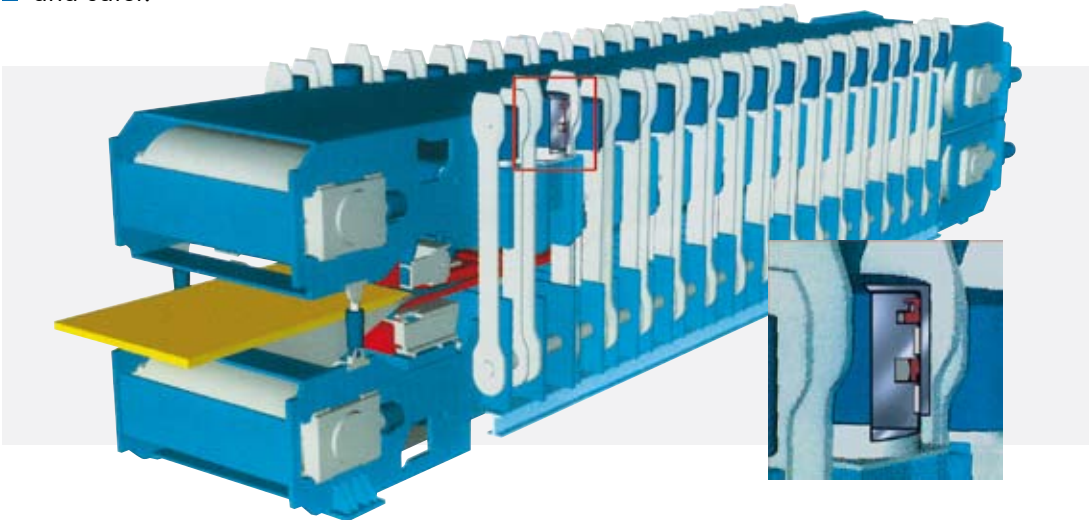
Merkel sealing systems are renowned for their outstanding material quality, coupled with high extrusion stability and a perfectly matched geometry.

Absolute performance under high pressures, at high speeds or in adverse weather is a matter of course for Merkel sealing systems. With Merkel sealing systems your processing equipment will operate

- a lot faster
- better
- more economic
- and safer.

Merkel Heavy Industry is one of the leading manufacturers of sealing systems for the heavy industry.

Major plant engineering and construction companies in the presses industry rely on the outstanding quality of Merkel products and the high standard of Merkel sealing technology. Close cooperation during development projects ensures a realisation that is close to the market, field-experienced and tailor-made for the application, even in harsh environments.



This will not only give you the cutting edge, but will result in less downtime, less maintenance and significantly reduced repair costs.

Take advantage of our superior product range for your systems, and rely on the expertise and know-how of a leading company.

Customized, field-proven, cost-efficient: the best sealing system for every requirement

Diverse operating conditions and the associated high requirements of sealing systems like:

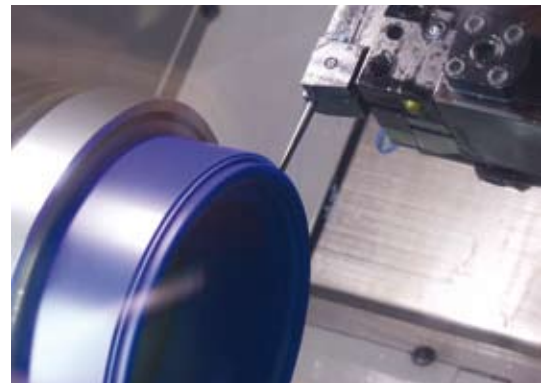
- low frictional forces and good controllability
- high reliability
- long service life
- optimal leakage behaviour

often require customer-specific solutions.

Merkel has specialised in this area and is one of the globally leading suppliers of seals and sealing systems particularly for large dimensions.



Development work is a crucial element in our globally successful product policy. The ideal sealing effect is offered to you by the Omegat rod seals OMS-MR PR and OMS-S PR. With the patented pressure-relief feature, the pressure in the intermediate space is held independently of the operating conditions at a level favorable for continuous operation. By virtue of the low thermal and mechanical stress on the sealing elements, a stable long term behavior is achieved, and the sealing system's service life is extended.



We offer sophisticated and high quality seals and sealing systems for a diverse number of applications:

in the metal processing industry (cold):

- i. e. bending- extrusion- and deep drawing presses

in metal processing (hot)

- i. e. forging presses and forging hammers

in the scrap industry

- i. e. scrap shears- and presses

for the building industry

- i.e. ceramic- and brick presses

for wood processing

- i. e. chipboard- and veneer presses

for paper processing

- i. e. baling presses

Merkel offers you firstly a high level of stock availability from conventional production methods, and secondly a fast-response capability for rush repair jobs, based on state-of-the-art lathe technology.

Merkel seals: Your competitive advantage

Due to their high extrusion resistance and their superior material quality, Merkel seals have no trouble standing up to high speeds and a wide range of temperatures. This means your machines can produce not only faster, but at significantly higher efficiencies into the bargain.

The superior sealing effect can be relied upon to prevent leaks and resultant machine failures, thus saving you costly downtimes. At the same time, both service and repair outlays are reduced.

About: Merkel

Around 800 employees develop, produce and sell seals and sealing systems for industrial applications.

Merkel Freudenberg Fluidtechnic belongs to the Freudenberg Seals and Vibration Control Technology business unit, forms part of the globally operating Freudenberg Group, and is thus integrated into one of the world's biggest global partnership and sales networks for sealing technology.





Typical applications

Sealing Systems for Presses

Merkel supplies compact sealing systems that ensure reliable sealing even under the extreme conditions encountered in the wide field of the presses industry. The individual elements involved are optimally matched in terms of both materials and functionality,

since all individual seals are developed as a system solution, and supplied from a single source. By selecting materials specifically matched to these requirements, a very high pressure resistance capability is achieved, assuring long, functional life.



Sealing Arrangement for Rod Seal (plunger)

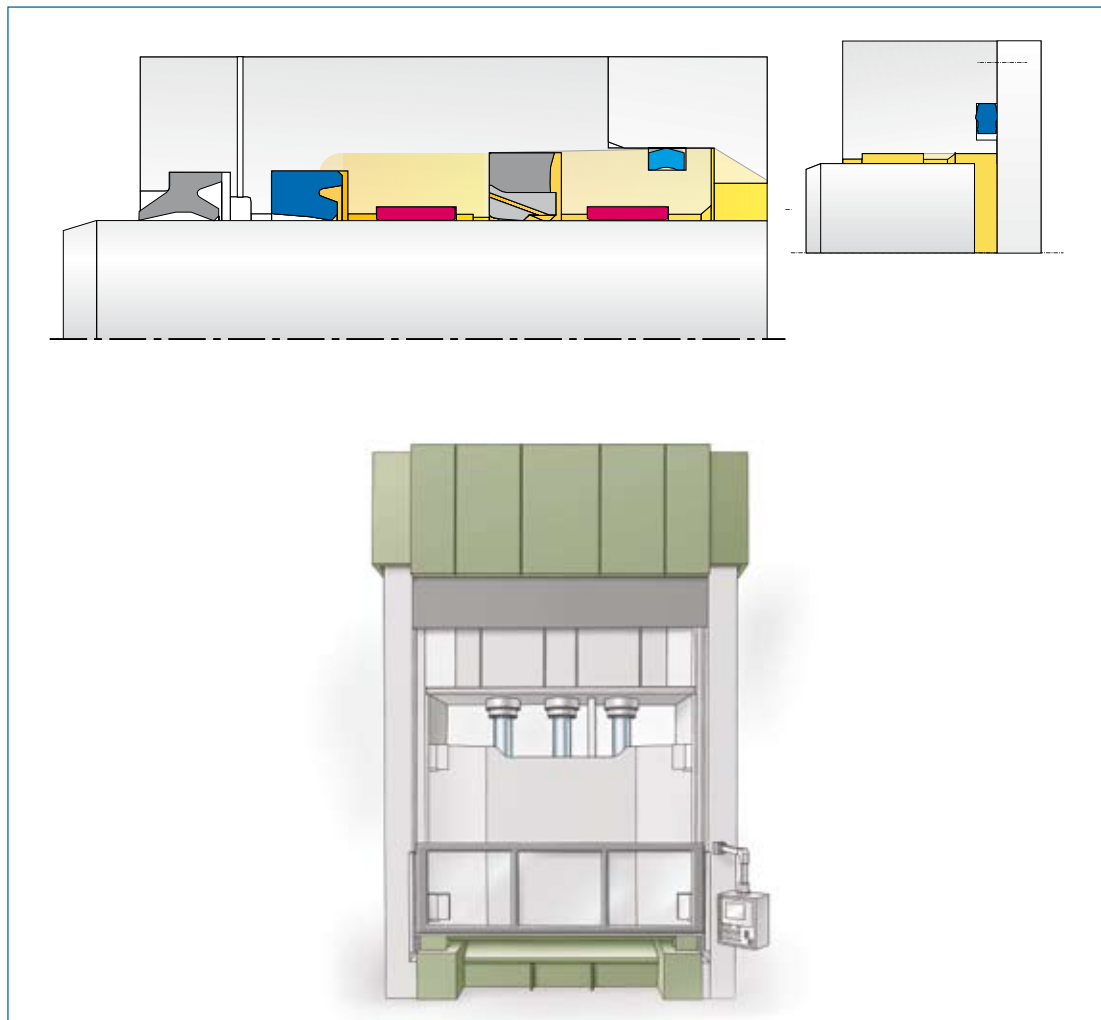
Applications:
Metal forming press,
particleboard press, pipe forming press

Merkel rod seal systems with doublewiper P 9, primary seal Omegat OMS-S PR, secondary seal U-Ring T 20, Guivex guide bushes SBK and Cover Seal PU 83 respectively Stirromatic SRC.

Requirements for the sealing system:

- Large diameter
- Long stroke
- High pressure

Typical operating parameters	
Diameter of the rod	700 mm
Movement	linear, downward out stroke
Pressure	30 MPa
Speed	loaded 0,02 m/s; without load 0,5 m/s
Stroke	loaded 400 mm; without load 2500 mm
Medium	mineral oil



Sealing Arrangement at Environmental Influence

Applications:

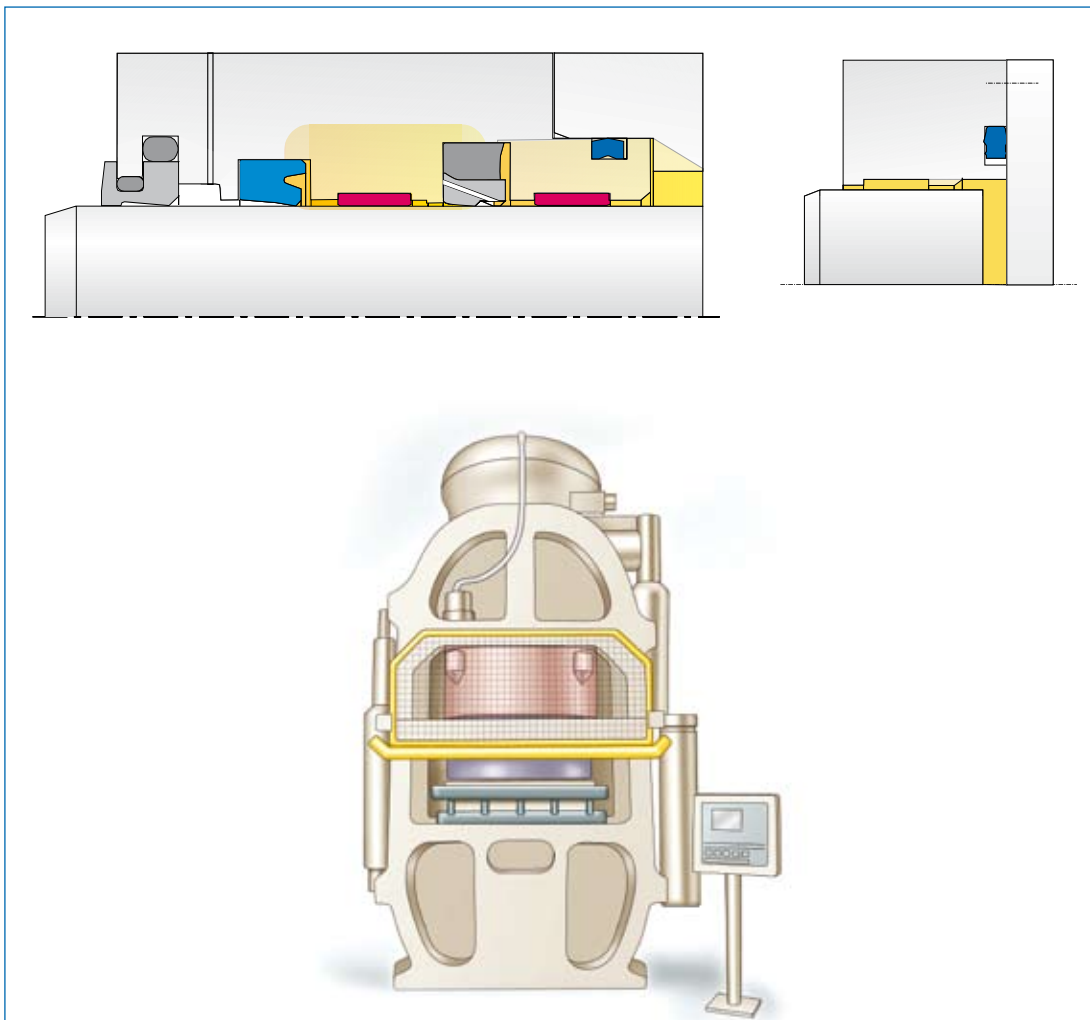
Particleboard press, short cycle press, stone press, ceramic press

Merkel Rod Sealing System with double wiper PT 2, primary seal Omegat OMS-S PR, secondary seal U-ring T 20, Guivex guide bushes SBK and Cover Seal PU 82 respectively Stirromatic SRC.

Requirements for the sealing system:

- Adherent pollution to the rod
- Fluid and dirt from the top
- Aggressive steam
- Radiant heat

Typical operating parameters	
Diameter of the rod	700 mm
Movement	linear
Pressure	30 MPa
Speed	loaded 0,02 m/s; without load 0,5 m/s
Stroke	loaded 400 mm; without load 2500 mm
Medium	mineral oil



Sealing Arrangement for Water Based Pressure Fluids

Applications:

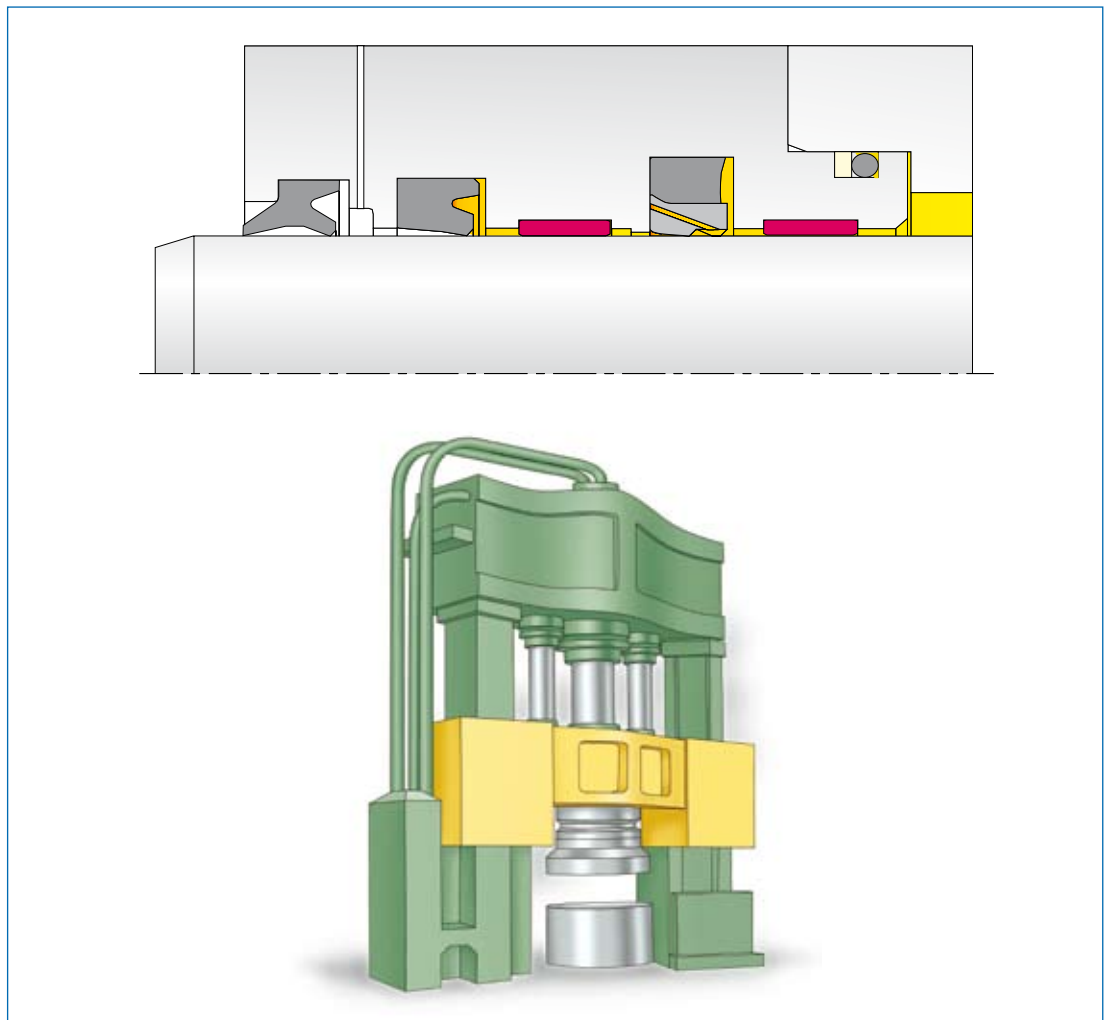
Forging press, metal forming press, particleboard press

Merkel Rod Sealing System with double-wiper P 9, primary seal Omegat OMS-S PR, secondary seal U-ring L 20, Guivex guide bushes SBK and an O-ring with a PTFE back-up ring

Requirements for the sealing system:

- Fire-resistant pressure fluids (HFA)

Typical operating parameters	
Diameter of the rod	700 mm
Movement	linear, downward out stroke
Pressure	30 MPa
Speed	loaded 0,02 m/s; without load 0,5 m/s
Stroke	loaded 400 mm; without load 2500 mm
Medium	water emulsion (HFA)



Sealing Arrangement for Existing Seal Housing with Optimized Sealing System

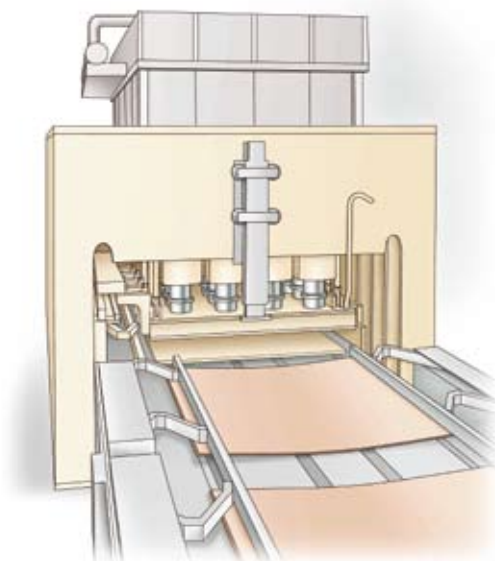
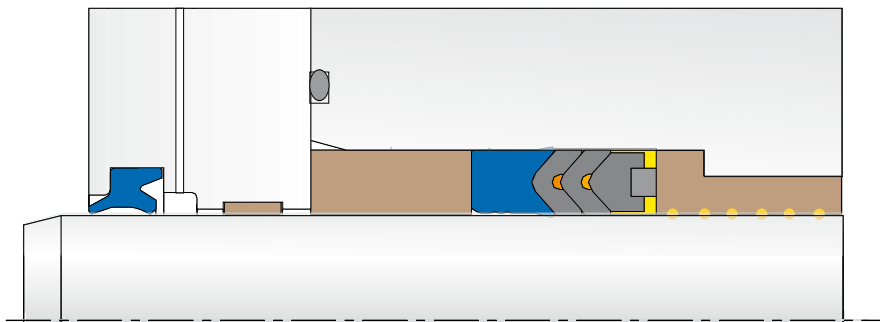
Applications: Short cycle press

Merkel rod sealing system with double wiper PU 11, roof shaped seal set ES 81 with a polyurethane pressure ring, PTFE bronze guide band SF and an O-ring.

Requirements for the sealing system:

- Main working pressure at the end of the stroke
- Partial vacuum
- Short-term rise in pressure

Typical operating parameters	
Diameter of the rod	400 mm
Movement	linear, downward out stroke
Pressure	loaded 32 MPa; temporary (low-pressure) -0,09 MPa
Speed	loaded 0,02 m/s; without load 0,5 m/s
Stroke	loaded 2 mm; without load 300 mm
Medium	mineral oil



Sealing Arrangement for Differential Cylinder

Applications:

Metal forming press, bending press, working cylinder in general

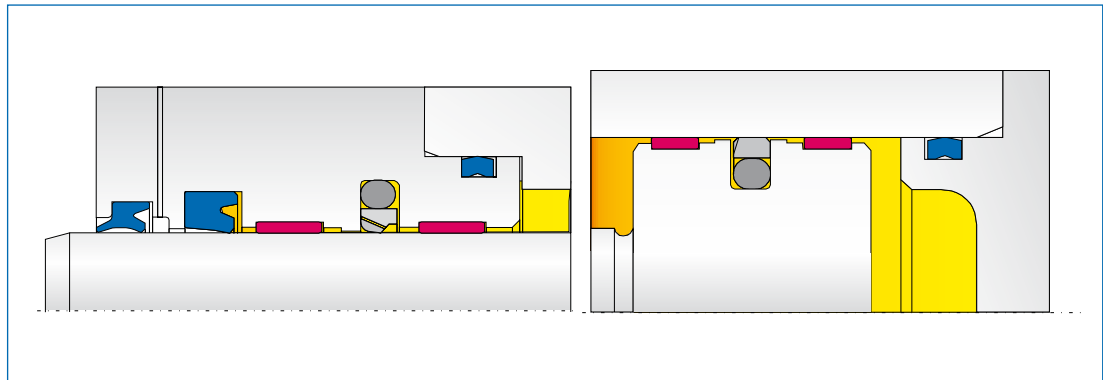
Merkel rod sealig system with double wiper PU 11, primery seal Omegat OMS-MR PR, secondary seal U-ring T 20, Guivex guide bushes SBK and Cover Seal PU 83.

Merkel piston sealing system with Omegat OMK-MR, Guivex guide bushes KBK and Cover Seal PU 83.

Requirements for the sealing system:

- long stroke

Typical operating parameters	
Diameter of the rod	rod: 200 mm piston: 250 mm
Movement	linear, downward out stroke
Pressure	rod: 16 MPa piston: 30 MPa
Speed	loaded 0,01 m/s; without load 1 m/s
Stroke	loaded 200 mm; without load 1600 mm
Medium	mineral oil



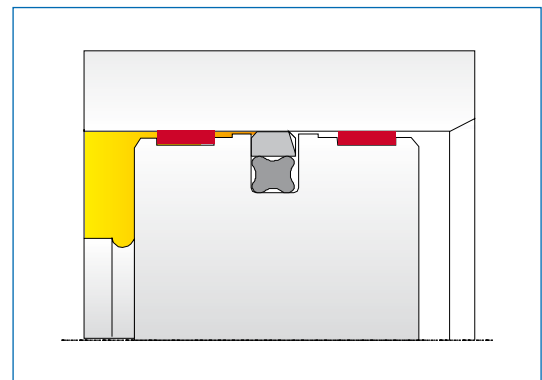
Alternative:

Merkel piston sealing system with Omegat OMK-QR and Guivex guide bush KBK.

Depending on the operating conditions, reciprocal load may cause twisting of the O-ring used as preload element.

In this case the O-ring of the piston seal set series Omegat OMK-MR can be replaced by an X-ring. The Omegat piston seal including an X-ring as preload element is described as piston seal set series Omegat OMK-QR.

The Omegat OMK-QR is used for pistons with pressure from both sides and heavy duty applications.



Sealing Arrangement under Rough Environment

Application: Baling press, scrap press

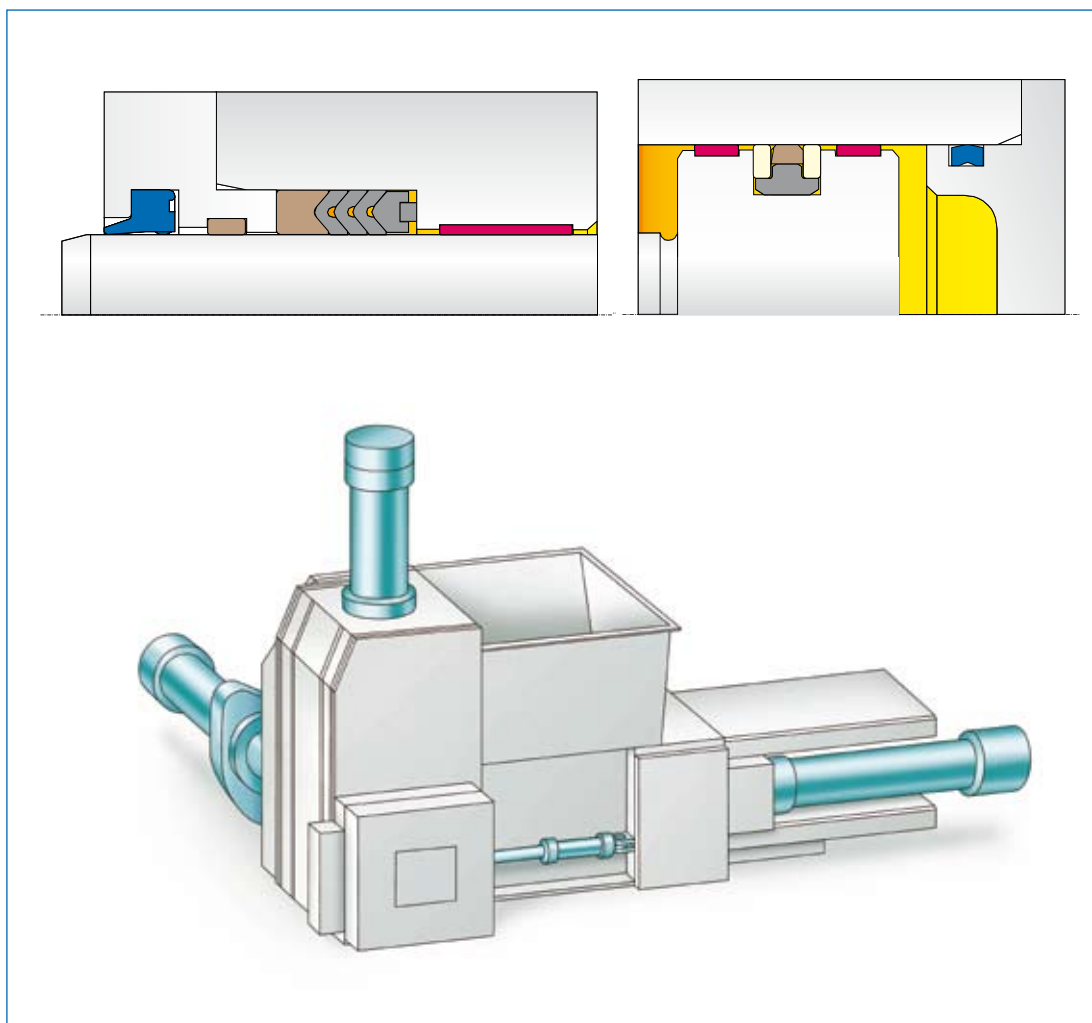
Merkel rod sealing system with wiper PU 6, roof shaped seal set ES 61 with a PTFE Bronze pressure ring, Guivex guide bush SBK and PTFE bronze guide band.

Merkel piston sealing system with the compact seal L 27, Guivex guide bushes KBK and Cover Seal PU 83.

Typical operating parameters	
Diameter	rod: 200 mm piston: 280 mm
Movement	linear, horizontal out stroke
Pressure	rod: 10 MPa piston: 30 MPa
Speed	0,3 m/s
Stroke	up to 10000 mm
Medium	mineral oil

Requirements for the sealing system:

- Robust
- Large gap size to prevent metal contact



Sealing Arrangement for the Application in Short Stroke Presses

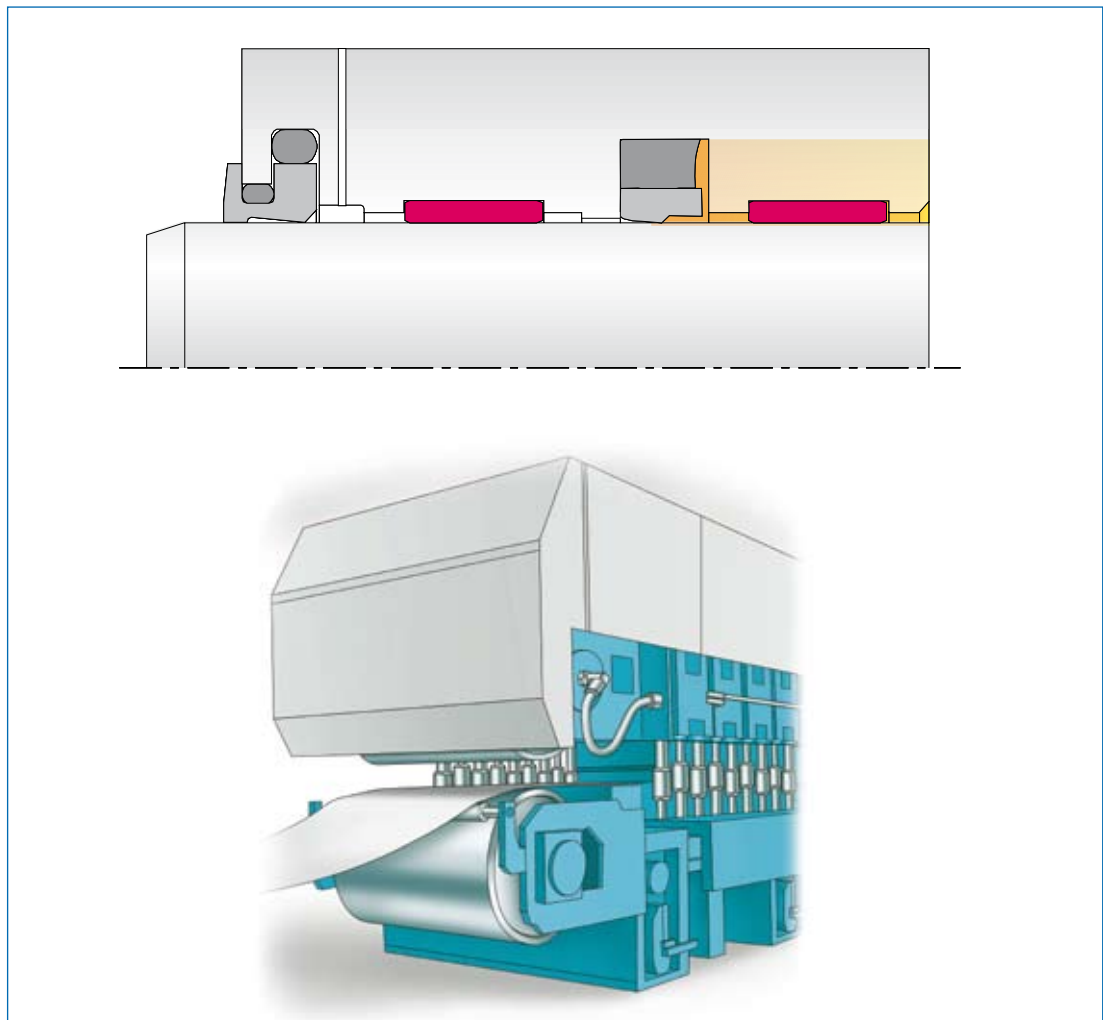
Application:
**Continuous particleboard press,
fine blanking press**

Merkel rod sealing system with double wiper
PT 2, rod seal Omegat OMS-S und Guivex guide
bushes SBK

Requirements for the sealing system:

- Short stroke
- Short cycle time
- Partly remaining under pressure

Typical operating parameters	
Diameter	400 mm
Movement	linear, upward out stroke
Pressure	26 MPa
Working cycle	60/min.
Stroke	2 mm to 10 mm
Medium	mineral oil



Sealing Arrangement for the Application at Automotiv Presses

Medium compressed air, lubricated

Application: Balancing cylinder, drawing cushion

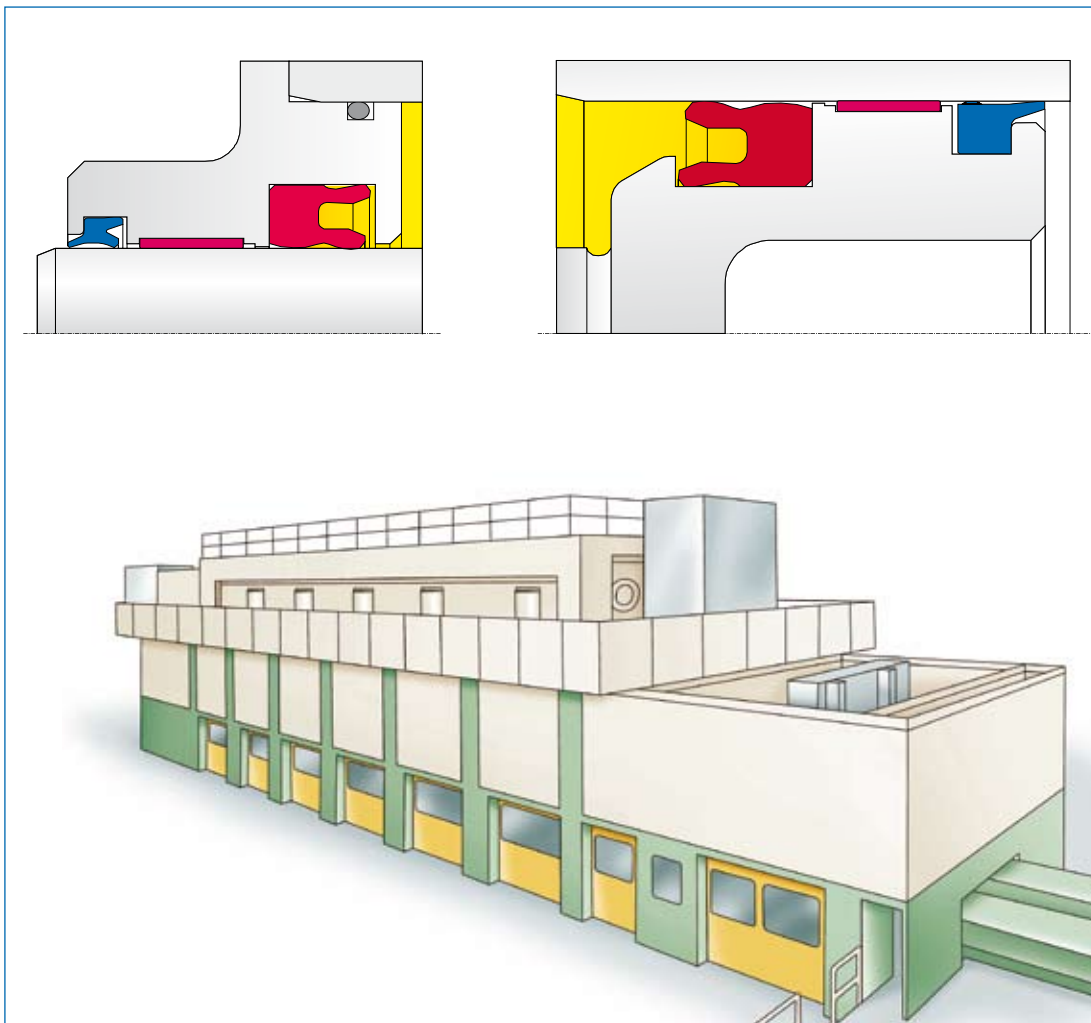
Merkel rod sealing system with double wiper PU 11, rod seal TMP 20, Guivex guide bush SBK and an O-ring.

Merkel piston sealing system with wiper PU 12, piston seal TMP 21, Guivex guide bush KBK.

Requirements for the sealing system:

- Medium compressed air, lubricated
- Robust

Typical operating parameters	
Diameter	rod: 100 mm piston: 600 mm
Movement	linear, downward out stroke
Pressure	rod: 2 MPa
Speed	1,5 m/s
Stroke	1500 mm
Medium	lubricated air, initial lubrication



Sealing Arrangement for the Application at Automotiv Presses

Medium compressed air, dry

Application: Balancing cylinder, drawing cushion

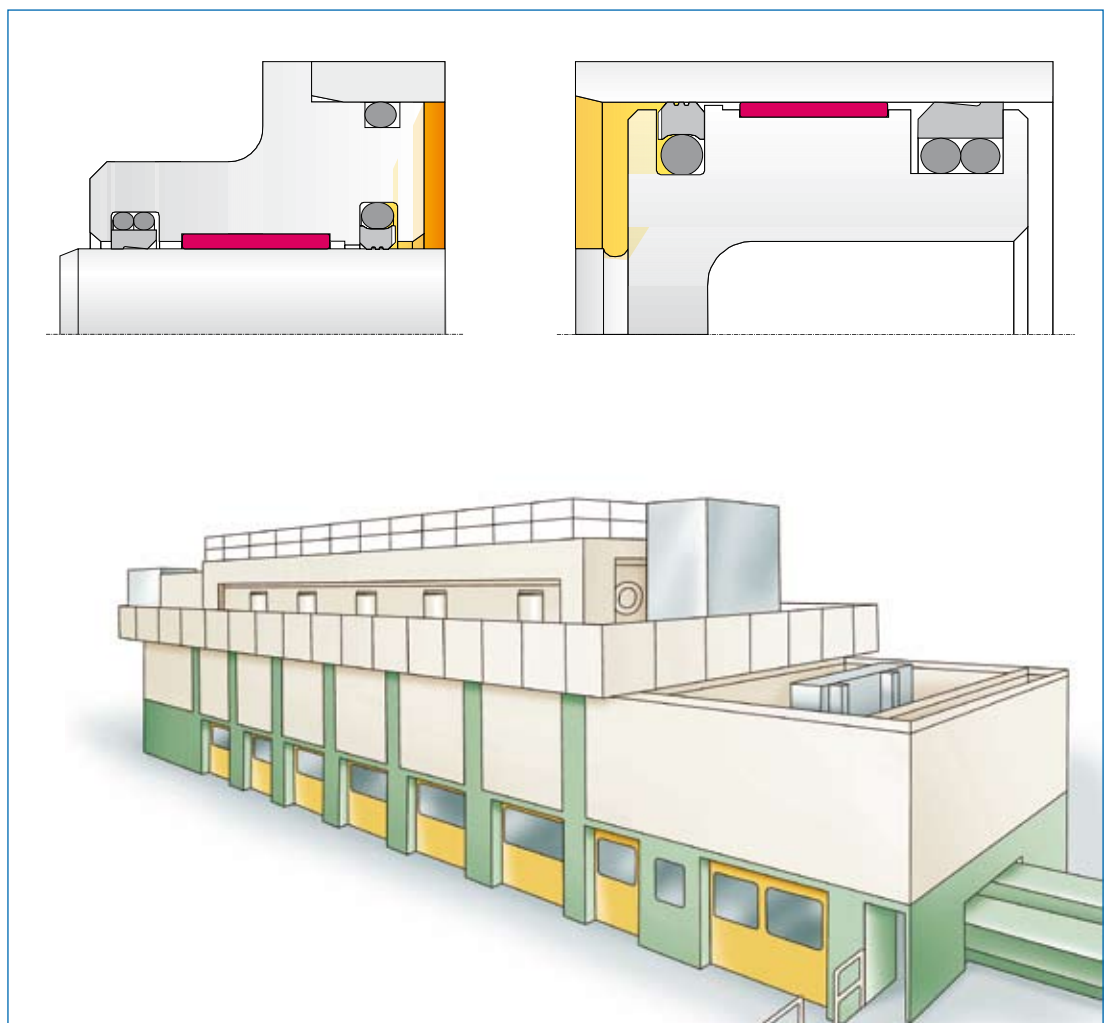
Merkel Stangen-Dichtsysteme Merkel rod sealing system with double wiper PT 1, Rotomatic M 15, Guivex guide bush SBK and an O-ring.

Merkel sealing system with Rotomatic M 16, double wiper PT 3 and Guivex guide bush KBK.

Requirements for the sealing system:

- Medium compressed air, lubricated or dry
- High speed

Typical operating parameters	
Diameter	rod: 100 mm piston: 600 mm
Movement	linear, downward out stroke
Pressure	2 MPa
Speed	2 m/s
Stroke	1500 mm
Medium	compressed air, initial lubrication, dry air





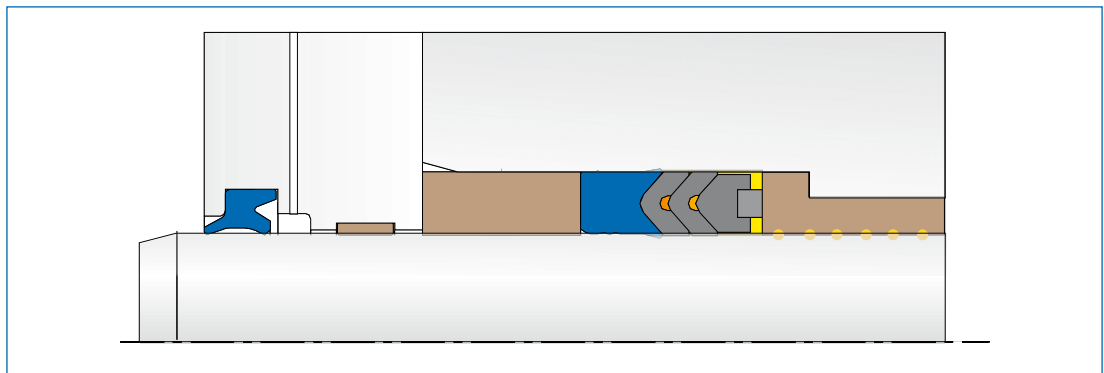
Sealing Arrangement for Existing Seal Housing

Roof-shaped seal set with polyurethane pressure ring

Merkel rod sealing system with double wiper PU 11, roof shaped seal set ES 81, PTFE bronze guide band SF.

Product advantages

- High sealing effect by means of a modern polyurethane pressure ring with optimized geometry (finite element)
- Additional static sealing edge against the ingress of air (partial vacuum)
- Favourable frictional characteristic by means of a grooved contact surface
- High resistance against gap extrusion by means of a robust polyurethane pressure ring

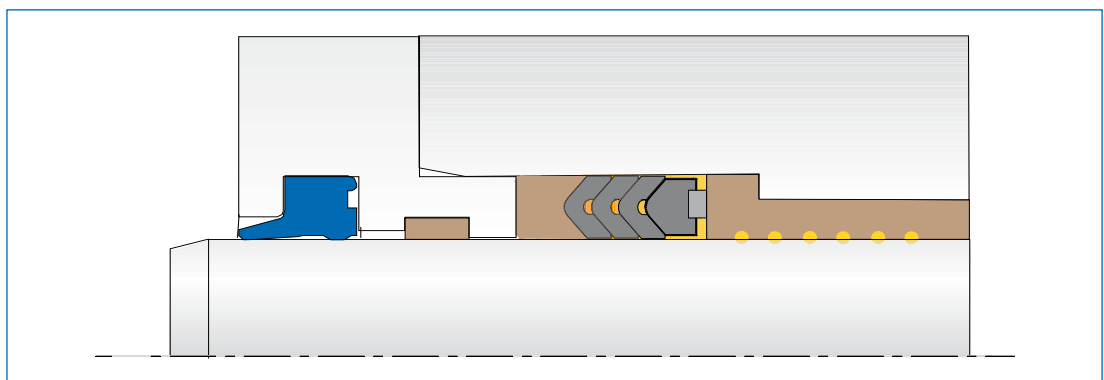


Roof-shaped seal set with PTFE bronze pressure ring

Merkel rod sealing system with wiper PU 6, roof shaped seal set ES 61, PTFE bronze guide band SF.

Product advantages

- High resistance against gap extrusion by means of a robust pressure ring made of PTFE-bronze compound
- High operating reliability by means of robust fabric roof-shaped seals
- Constant axial preload by means of a rubber spring activated support ring
- Installation in non-adjustable seal housing

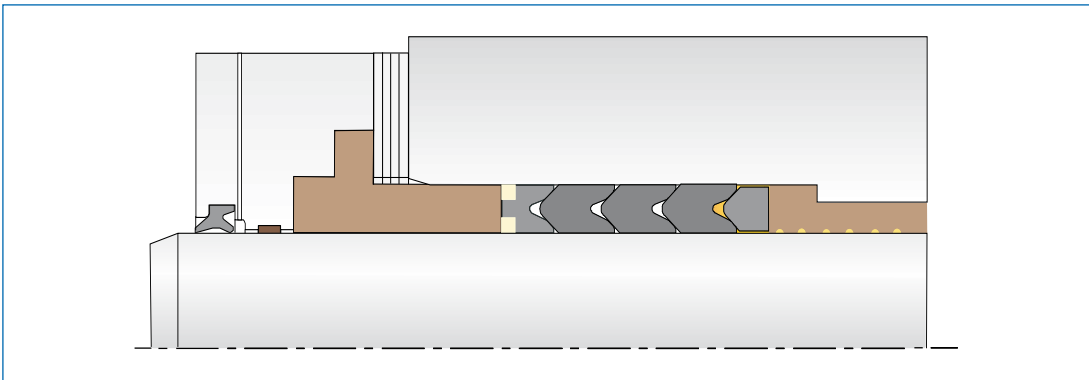


Rod-V-packing set with integrated back-up ring

Merkel rod sealing system with V-packung set with integrated back-up rings, double wiper P 9 and PTFE-bronze guide band SF.

Product advantages

- Excellent gap bridging (high pressure; increase of guidance clearance due to wear)
- Tolerant to misalignment of shaft
- Insensitive to poor surface quality (rough environment)
- Special design of profile for an excellent adjustability



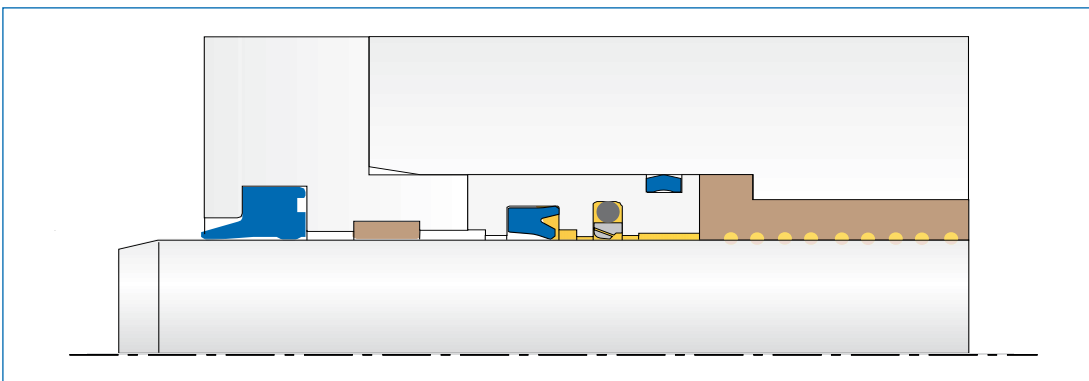
Cartridge sealing systems

Profile Roof-shaped seal set ≥ 15 mm

Merkel rod sealing system with wiper PU 6, guide band SF and the cartridge with U-ring T 20, Omegat OMS-MR PR, Cover Seal PU 83

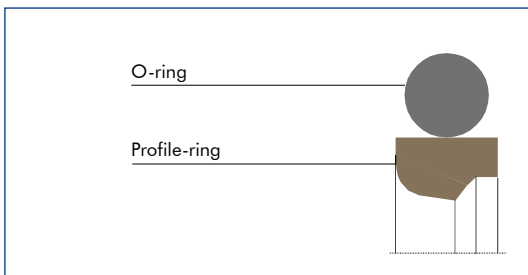
Product advantages

- High sealing effect
- Favourable frictional characteristic (control precision; short cycle time; high speed)
- Constant long-term behaviour (no load compression)
- Simple assembly





Merkel Rod Seal Omegat OMS-MR



Product description

Two-piece seal set for sealing piston rods, consisting of a PTFE profile ring and an O-ring as a preloading element. .

Product advantages

Rod seal especially suitable for use within a sealing system.

- Very high stability under pressure
- Good thermal conductivity
- Very good extrusion safety
- High resistance to abrasion
- Low friction, stick-slip free

Material

PTFE profile ring

Material	Designation	Color
PTFE-bronze compound	PTFE B602	brown
PTFE-glass-fiber-MoS2 compound	PTFE GM201	light grey
PTFE-carbon-fiber compound	PTFE C104	dark grey

Material

O-ring

Material	Designation
Nitrile rubber	NBR
Fluoroelastomer	FKM

Other material combinations available on request.

Operating conditions

Material	PTFE B602/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-
Water	-
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

Operating condition

Material	PTFE GM201/NBR PTFE C104/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

Material	PTFE B602/FKM
Hydraulic oils, HL, HLP	-10 ... +200 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-10 ... +200 °C
Water	-
HETG (rape-seed oil)	-10 ... +80 °C
HEES (synth. ester)	-10 ... +100 °C
HEPG (glycol)	-10 ... +80 °C
Mineral greases	-10 ... +200 °C
Pressure	40 MPa
Running speed	5 m/s

Material	PTFE GM201/FKM PTFE C104/FKM
Hydraulic oils, HL, HLP	-10 ... +200 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-10 ... +60 °C
HFD fluids	-10 ... +200 °C
Water	+5 ... +100 °C
HETG (rape-seed oil)	-10 ... +80 °C
HEES (synth. ester)	-10 ... +100 °C
HEPG (glycol)	-10 ... +80 °C
Mineral greases	-10 ... +200 °C
Pressure	40 MPa
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

The long-time behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface.

A precise description and assessment of the surface is thus indispensable.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface.

See also *Merkel Technical Manual*.



Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance and the deflection of the guide under load.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension		Max. permissible gap dimension			
L	Profile	16 MPa	26 MPa	32 MPa	40 MPa
3,2	3,65	0,4	0,35	–	–
4,2	5,35	0,5	0,4	0,3	–
6,3	7,55	0,55	0,45	0,35	0,3
8,1	10,25	0,6	0,5	0,4	0,4
8,1	12	0,7	0,6	0,55	0,5
9,5	13,65	0,75	0,65	0,6	0,55

At an operating temperature of above 90°C, and simultaneous exposure to an operating pressure of more than 26 MPa, we recommend the use of the material compound PTFE B602 and PTFE C104.

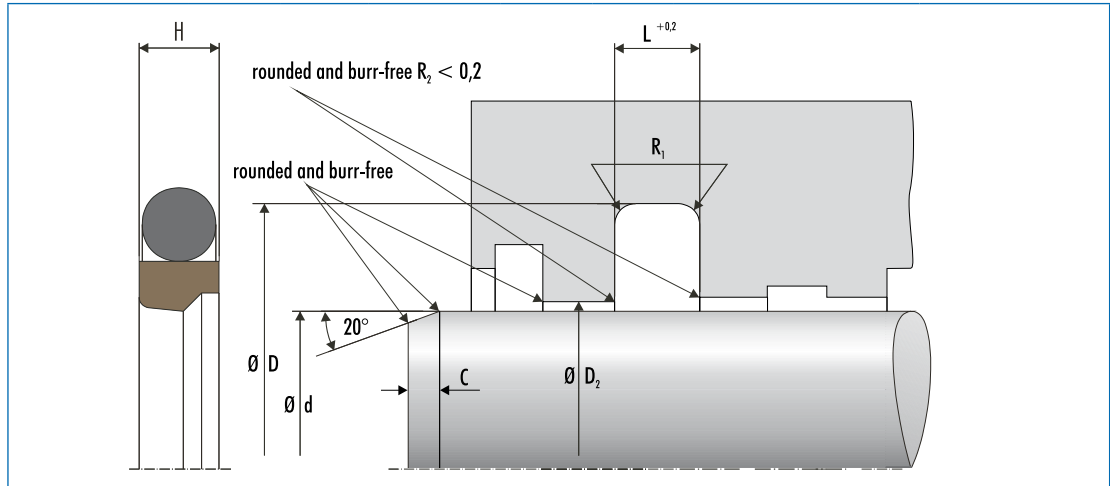
Tolerances

Diameter D	Tolerance
< 500	H8
> 500	H7

The tolerance for the diameter d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

Installation & assembly

Flawless functioning of the seals is conditional on meticulous installation. See also *Merkel Technical Manual*.



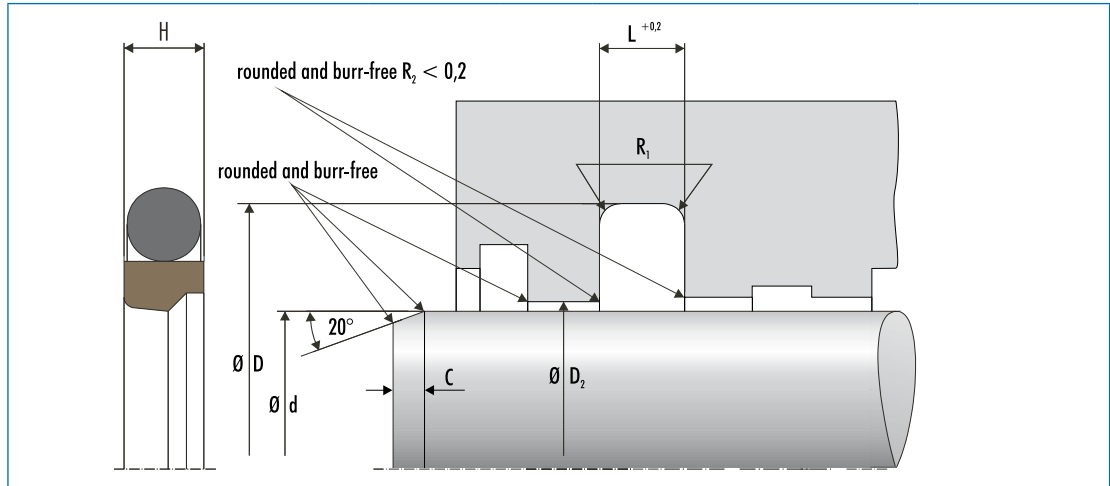
d	D	H	L	Profile	C	R1	Material	Article No.
60	70,7	4	4	5,35	3,5	0,8	PTFE GM201 / NBR	24131184
60	70,7	4	4,2	5,35	3,5	0,8	PTFE B602 / NBR	24223162
60	70,7	4	4,2	5,35	3,5	0,8	PTFE C104 / NBR	49069400
60	75,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	24178447
60	75,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	24105984
63	73,7	4	4,2	5,35	3,5	0,8	PTFE B602 / NBR	49001988
63	78,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	24190727
63	78,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49038138
63	78,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	24131213
65	80,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	24178449
65	80,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	24131214
70	80,7	4	4,2	5,35	3,5	0,8	PTFE B602 / NBR	24334160
70	85,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	24178450
70	85,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	24110738
75	90,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	24178451
75	90,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	24121487
80	90,7	4	4,2	5,35	3,5	0,8	PTFE B602 / NBR	24334161
80	95,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	24178452
80	95,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49039867
80	95,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	24121483
85	100,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24178453
85	100,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24110740
90	105,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24178454
90	105,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24294068
90	105,1	5,9	6,3	7,55	6	1,2	PTFE C104 / NBR	49038787
90	105,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24111803

Other material combinations and further dimensions are available on request.



d	D	H	L	Profile	C	R1	Material	Article No.
95	110,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24213071
95	110,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24223698
100	115,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24178455
100	115,1	5,9	6,3	7,55	6	1,2	PTFE C104 / NBR	49026668
100	115,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24131215
105	120,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24214072
105	120,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24138660
110	125,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24179236
110	125,1	5,9	6,3	7,55	6	1,2	PTFE C104 / NBR	49023333
110	125,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24119466
115	130,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24179237
115	130,1	5,9	6,3	7,55	6	1,2	PTFE C104 / NBR	49060434
115	130,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24131216
120	135,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24214075
120	135,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24196902
125	140,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24179238
125	140,1	5,9	6,3	7,55	6	1,2	PTFE C104 / NBR	49045402
125	140,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24131217
130	145,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24214077
130	145,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24193747
135	150,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24223165
135	150,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24213365
140	155,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24179239
140	155,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24131218
145	160,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24314587
150	165,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24179240
150	165,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24131219
155	170,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24331789
155	170,1	5,9	6,3	7,55	6	1,2	PTFE C104 / NBR	49018755
155	170,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24343181
160	175,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24179241
160	175,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24131220
165	180,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	49008556
165	180,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24329893
165	180,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	49061412
170	185,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24214082
170	185,1	5,9	6,3	7,55	6	1,2	PTFE C104 / NBR	49018756
170	185,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24133133

Other material combinations and further dimensions are available on request.



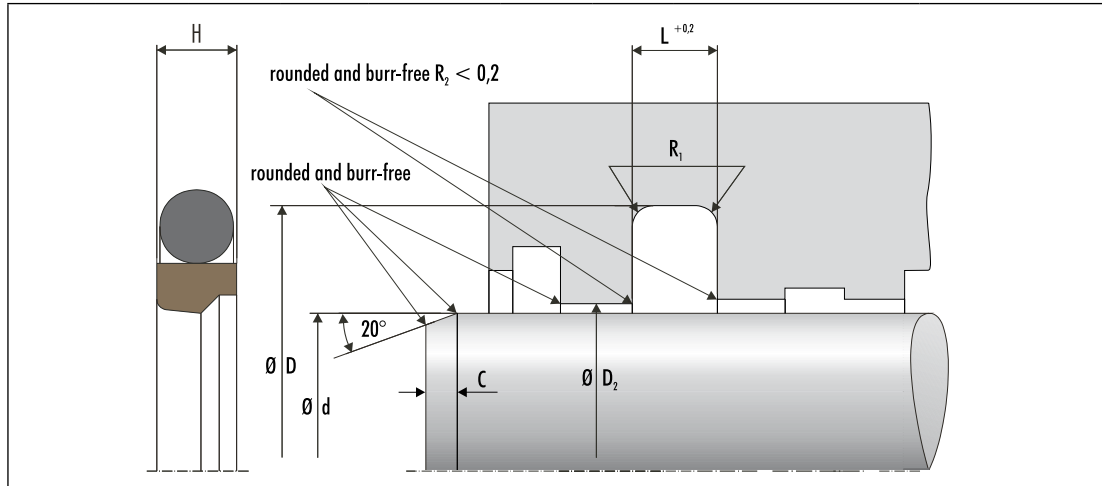
d	D	H	L	Profile	C	R1	Material	Article No.
175	190,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24379243
180	195,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24179242
180	195,1	5,9	6,3	7,55	6	1,2	PTFE C104 / NBR	49018757
180	195,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24131221
185	200,1	6,15	6,3	7,55	6	1,2	PTFE B602 / NBR	24335093
185	200,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24292413
190	205,1	5,9	6,3	7,55	6	1,2	PTFE B602 / NBR	24223168
190	205,1	5,9	6,3	7,55	6	1,2	PTFE C104 / NBR	49035942
190	205,1	5,9	6,3	7,55	6	1,2	PTFE GM201 / NBR	24216295
190	210,5	7,6	8,1	10,25	7,5	2	PTFE GM201 / NBR	24361227
200	220,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24179243
200	220,5	7,6	8,1	10,25	7,5	2	PTFE C104 / NBR	49037711
200	220,5	7,6	8,1	10,25	7,5	2	PTFE GM201 / NBR	24131222
205	225,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24335733
205	225,5	7,6	8,1	10,25	7,5	2	PTFE GM201 / NBR	24335588
210	230,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24223171
210	230,5	7,6	8,1	10,25	7,5	2	PTFE GM201 / NBR	24121485
215	235,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24355466
220	240,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24214085
220	240,5	7,6	8,1	10,25	7,5	2	PTFE C104 / NBR	49016409
220	240,5	7,6	8,1	10,25	7,5	2	PTFE GM201 / NBR	24223690
225	245,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24335734
225	245,5	7,6	8,1	10,25	7,5	2	PTFE GM201 / NBR	24275173
230	250,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24223174
230	250,5	7,6	8,1	10,25	7,5	2	PTFE GM201 / NBR	24174789
235	255,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24315039

Other material combinations and further dimensions are available on request.



d	D	H	L	Profile	C	R1	Material	Article No.
240	260,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24223177
240	260,5	7,6	8,1	10,25	7,5	2	PTFE GM201 / NBR	24105394
245	265,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24377707
250	270,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	24214087
250	270,5	7,6	8,1	10,25	7,5	2	PTFE GM201 / NBR	24179920
260	284	7,6	8,1	12	8	2	PTFE B602 / NBR	24223180
260	284	7,6	8,1	12	8	2	PTFE GM201 / NBR	24223691
270	294	7,6	8,1	12	8	2	PTFE B602 / NBR	24223183
270	294	7,6	8,1	12	8	2	PTFE GM201 / NBR	24123234
280	304	7,6	8,1	12	8	2	PTFE B602 / NBR	24214089
280	304	7,6	8,1	12	8	2	PTFE C104 / NBR	49035776
280	304	7,6	8,1	12	8	2	PTFE GM201 / NBR	24177957
290	314	7,6	8,1	12	8	2	PTFE B602 / NBR	24223186
290	314	7,6	8,1	12	8	2	PTFE GM201 / NBR	24223692
300	324	7,6	8,1	12	8	2	PTFE B602 / NBR	24214091
300	324	7,6	8,1	12	8	2	PTFE GM201 / NBR	24213516
310	334	7,6	8,1	12	8	2	PTFE B602 / NBR	24223189
320	344	7,6	8,1	12	8	2	PTFE B602 / NBR	24214093
320	344	7,6	8,1	12	8	2	PTFE GM201 / NBR	24223694
330	354	7,6	8,1	12	8	2	PTFE B602 / NBR	24223192
330	354	7,6	8,1	12	8	2	PTFE GM201 / NBR	24223695
340	364	7,6	8,1	12	8	2	PTFE B602 / NBR	24223195
340	364	7,6	8,1	12	8	2	PTFE GM201 / NBR	24223696
350	374	7,6	8,1	12	8	2	PTFE B602 / NBR	24223198
350	374	7,6	8,1	12	8	2	PTFE GM201 / NBR	24223697
360	384	7,6	8,1	12	8	2	PTFE B602 / NBR	24214095
360	384	7,6	8,1	12	8	2	PTFE GM201 / NBR	24196617
370	394	7,6	7,6	12	8	2	PTFE GM201 / NBR	24275883
370	394	7,6	8,1	12	8	2	PTFE B602 / NBR	24275719
380	404	7,6	8,1	12	8	2	PTFE B602 / NBR	24275731
380	404	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275871
390	414	7,6	8,1	12	8	2	PTFE B602 / NBR	24275745
390	414	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275912
400	424	7,6	8,1	12	8	2	PTFE B602 / NBR	24259183
400	424	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275913
410	434	7,6	7,6	12	8	2	PTFE GM201 / NBR	24275910
410	434	7,6	8,1	12	8	2	PTFE B602 / NBR	24275730
420	444	7,6	8,1	12	8	2	PTFE B602 / NBR	24275718

Other material combinations and further dimensions are available on request.



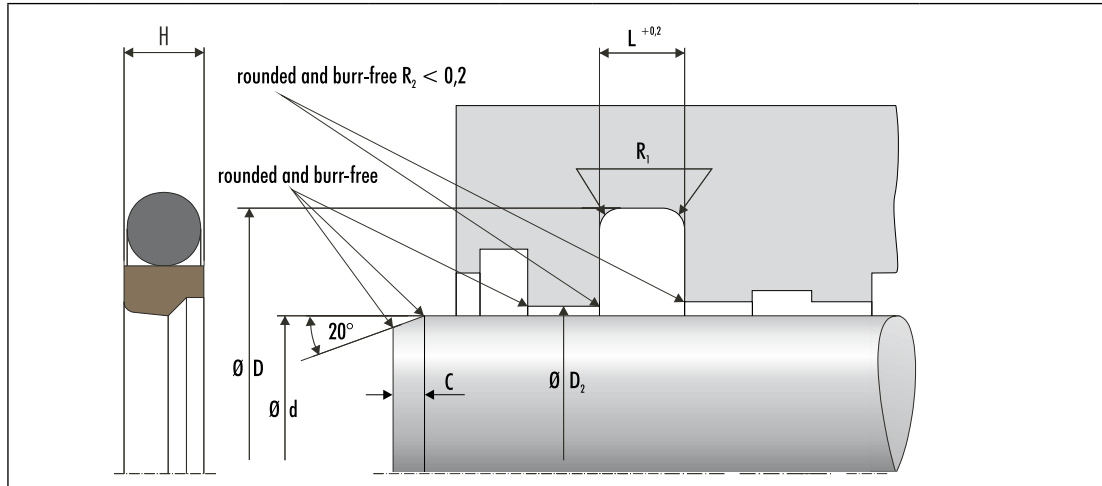
d	D	H	L	Profile	C	R1	Material	Article No.
420	444	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275882
430	454	7,6	8,1	12	8	2	PTFE B602 / NBR	24275744
430	454	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275870
440	464	7,6	8,1	12	8	2	PTFE B602 / NBR	24275751
440	464	7,6	8,1	12	8	2	PTFE GM201 / NBR	24265249
450	474	7,6	8,1	12	8	2	PTFE B602 / NBR	24275756
450	474	7,6	8,1	12	8	2	PTFE B602 / NBR	24346723
450	474	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275900
460	484	7,6	8,1	12	8	2	PTFE B602 / NBR	24275729
460	484	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275909
470	494	7,6	8,1	12	8	2	PTFE B602 / NBR	24269646
470	494	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275881
480	504	7,6	8,1	12	8	2	PTFE B602 / NBR	24268686
480	504	7,6	8,1	12	8	2	PTFE GM201 / NBR	24268688
490	514	7,6	8,1	12	8	2	PTFE B602 / NBR	24269412
490	514	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275869
500	524	7,6	8,1	12	8	2	PTFE B602 / NBR	24264956
500	524	7,6	8,1	12	8	2	PTFE C104 / NBR	49055699
500	524	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275911
510	534	7,6	8,1	12	8	2	PTFE B602 / NBR	24275750
510	534	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275908
520	544	7,6	8,1	12	8	2	PTFE B602 / NBR	24275716
520	544	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275899
530	554	7,6	8,1	12	8	2	PTFE B602 / NBR	24275728
530	554	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275880
540	564	7,6	8,1	12	8	2	PTFE B602 / NBR	24261155

Other material combinations and further dimensions are available on request.



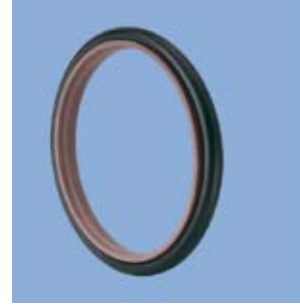
d	D	H	L	Profile	C	R1	Material	Article No.
540	564	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275868
550	574	7,6	8,1	12	8	2	PTFE B602 / NBR	24234533
550	574	7,6	8,1	12	8	2	PTFE GM201 / NBR	24233563
560	584	7,6	8,1	12	8	2	PTFE B602 / NBR	24275702
560	584	7,6	8,1	12	8	2	PTFE GM201 / NBR	24243496
570	594	7,6	8,1	12	8	2	PTFE B602 / NBR	24275715
570	594	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275898
580	604	7,6	8,1	12	8	2	PTFE B602 / NBR	24275732
580	604	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275907
590	614	7,6	8,1	12	8	2	PTFE B602 / NBR	24275727
590	614	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275879
600	624	7,6	8,1	12	8	2	PTFE B602 / NBR	24275742
600	624	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275867
610	634	7,6	8,1	12	8	2	PTFE B602 / NBR	24275703
610	634	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275890
620	644	7,6	8,1	12	8	2	PTFE B602 / NBR	24275714
620	644	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275897
630	654	7,6	8,1	12	8	2	PTFE B602 / NBR	24268690
640	664	7,6	8,1	12	8	2	PTFE B602 / NBR	24275726
640	664	7,6	8,1	12	8	2	PTFE GM201 / NBR	24275878
650	677,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275734
650	677,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275866
660	687,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275704
660	687,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275889
670	697,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275713
670	697,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275896
680	707,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24269482
680	707,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275906
690	717,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275725
690	717,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275877
700	727,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275741
700	727,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275865
710	737,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275705
710	737,3	8,7	9,5	13,7	11	2	PTFE GM201 / NBR	24275888
720	747,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275712
720	747,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275895
730	757,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275724
740	767,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275749

Other material combinations and further dimensions are available on request.



d	D	H	L	Profile	C	R1	Material	Article No.
740	767,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275876
750	777,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275736
750	777,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275864
760	787,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275706
760	787,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275887
770	797,3	8,7	9,5	13,65	11	2	PTFE C104 / NBR	49055696
770	797,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275894
780	807,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275711
780	807,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275904
790	817,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275748
800	827,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275737
800	827,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275863
810	837,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275707
810	837,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275886
820	847,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275722
820	847,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275893
830	857,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275747
830	857,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275903
840	867,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275752
840	867,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275874
850	877,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275738
860	887,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275708
860	887,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275902
870	897,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275721
880	907,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275746
880	907,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275885

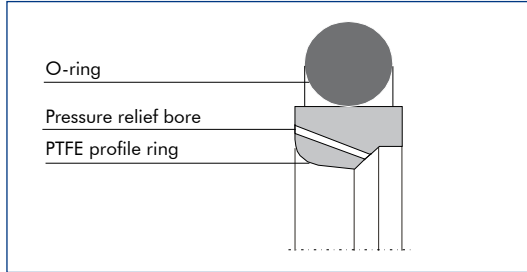
Other material combinations and further dimensions are available on request.



d	D	H	L	Profile	C	R1	Material	Article No.
890	917,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275753
890	917,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275873
900	927,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275739
900	927,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275861
910	937,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275709
910	937,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275901
920	947,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275720
920	947,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275891
930	957,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	24275754
930	957,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275884
940	967,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275872
950	977,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	24275860

Other material combinations and further dimensions are available on request.

Merkel Rod Seal OMS-MR PR



Product description

Two-piece seal set for sealing piston rods, consisting of a PTFE profile ring with an integrated pressure relief function, plus an O-ring as a preloading element. Patented product design.
(Patent No.: DE 10117662 Cl)

Product advantages

- interchangeable with housings of the OMS-MR series
- enhanced operating reliability of sealing systems with tough operating parameters (no continuous pressure build-up in the intermediate space)
- extended service life of sealing systems due to stable long term behavior (reduced loads on the sealing system from friction and wear)

Material

PTFE profile ring

Material	Designation	Color
PTFE-bronze compound	PTFE B602	brown
PTFE-glass-fiber-MoS2 compound	PTFE GM201	light grey

O-ring

Material	Designation
Nitrile rubber	NBR
Fluoroelastomere	FKM

Other material combinations available on request.

Applications

- Primary seal in a sealing system
- Long stroke (greater than 400 mm)
- High running speed when the piston rod is extended (greater than 0.5 m/s)
- Sizeable velocity differences in dependence on the direction of motion (v_{ext} greater than $8 \times v_{retr}$)
- Fast pressure drop in the main chamber

Operating condition

Material	PTFE B602/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-
Water	-
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

Material	PTFE GM201/NBR PTFE C104/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.



Operating condition

Material	PTFE B602/FKM
Hydraulic oils, HL, HLP	-10 ... +200 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-10 ... +200 °C
Water	-
HETG (rape-seed oil)	-10 ... +80 °C
HEES (synth. ester)	-10 ... +100 °C
HEPG (glycol)	-10 ... +80 °C
Mineral greases	-10 ... +200 °C
Pressure	40 MPa
Running speed	5 m/s

Material	PTFE GM201/FKM PTFE C104/FKM
Hydraulic oils, HL, HLP	-10 ... +200 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-10 ... +60 °C
HFD fluids	-10 ... +200 °C
Water	+5 ... +100 °C
HETG (rape-seed oil)	-10 ... +80 °C
HEES (synth. ester)	-10 ... +100 °C
HEPG (glycol)	-10 ... +80 °C
Mineral greases	-10 ... +200 °C
Pressure	40 MPa
Running speed	5 m/s

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content Mr > 50 % to max. 90 %, with cut depth c = Rz/2 and reference line Cref = 0 %

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface.

Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness.

See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance and the deflection of the guide under load.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material.

See also *Merkel Technical Manual*.

Profile dimension		Max. permissible gap dimension			
L	Profile	16 MPa	26 MPa	32 MPa	40 MPa
4,2	5,35	0,5	0,4	0,3	-
6,3	7,55	0,55	0,45	0,35	0,3
8,1	10,25	0,6	0,5	0,4	0,4
8,1	12	0,7	0,6	0,55	0,5
9,5	13,65	0,75	0,65	0,6	0,55

At an operating temperature of above 90°C, and simultaneous exposure to an operating pressure of more than 26 MPa, we recommend the use of the material compound PTFE B602 and PTFE C104.

Tolerances

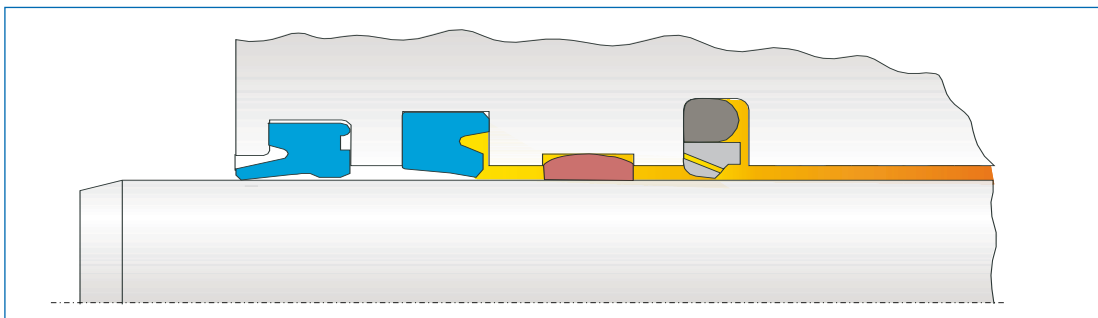
Diameter D	Tolerance
< 500	H8
> 500	H7

The tolerance for the diameter d and D_2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

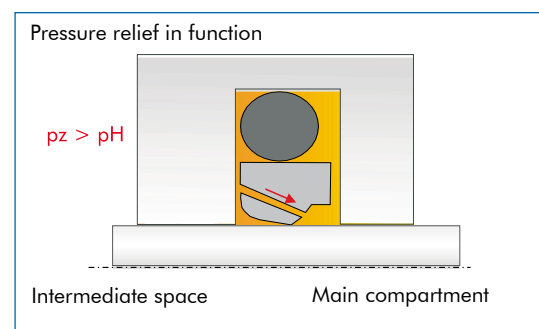
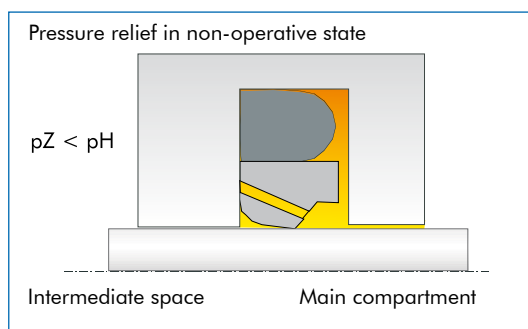
Installation & assembly

Reliable seal function is dependent on correct installation.
See also *Merkel Technical Manual*.

Functional principle



The Omegat OMS-MR PR features an integrated pressure relief function. As soon as the pressure in the intermediate space p_z becomes greater than the main-compartment pressure p_H (caused, for example, by unfavorable velocity conditions during extension and retraction), the seal can be relied on to relieve the pressure. The sealing function of the Omegat OMS-MR PR corresponds to that of the field-proven Omegat seals.



p_z = pressure in the intermediate space; p_H = pressure in main compartment



Additional product description for Omegat OMS-MR PR



Intermediate-space pressure

In operation, the space between the primary and secondary seals is filled with hydraulic medium after a few cycles. The further entry of media leads to an increase of the pressure in the intermediate space. If a U-packing is used as the secondary seal, then it will act as a volume compensator under pressure by reason of the mold-release volume, thus contributing towards reducing the general pressure level. Normally, the pressure in the intermediate space will settle at up to 5 MPa, in dependence on the operating parameters, and is then reduced again with a temporal offset to the main compartment's pressure during the return stroke.

Pressure build-up

In the case of a large stroke length (> 400 mm), and a high running speed (> 0.5 m/s) while the rod is being extended, but also as a consequence of vibrations and in the case of major differences in velocity in dependence on the direction of motion (v_{retr} greater than $8x v_{\text{ext}}$), a comparatively larger volume of oil is released into the intermediate space under the sealing edge than comes out of it. If these or similar operating parameters apply, a significantly increased pressure level will be formed in the intermediate space. The higher pressure is reduced incompletely during the return stroke, and can be accumulated over a number of cycles. The pressure level can here rise continuously until it exceeds the operating pressure. The increased pressure in the intermediate space results in an increased amount of friction.

The temperature rises, and thus not only fosters deformation of the PTFE Profile ring of the primary seal under load, but also reduces the extrusion resistance of the secondary seal. Because of the increased friction, moreover, intensified wear can be expected, and due to the frictional heat produced, accelerated aging of the hydraulic medium can also be anticipated.

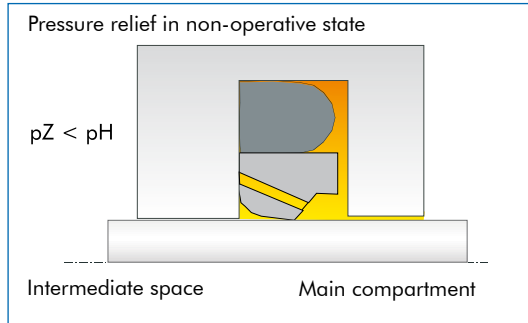
If, as a result of the above-mentioned phenomena, the pressure in the intermediate space is significantly higher than in the main compartment, then the preloading element of the primary seal (O-ring) will be pushed towards the main compartment. The PTFE Profile ring of the primary seal is thereby twisted over the neutral position towards the main compartment; this movement causes the sealing edge to become gradually more rounded, and the sealing function of the primary seal is disturbed.

As this goes on, the Profile ring may tilt completely to the main compartment, which will ultimately lead to extrusion of the primary and secondary seals, and thus to the system's failure. Leakage will only become visible outside the sealing system, when the secondary seal is no longer performing its function.

Pressure relief

Building successfully on the field-proven functionality of the Omegat series, the Omegat OMS-MR PR possesses a pressure-relief feature integrated into the Profile ring. As soon as the pressure in the intermediate space is greater than in the main compartment, the pressure-relief bore is opened, and can be relied on to relieve the pressure in the intermediate space down to the pressure in the main compartment. A lasting inclusion of overpressure in the intermediate space is not possible here.

In operation, the pressure in the main compartment is higher than in the intermediate space. The pressure-relief bore is closed in contact between the PTFE Profile ring and the wall of the compartment (Fig. 01). If the pressure in the intermediate space rises to a level above that in the main compartment, then the contact between the PTFE Profile ring and the wall is broken (Fig. 02). Since the pressure is equalized directly via the pressure-relief bore, the preloading element remains on the side facing the intermediate space. The Profile ring will not tilt towards the main compartment. [With the](#)



p_Z = pressure in the intermediate space; p_H = pressure in main compartment

Fig.01

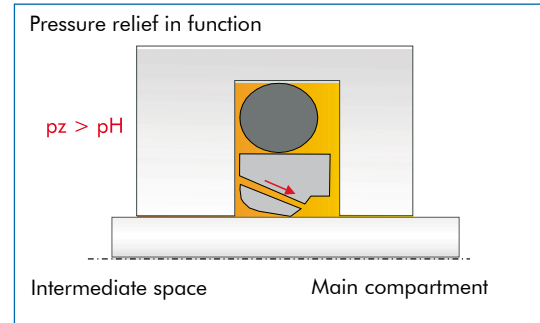


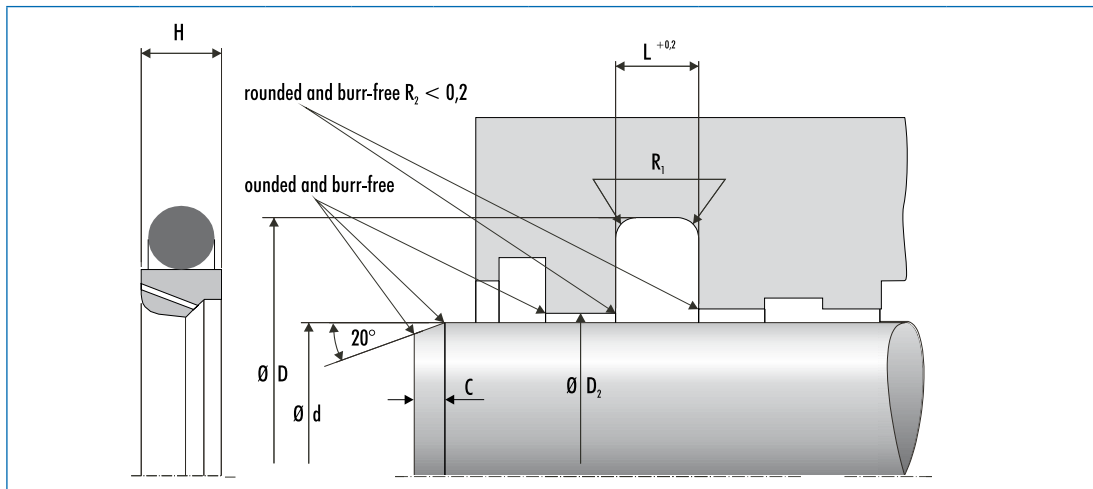
Fig.02

patented pressure-relief feature, the pressure in the intermediate space is held independently of the operating conditions at a level favorable for continuous operation. By virtue of the low thermal and mechanical stress on the sealing elements, a stable long term behavior is achieved, and the sealing system's service life is extended.

The functionality of the pressure-relief feature renders the sealing system tolerant to the external influences acting on it during operation. Operating reliability is thus enhanced across the board by using the Omegat OMS-MR PR.

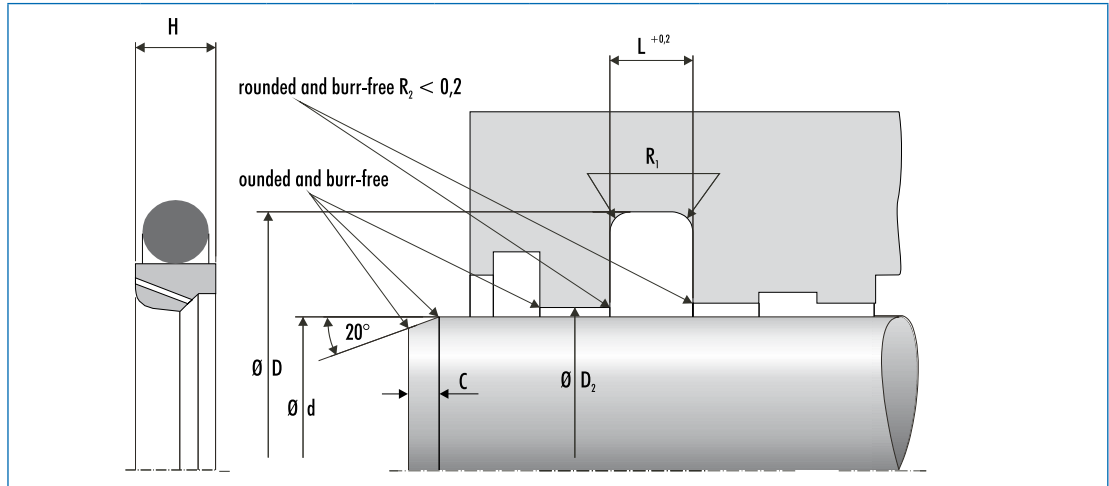
Using the Omegat OMS-MR PR makes an important contribution towards the reliability and long lifetimes of hydraulic cylinders.

Using the Omegat OMS-MR PR will eliminate downtimes caused by intermediate-space pressure, thus substantially reducing your complaint-related costs and cutting the amount of maintenance required by up to 30 %.



d	D	H	L	Profile	C	R1	Material	Article No.
60	75,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49039570
60	75,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49012253
63	78,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49009142
63	78,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49018475
63	78,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49014917
65	80,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49002595
65	80,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49021364
70	85,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49006087
70	85,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49017738
70	85,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49008472
75	90,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49002596
75	90,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49018476
75	90,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49022320
80	95,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49005181
80	95,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49039522
80	95,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49016403
85	100,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49002597
85	100,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49018477
85	100,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49018521
90	105,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49027501
90	105,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49017739
90	105,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49040406
95	110,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49021365
95	110,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49023416
100	115,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49015915
100	115,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49021366

Other material combinations and further dimensions are available on request.



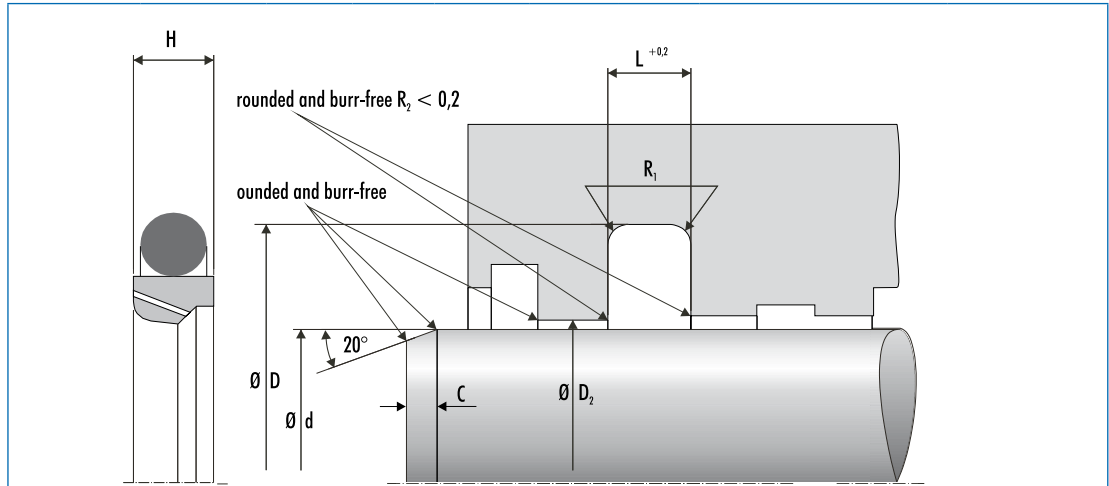
d	D	H	L	Profile	C	R1	Material	Article No.
100	115,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49020572
105	120,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49015663
105	120,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49003864
110	125,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49002598
110	125,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49017740
110	125,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49012225
115	130,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49018445
120	135,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49002599
120	135,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49017277
120	135,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49012945
125	140,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49015916
125	140,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49017741
125	140,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49010807
130	145,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49002600
130	145,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49036920
130	145,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49012252
135	150,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49046536
135	150,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49018331
140	155,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49015917
140	155,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49024657
140	155,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49004553
145	160,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49017742
150	165,1	5,9	6,3	7,55	5,5	1,2	PTFE B602 / NBR	49016162
150	165,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49020172
150	165,1	5,9	6,3	7,55	5,5	1,2	PTFE GM201 / NBR	49005153
155	170,1	5,9	6,3	7,55	5,5	1,2	PTFE C104 / NBR	49018944

Other material combinations and further dimensions are available on request.



d	D	H	L	Profile	C	R1	Material	Article No.
200	220,5	7,6	8,1	10,25	8	2	PTFE B602 / NBR	49027562
200	220,5	7,6	8,1	10,25	8	2	PTFE C104 / NBR	49017745
200	220,5	7,6	8,1	10,25	8	2	PTFE GM201 / NBR	49023811
205	225,5	7,6	8,1	10,25	8	2	PTFE C104 / NBR	49042766
210	230,5	7,6	8,1	10,25	8	2	PTFE B602 / NBR	49027563
210	230,5	7,6	8,1	10,25	8	2	PTFE C104 / NBR	49015913
210	230,5	7,6	8,1	10,25	8	2	PTFE GM201 / NBR	49023822
215	235,5	7,6	8,1	10,25	8	2	PTFE C104 / NBR	49023880
220	240,5	7,6	8,1	10,25	8	2	PTFE B602 / NBR	49012807
220	240,5	7,6	8,1	10,25	8	2	PTFE C104 / NBR	49017746
230	250,5	7,6	8,1	10,25	7,5	2	PTFE B602 / NBR	49027564
230	250,5	7,6	8,1	10,25	8	2	PTFE GM201 / NBR	49004615
235	255,5	7,6	8,1	10,25	8	2	PTFE C104 / NBR	49017635
240	260,5	7,6	8,1	10,25	8	2	PTFE B602 / NBR	49016866
240	260,5	7,6	8,1	10,25	8	2	PTFE C104 / NBR	49018772
250	270,5	7,6	8,1	10,25	8	2	PTFE B602 / NBR	49030568
250	270,5	7,6	8,1	10,25	8	2	PTFE C104 / NBR	49017747
250	270,5	7,6	8,1	10,25	8	2	PTFE GM201 / NBR	49009053
260	284	7,6	8,1	12	8	2	PTFE B602 / NBR	49016862
260	284	7,6	8,1	12	8	2	PTFE C104 / NBR	49019084
270	294	7,6	8,1	12	8	2	PTFE B602 / NBR	49016776
280	304	7,6	8,1	12	8	2	PTFE B602 / NBR	49020179
280	304	7,6	8,1	12	8	2	PTFE C104 / NBR	49017748
290	303	7,6	8,1	12	8	2	PTFE B602 / NBR	49012804
300	324	7,6	8,1	12	8	2	PTFE B602 / NBR	49020994
300	324	7,6	8,1	12	8	2	PTFE C104 / NBR	49043086
310	334	7,6	8,1	12	8	2	PTFE B602 / NBR	49054856
310	334	7,6	8,1	12	8	2	PTFE C104 / NBR	49023881
315	339	7,6	8,1	12	8	2	PTFE GM201 / NBR	49041460
320	344	7,6	8,1	12	8	2	PTFE B602 / NBR	49013550
320	344	7,6	8,1	12	8	2	PTFE C104 / NBR	49024658
320	344	7,6	8,1	12	8	2	PTFE GM201 / NBR	49055891
330	354	7,6	8,1	12	8	2	PTFE B602 / NBR	49012805
330	354	7,6	8,1	12	8	2	PTFE GM201 / NBR	49004616
335	359	7,6	8,1	12	8	2	PTFE C104 / NBR	49017638
340	364	7,6	8,1	12	8	2	PTFE B602 / NBR	49013224
340	364	7,6	8,1	12	8	2	PTFE C104 / NBR	49021631
350	374	7,6	8,1	12	8	2	PTFE B602 / NBR	49036916

Other material combinations and further dimensions are available on request.



d	D	H	L	Profile	C	R1	Material	Article No.
360	384	7,6	8,1	12	8	2	PTFE B602 / NBR	49014368
360	384	7,6	8,1	12	8	2	PTFE C104 / NBR	49024660
360	384	7,6	8,1	12	8	2	PTFE GM201 / NBR	49058183
370	394	7,6	8,1	12	8	2	PTFE B602 / NBR	49020995
370	394	7,6	8,1	12	8	2	PTFE C104 / NBR	49023942
380	404	7,6	8,1	12	8	2	PTFE B602 / NBR	49012806
380	404	7,6	8,1	12	8	2	PTFE C104 / NBR	49017639
390	414	7,6	8,1	12	8	2	PTFE B602 / NBR	49027566
400	424	7,6	8,1	12	8	2	PTFE B602 / NBR	49027567
400	424	7,6	8,1	12	8	2	PTFE C104 / NBR	49017751
410	434	7,6	8,1	12	8	2	PTFE B602 / NBR	49007163
430	454	7,6	8,1	12	8	2	PTFE C104 / NBR	49043923
440	464	7,6	8,1	12	8	2	PTFE B602 / NBR	49019314
440	464	7,6	8,1	12	8	2	PTFE GM201 / NBR	49066592
450	474	7,6	8,1	12	8	2	PTFE B602 / NBR	49027568
460	484	7,6	8,1	12	8	2	PTFE B602 / NBR	49014935
470	494	7,6	8,1	12	8	2	PTFE B602 / NBR	49014936
470	494	7,6	8,1	12	8	2	PTFE C104 / NBR	49017641
480	504	7,6	8,1	12	8	2	PTFE B602 / NBR	49054816
480	504	7,6	8,1	12	8	2	PTFE C104 / NBR	49060836
480	504	7,6	8,1	12	8	2	PTFE GM201 / NBR	49054629
490	514	7,6	8,1	12	8	2	PTFE B602 / NBR	49037293
500	524	7,6	8,1	12	8	2	PTFE B602 / NBR	49015337
500	524	7,6	8,1	12	8	2	PTFE C104 / NBR	49017753
510	534	7,6	8,1	12	8	2	PTFE B602 / NBR	49038731
520	544	7,6	8,1	12	8	2	PTFE B602 / NBR	49014937

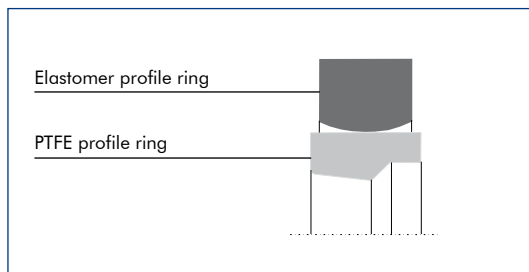
Other material combinations and further dimensions are available on request.



d	D	H	L	Profile	C	R1	Material	Article No.
530	554	7,6	8,1	12	8	2	PTFE B602 / NBR	49014247
530	554	7,6	8,1	12	8	2	PTFE GM201 / NBR	49033643
540	564	7,6	8,1	12	8	2	PTFE B602 / NBR	49034165
550	574	7,6	8,1	12	8	2	PTFE B602 / NBR	49054769
560	584	7,6	8,1	12	8	2	PTFE B602 / NBR	49033893
570	594	7,6	8,1	12	8	2	PTFE GM201 / NBR	49041458
590	614	7,6	8,1	12	8	2	PTFE C104 / NBR	49020078
600	624	7,6	8,1	12	8	2	PTFE B602 / NBR	49016703
630	654	7,6	8,1	12	8	2	PTFE C104 / NBR	49023709
650	677,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	49038772
670	697,3	8,7	9,5	13,65	11	2	PTFE C104 / NBR	49017644
720	747,3	8,7	9,5	13,65	11	2	PTFE GM201 / NBR	49054628
730	757,3	8,7	9,5	13,65	11	2	PTFE C104 / NBR	49018768
750	777,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	49020530
750	777,3	8,7	9,5	13,65	11	2	PTFE C104 / NBR	49017645
760	787,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	49039345
770	797,3	8,7	9,5	13,65	11	2	PTFE C104 / NBR	49055742
800	827,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	49003492
900	927,3	8,7	9,5	13,65	11	2	PTFE B602 / NBR	49032920

Other material combinations and further dimensions are available on request.

Merkel Rod Seal Omegat OMS-S



Product description

Two-piece seal set for sealing piston rods, consisting of a PTFE profile ring and an elastomer Profile ring as a pre-stress element. The seal set is intended for demanding hydraulic applications

Product advantages

- Very high stability under pressure
- High torsional safety
- Very good extrusion safety
- High resistance to abrasion
- Low friction, stick-slip free
- High contact pressure due to the elastomer Profile ring

Material

PTFE profile ring

Material	Designation	Color
PTFE-glass-fiber-MoS2 compound	PTFE GM201	light grey

Elastomer profile ring

Material	Designation	Hardness
Nitrile rubber	NBR	80 Shore A

Other material combinations available on request.

Application

- Especially designed for heavy-duty applications
- Especially designed for large dimensions
- Seal set for tough applications
- Seal set suitable for large gaps

Operating conditions

Material	PTFE GM201/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

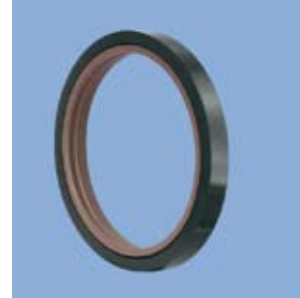
Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

The long-time behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface.

A precise description and assessment of the surface is thus indispensable.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface.

See also *Merkel Technical Manual*.



Surface finish of the sliding surfaces

Characteristic value	Limit	
	Ra	> 0,05 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance and the deflection of the guide under load.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension		Max. permissible gap dimension			
L	Profile	16 MPa	26 MPa	32 MPa	40 MPa
12,5	12,5	0,75	0,65	0,55	0,5
15	15	0,75	0,65	0,55	0,5
17,5	17,5	0,75	0,65	0,55	0,5
20	20	0,8	0,7	0,6	0,55

Tolerances

Diameter D	Tolerance
< 500	H8
> 500	H7

The tolerance for the diameter d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

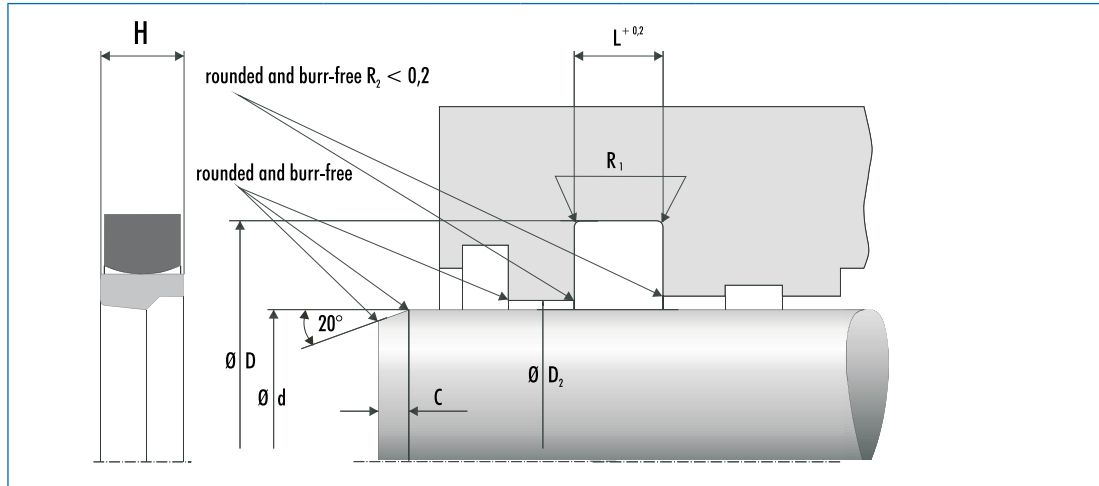
Design notes

Please note our general design remarks in the *Merkel Technical Manual*.

Installation & assembly

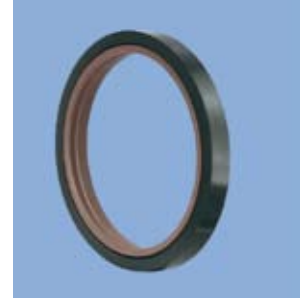
When fitting the Omegat OMS-S the elastomer profile ring is first placed in the housing groove, then the Profile ring is deformed to a kidney shape and sprung into place.

During this process it is to be ensured no sharp kinks are produced in the PTFE profile ring and that the sealing edge is correctly arranged in relation to the direction of the pressure. The entire fitting operation is only allowed to be performed over rounded edges.



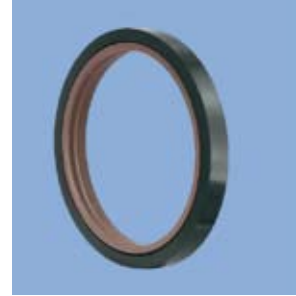
d	D	H	L	Profile	C	R1	Material	Article No.
105	125	9,4	0	10	7,5	0,4	PTFE GM201 / NBR	24239117
115	135	9,4	0	10	7,5	0,4	PTFE GM201 / NBR	24096142
120	140	9,4	0	10	7,5	0,4	PTFE GM201 / NBR	24182344
145	165	9,4	0	10	7,5	0,4	PTFE GM201 / NBR	24138538
175	195	9,4	10	10	7,5	0,4	PTFE GM201 / NBR	24187339
200	225	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	49000277
210	235	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	24374728
230	255	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	24224744
240	265	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	24224748
250	275	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	24195054
260	285	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	24177004
270	295	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	24224737
270	300	14	15	15	10	0,4	PTFE GM201 / NBR	24132488
280	305	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	24192379
290	315	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	24195056
300	325	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	24208689
310	340	14	15	15	12	0,8	PTFE GM201 / NBR	24194530
320	350	14	15	15	12	0,8	PTFE GM201 / NBR	24209894
340	370	14	15	15	12	0,8	PTFE GM201 / NBR	24224735
360	390	14	15	15	12	0,8	PTFE GM201 / NBR	24224746
370	400	14	15	15	12	0,8	PTFE GM201 / NBR	24224751
380	410	14	15	15	12	0,8	PTFE GM201 / NBR	24182881
390	420	14	15	15	12	0,8	PTFE GM201 / NBR	24224739
410	440	14	15	15	12	0,8	PTFE GM201 / NBR	24197943
420	450	14	15	15	12	0,8	PTFE GM201 / NBR	24224742
430	460	14	15	15	12	0,8	PTFE GM201 / NBR	24224749

Other material combinations and further dimensions are available on request.

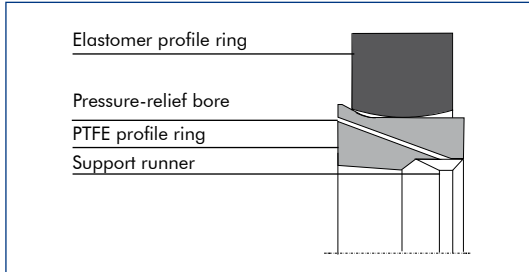


d	D	H	L	Profile	C	R1	Material	Article No.
440	470	14	15	15	12	0,8	PTFE GM201 / NBR	24193472
460	490	14	15	15	12	0,8	PTFE GM201 / NBR	24224740
480	510	14	15	15	12	0,8	PTFE GM201 / NBR	24193226
490	520	14	15	15	12	0,8	PTFE GM201 / NBR	24224738
520	555	16,4	17,5	17,5	12	0,8	PTFE GM201 / NBR	24198653
530	560	14	15	15	12	0,8	PTFE GM201 / NBR	24181189
540	575	16,4	17,5	17,5	12	0,8	PTFE GM201 / NBR	24224759
550	585	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24191359
560	595	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24224747
570	605	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24224756
580	615	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24224760
590	625	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24224753
600	635	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24224745
610	645	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	49068069
620	655	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24186170
630	665	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24356724
640	675	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24226250
650	685	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24224750
660	695	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24377265
670	705	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24224741
680	715	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	24238543
690	725	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	528031
700	740	18,7	20	20	12	1,2	PTFE GM201 / NBR	24191357
720	760	18,7	20	20	12	1,2	PTFE GM201 / NBR	24224754
730	770	18,7	20	20	12	1,2	PTFE GM201 / NBR	24263626
740	780	18,7	20	20	12	1,2	PTFE GM201 / NBR	24224763
760	800	18,7	20	20	12	1,2	PTFE GM201 / NBR	24224765
770	810	18,7	20	20	12	1,2	PTFE GM201 / NBR	24357244
790	830	18,7	20	20	12	1,2	PTFE GM201 / NBR	49015688
800	840	18,7	20	20	12	1,2	PTFE GM201 / NBR	24224758
810	850	18,7	20	20	12	1,2	PTFE GM201 / NBR	24370506
820	860	18,7	20	20	12	1,2	PTFE GM201 / NBR	24224762
830	870	18,7	20	20	12	1,2	PTFE GM201 / NBR	24344383
850	890	18,7	20	20	12	1,2	PTFE GM201 / NBR	24215728
860	900	18,7	20	20	12	1,2	PTFE GM201 / NBR	24224755
890	930	18,7	20	20	12	1,2	PTFE GM201 / NBR	24264039
900	940	18,7	20	20	12	1,2	PTFE GM201 / NBR	24224764
920	960	18,7	20	20	12	1,2	PTFE GM201 / NBR	49008662
950	990	18,7	20	20	12	1,2	PTFE GM201 / NBR	24262250
1000	1040	18,7	20	20	12	1,2	PTFE GM201 / NBR	24224757

Other material combinations and further dimensions are available on request.



Merkel Rod Seal OMS-S PR



Product description

Two-piece seal set for sealing piston rods, consisting of a PTFE profile ring with an integrated pressure-relief function, a support runner and an elastomer profile ring as the preloading element (Patent No.: DE 10117662 CI)

Product advantages

- Interchangeable with housings of the OMS-S series
- Enhanced operating reliability of sealing systems with tough operating parameters (no continuous pressure build-up in the intermediate space)
- Extended service life of sealing systems due to stable long term behavior (improved stability against twisting due to the support runner)
- High resistance to extrusion (large deformation volume of the PTFE profile ring)

Material

PTFE profile ring

Material	Designation	Color
PTFE-Bronze-Compound	PTFE B602	brown
PTFE-glass-fiber-MoS2 compound	PTFE GM201	light grey
PTFE-carbon-fiber-Compound	PTFE C104	dark grey

Elastomer profile ring

Material	Designation
Nitrile rubber	NBR
Fluoroelastomere	FKM

Other material combinations are available on request.

Applications

- Primary seal in a sealing system
- Long stroke (greater than 400 mm)
- High running speed when the piston rod is extended (greater than 0.5 m/s)
- Sizeable velocity differences in dependence on the direction of motion (vext greater than 8x vret)
- Fast pressure drop in the main compartment
- Large diameters (greater than 200 mm)

Operating conditions

Material	PTFE B602/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-
Water	-
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

Material	PTFE GM201/NBR PTFE C104/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Operating conditions

Material	PTFE B602/FKM
Hydraulic oils, HL, HLP	-10 ... +200 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-10 ... +200 °C
Water	-
HETG (rape-seed oil)	-10 ... +80 °C
HEES (synth. ester)	-10 ... +100 °C
HEPG (glycol)	-10 ... +80 °C
Mineral greases	-10 ... +200 °C
Pressure	40 MPa
Running speed	5 m/s

Material	PTFE GM201/FKM PTFE C104/FKM
Hydraulic oils, HL, HLP	-10 ... +200 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-10 ... +60 °C
HFD fluids	-10 ... +200 °C
Water	+5 ... +100 °C
HETG (rape-seed oil)	-10 ... +80 °C
HEES (synth. ester)	-10 ... +100 °C
HEPG (glycol)	-10 ... +80 °C
Mineral greases	-10 ... +200 °C
Pressure	40 MPa
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content Mr > 50 % to max. 90 %, with cut depth c = Rz/2 and reference line Cref = 0 %

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

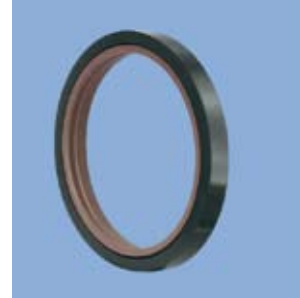
The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion. The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension		Max. permissible gap dimension			
L	Profile	16 MPa	26 MPa	32 MPa	40 MPa
12,5	12,5	0,75	0,65	0,55	0,5
15	15	0,75	0,65	0,55	0,5
17,5	17,5	0,75	0,65	0,55	0,5
20	20	0,8	0,7	0,6	0,55

At an operating temperature of above 90°C, and simultaneous exposure to an operating pressure of more than 26 MPa, we recommend the use of the material compounds PTFE B602 and PTFE C104.



Tolerances

Diameter D	Tolerance
≤ 500	H8
> 500	H7

The tolerance for the diameters d and D_2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

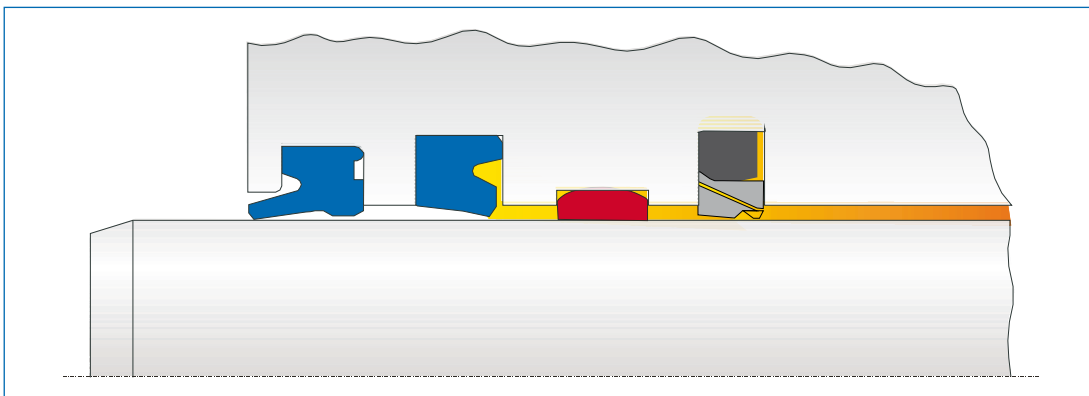
Design notes

Please note our general design remarks in the *Merkel Technical Manual*.

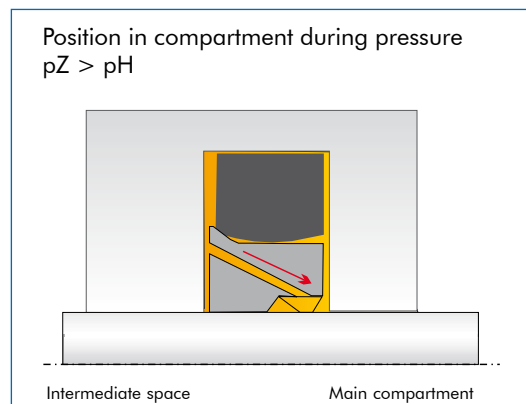
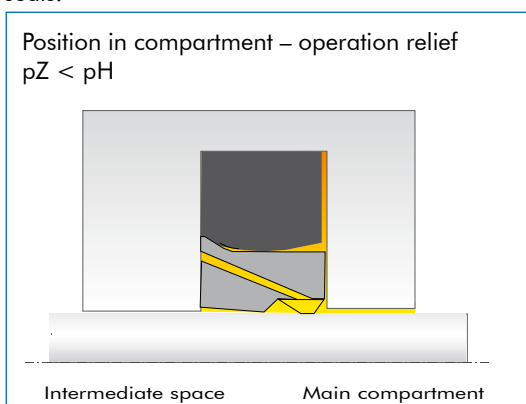
Installation & assembly

Reliable seal function is dependent on correct installation. See also *Merkel Technical Manual*.
See also *Merkel Technical Manual*.

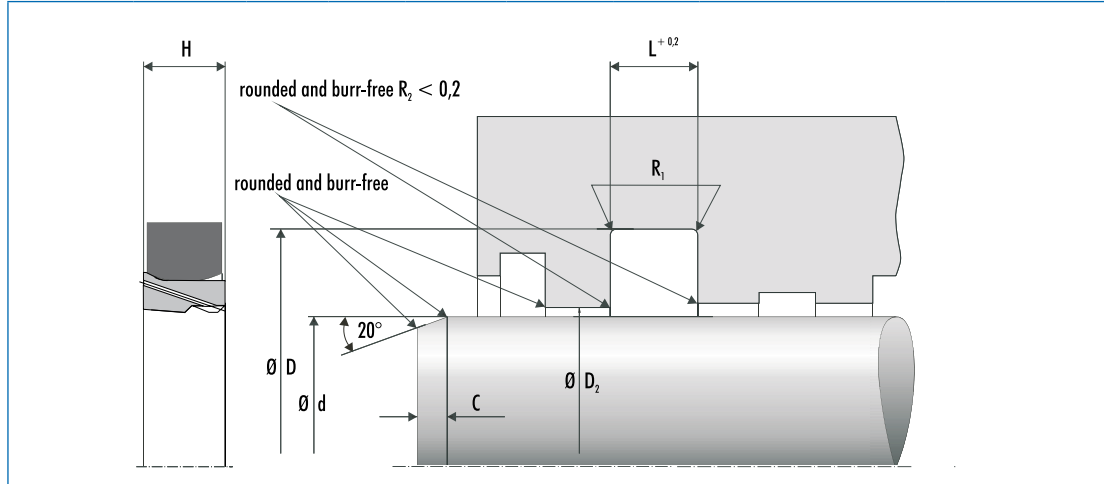
Functional principle



The Omegat OMS-S PR features an integrated pressure relief function. As soon as the pressure in the intermediate space p_Z becomes greater than the main-compartment pressure p_H (caused, for example, by unfavorable velocity conditions during extension and retraction), the seal can be relied on to relieve the pressure. The sealing function of the Omegat OMS-S PR corresponds to that of the field-proven Omegat seals.

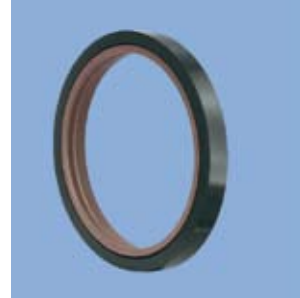


p_Z = pressure in the intermediate space; p_H = pressure in main compartment



d	D	H	L	Profile	C	R1	Material	Article No.
200	220	9,4	10	10	7,5	0,4	PTFE B602 / NBR	531597
240	265	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	533361
250	275	11,7	12,5	12,5	10	0,4	PTFE C104 / NBR	49057672
250	275	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	49004521
260	285	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	49002343
280	305	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	49017440
290	315	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	49031374
300	325	11,7	12,5	12,5	10	0,4	PTFE B602 / NBR	49018104
300	325	11,7	12,5	12,5	10	0,4	PTFE GM201 / NBR	49030569
320	350	14	15	15	12	0,8	PTFE GM201 / NBR	49003542
340	370	14	15	15	12	0,8	PTFE GM201 / NBR	530525
350	380	14	15	15	12	0,8	PTFE B602 / NBR	49038827
350	380	14	15	15	12	0,8	PTFE C104 / NBR	49040590
360	390	14	15	15	12	0,8	PTFE GM201 / NBR	49035736
380	410	14	15	15	12	0,8	PTFE B602 / NBR	49027736
380	410	14	15	15	12	0,8	PTFE GM201 / NBR	49027663
400	430	14	15	15	12	0,8	PTFE GM201 / NBR	49017441
410	440	14	15	15	12	0,8	PTFE GM201 / NBR	49045104
420	450	14	15	15	12	0,8	PTFE B602 / NBR	49021387
420	450	14	15	15	12	0,8	PTFE GM201 / NBR	49010869
440	470	14	15	15	12	0,8	PTFE B602 / NBR	49038828
450	480	14	15	15	12	0,8	PTFE GM201 / NBR	49017442
490	520	14	15	15	12	0,8	PTFE GM201 / NBR	49022435
500	530	14	15	15	12	0,8	PTFE GM201 / NBR	49008121
510	545	16,4	17,5	17,5	12	1,2	PTFE B602 / NBR	49038862
530	565	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	49026032

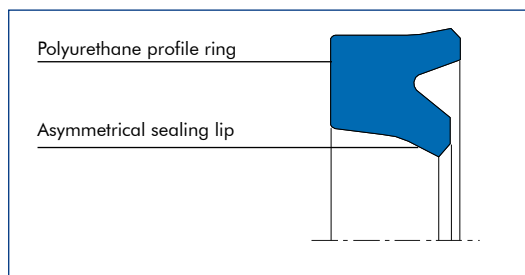
Other material combinations and further dimensions are available on request.



d	D	H	L	Profile	C	R1	Material	Article No.
540	575	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	49030424
570	605	16,4	17,5	17,5	12	1,2	PTFE C104 / NBR	49024945
570	605	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	49017443
580	615	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	49015661
600	635	16,4	17,5	17,5	12	1,2	PTFE B602 / NBR	49035979
620	655	16,4	17,5	17,5	12	1,2	PTFE C104 / NBR	49027857
620	655	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	49014784
630	665	16,4	17,5	17,5	12	1,2	PTFE C104 / NBR	49054642
630	665	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	49017444
640	675	16,4	17,5	17,5	12	1,2	PTFE C104 / NBR	49046152
650	685	16,4	17,5	17,5	12	1,2	PTFE B602 / NBR	49038863
660	695	16,4	17,5	17,5	12	1,2	PTFE C104 / NBR	49064972
680	715	16,4	17,5	17,5	12	1,2	PTFE GM201 / NBR	49026183
690	725	16,4	17,5	17,5	12	1,2	PTFE C104 / NBR	49059295
710	750	18,7	20	20	12	1,2	PTFE GM201 / NBR	49017446
720	760	18,7	20	20	12	1,2	PTFE GM201 / NBR	49004522
730	770	18,7	20	20	12	1,2	PTFE GM201 / NBR	49015650
780	820	18,7	20	20	12	1,2	PTFE B602 / NBR	49043283
780	820	18,7	20	20	12	1,2	PTFE GM201 / NBR	49032356
790	830	18,7	20	20	12	1,2	PTFE GM201 / NBR	49015649
800	840	18,7	20	20	12	1,2	PTFE GM201 / NBR	49015797
830	870	18,7	20	20	12	1,2	PTFE GM201 / NBR	49003543
850	890	18,7	20	20	12	1,2	PTFE GM201 / NBR	49062410
880	920	18,7	20	20	12	1,2	PTFE C104 / NBR	49062165
900	940	18,7	20	20	12	1,2	PTFE GM201 / NBR	49006257
920	960	18,7	20	20	12	1,2	PTFE GM201 / NBR	49011973
940	980	18,7	20	20	12	1,2	PTFE GM201 / NBR	49022200
960	1000	18,7	20	20	12	1,2	PTFE GM201 / NBR	49021789
970	1010	18,7	20	20	12	1,2	PTFE B602 / NBR	49043260
980	1020	18,7	20	20	12	1,2	PTFE B602 / NBR	49055163
990	1030	18,7	20	20	12	1,2	PTFE C104 / NBR	49045107
1000	1040	18,7	20	20	12	1,2	PTFE GM201 / NBR	49017447
1020	1060	18,7	20	20	12	1,2	PTFE GM201 / NBR	49067454

Other material combinations and further dimensions are available on request.

Merkel Rod Seal U-Ring T 20



Product description

U-ring with asymmetrical profile for sealing piston rods.

Product advantages

- Extended service life in the sealing system, due to volume compensation
- Functional reliability in the event of radial deflection due to Profile size overlap
- Operating reliability, due to sturdiness of the polyurethane profile ring
- High sealing effect, due to prominent sealing edge (high line force)
- Secured against metallic contact by high extrusion resistance (large seal gap)
- Favorable friction values at low pressures due to
- Short contact length (secondary seal) simple and secure installation (single-piece element)

Material

Material	Designation	Color
Polyurethane	95 AU V142	dark blue
Polyurethane	94 AU 925	light blue

The material is determined by the nominal diameter and the production process involved.

Applications

- Secondary seal in a sealing system
- Single seal in the pressure range up to 26 MPa
- Single seal for subordinate applications in the pressure range up to 40 MPa
- Nominal diameter up to 2,000 mm

Field of application

Material	95 AU V142/94 AU 925
Hydraulic oils, HL, HLP	-30 ... +110 °C
HFA fluids	+5 ... +50 °C
HFB fluids	+5 ... +50 °C
HFC fluids	-30 ... +40 °C
HFD fluids	-
Water	+5 ... +40 °C
HETG (rape-seed oil)	-30 ... +60 °C
HEES (synth. ester)	-30 ... +60 °C
HEPG (glycol)	-30 ... +40 °C
Mineral greases	-30 ... +110 °C
Pressure	40 MPa
Running speed	0,5 m/s*

* When the T 20 is used as a secondary seal, running speed of up to 1.5 m/s can be permitted.

The figures given are maximum values and must not be applied simultaneously.



Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	< 2,5 μm
Groove base	< 1,6 μm	< 6,3 μm
Groove sides	< 3,0 μm	< 15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
R_a	> 0,05 μm	< 0,30 μm
R_{max}	< 2,5 μm	
R_{pkx}	< 0,5 μm	
R_{pk}	< 0,5 μm	
R_k	> 0,25 μm	< 0,7 μm
R_{vk}	> 0,2 μm	< 0,65 μm
R_{vkx}	> 0,2 μm	< 2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D_2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion See also *Merkel Technical Manual*.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension	Max. permissible gap dimension			
	16 MPa	26 MPa	32 MPa	40 MPa
Profile				
$\leq 5,0$	0,45	0,4	0,35	-
> 5,0 ... 7,5	0,5	0,45	0,4	0,35
> 7,5 ... 12,5	0,55	0,5	0,45	0,4
> 12,5 ... 15,0	0,6	0,55	0,45	0,4

If the T 20 U-ring is used as a secondary seal in a sealing system, a larger gap dimension can be set. The general rule applying here is $D_2 = d + 1\text{ mm}$ with a tolerance of H11 for $D_2 \leq 400$ or +0.4 for $D_2 > 400$.

Tolerances

Diameter D	Tolerance
≤ 400	H11
> 400	+0,4

The tolerance for the diameters d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

Design notes

For U-rings with a nominal dimension of d < 25 mm, an axially accessible housing is required. U-rings with a nominal dimension of d > 25 can generally be installed in a recessed groove using a fitting tool or by hand. Depending on the ratio of the nominal diameter to the Profile dimension, in individual cases an axially accessible housing will be required here as well (note in the article list).

Housing recommendation for larger diameters (individual seal)

d	D	L	C
> 320 ... 600	d + 30	25	11
> 320 ... 720	d + 40	32	12
> 720 ... 2000	d + 50	40	16

Housing recommendation for larger diameters (secondary seal in a sealing system)

d	D	L	C
> 320 ... 600	d + 20	16	8
> 600 ... 950	d + 25	20	10
> 950 ... 2000	d + 30	25	11

Please note our general design remarks in the *Merkel Technical Manual*.

Installation & assembly

*Reliable seal function is dependent on correct installation
See also *Merkel Technical Manual*.*



Additional product description for U-ring T 20



secondary seal, then it will act as a volume compensator under pressure by reason of the mold-release volume (Fig. 01). The pressure level in the intermediate space, and thus the thermal and mechanical loads as well, are effectively reduced.

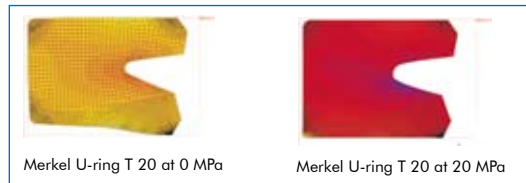


Fig. 01

Seal configuration

The choice of a sealing element is crucially influenced by the material-dependent resistance to extrusion and the likewise material-dependent friction and wear behaviors.

The values of the principal characteristics (sealing effect, dimensional stability and friction or wear) are mutually contradictory in this context.

Depending on the operating and boundary conditions involved, U-rings made of Polyurethane are used as individual seals, but more frequently in an appropriate combination of individual sealing and guide elements as a secondary seal in a sealing system.

The characteristics of the individual elements in a sealing system are optimized in line with the principal requirement involved. An individual seal, or the primary seal in the system concerned, is exposed to the operating pressure. The principal requirement being high resistance to extrusion coupled with favorable frictional values under high pressure. The secondary seal in a sealing system is exposed to the low intermediate space pressure. The principal requirements in this case are the effective reduction of the residual-oil film released via the primary seal, coupled with favorable frictional values at low pressures.

Mold-release volume

In a sealing system, the space between the primary and secondary seals is filled with hydraulic medium after a few cycles. The further entry of media leads to an increase of the pressure in the intermediate space. If a U-ring is used as the

Sealing effect

An element's sealing effect is described in terms of the ratio between the wiping effect and the return capability.

The initial sealing effect of compact, two-piece sealing elements is achieved by pressing the prestressing element. There is thus, of course, a close interdependence between the deformation of the loading element and the force being applied. A small change in the compression (due to tolerances and radial movement) results in a relevant change in the force being applied and thus ultimately in the sealing effect. In the case of the T 20 U-ring, the initial sealing effect is entailed by the deformation of the sealing lips. Small changes in the radial contact pressure do not produce any relevant change in the pressure exerted by the sealing edge. The U-ring's geometry is thus, at a consistently high level of functionality, tolerant to radial deflections.

In the high-pressure range, many sealing elements exhibit a satisfactory sealing effect, attributable solely to the high contact pressure on the counterface. In the pressure range up to 5 MPa (intermediate space pressure in the sealing system), by contrast, the sealing effect is crucially influenced by the edge geometry and the contact stress. The compression characteristic under the sealing edge is generally optimized so as to ensure effective wiping ability in the pressure chamber (rapid pressure rise) and a good return capability

In comparison to compact sealing elements, the U-ring geometry of the T 20 exhibits a short contact length at low pressure, with a definite pressing maximum value. The oil film is effectively downsized here, all that remains is the wetting on the counterface, desirable in terms of the sliding characteristics.

Friction

With sealing elements made of polyurethane, the material properties mean that a high sealing effect is achieved. Depending on the force being applied and the size of the contact area, the seal material is intermeshed to a greater or lesser extent with the counterface. The closer the contact, the higher the friction force will be. Due to the small contact length of a PU U-ring in the low-pressure range, significantly lower friction values are achieved in comparison to compact sealing elements made of polyurethane.

As the secondary seal in a sealing system, the T 20 U-ring is subjected to significantly less than the mold-release pressure. If, however, the U-ring is being used as an individual seal, the operating pressure may rise to a level above the U-ring's mold-release pressure. Because of the increased intermeshing between the seal material and the counter surface due to the enlarged contact area, the amount of friction rises. If the working pressure is between 5 MPa and 10 MPa, the friction-optimized version LF 300 (LF = "low friction") with a grooved contact surface is the preferable option.

Extrusion

The resistance to extrusion is essentially determined by the properties of the seal materials. In addition, not only the size of the deformation, but the deformation volume available also plays a crucial role. Due to the generally larger volume provided by a U-ring, larger gaps can be permitted here under otherwise identical boundary conditions in comparison to a compact seal with a slip ring made of Polyurethane. This significantly reduces the possibility of unwanted metallic contacts.

The sealing system's service life is extended by using the T 20 U-ring in the sealing system concerned, since as a volume compensator it substantially reduces the thermal and mechanical stresses involved, thus assuring stable long term behavior.

Due to a U-ring's larger deformation volume, larger gaps can be permitted, thus significantly reducing the possibility of metallic contacts.

The T 20 U-ring exhibits an edge geometry designed for optimum sealing effect. Individual seals and sealing systems with a T 20 U-ring as the secondary seal score highly in terms of a very good sealing effect.

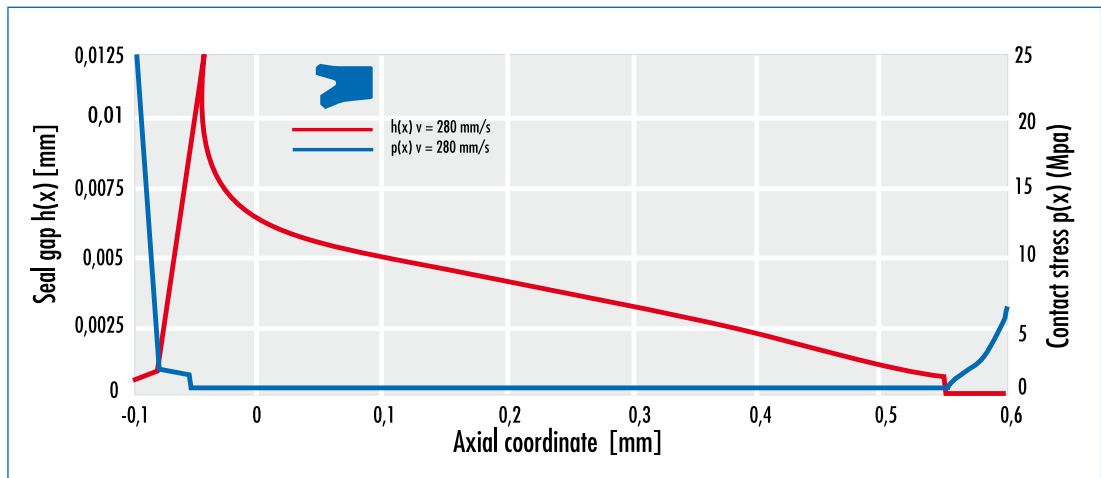
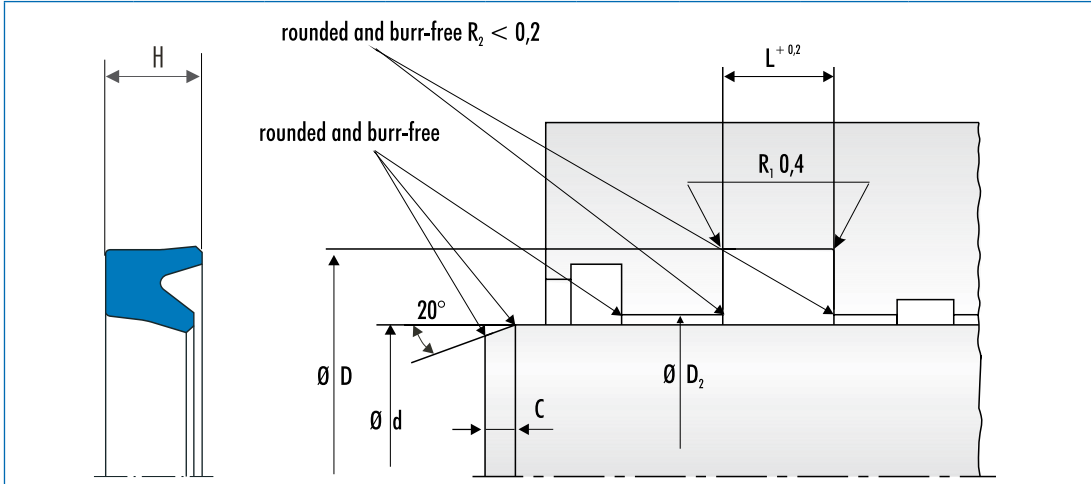


Fig. 02: Contact stress p and contact height h for the T 20 U-ring, extending rod at 0.5 MPa operating pressure, 0.28 m/s velocity

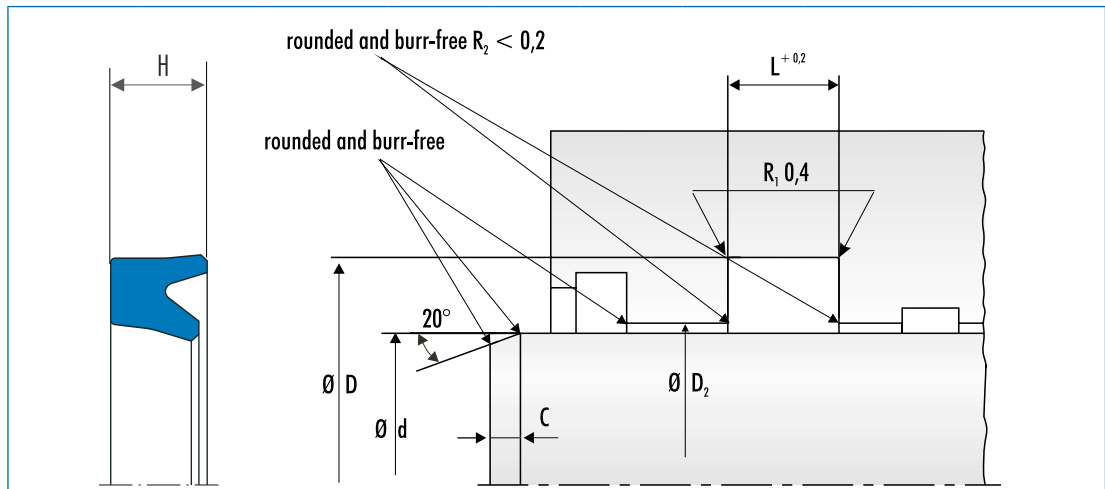


Housing	d	D	H	L	Profile	C	Fitting	Article No.
	60	68	8,2	9	4	4,5	H	24219456*
	60	70	7,3	8	5	4,5	H	24236858*
	60	70	10	11	5	4,5	H	24223296*
	60	70	11,8	13	5	4,5	W	24187211*
	60	72	10	11	6	5	H	24261224*
	60	75	10,4	11	7,5	5,5	W	24337823
	60	75	11,4	12,5	7,5	5,5	W	24223297*
	60	75	11,4	13	7,5	5,5	W	24187212*
	60	80	16,6	18,2	10	6	W	24373695
	63	73	11,8	13	5	4,5	H	24223298*
	63	75	8,7	9,6	6	5	H	24246801*
	63	78	10	11	7,5	5,5	W	24236586*
ISO	63	78	11,4	12,5	7,5	5,5	W	24223299*
	63	80	12,7	14	8,5	5,5	W	24370282
ISO	63	83	14,6	16	10	6	W	24289375*
	65	73	8,2	0	4	4,5	H	49000807*
	65	75	7,3	8	5	4,5	H	24370874
	65	75	11,8	13	5	4,5	H	24187213*
	65	77	8,7	9,6	6	5	H	24251887*
	65	80	10	11	7,5	5,5	W	24373620
	65	80	11,4	13	7,5	5,5	W	24223300*
	65	85	11,4	13	10	6	W	24223301*
	70	78	8,2	9	4	4,5	H	24314731*
	70	80	11,8	13	5	4,5	H	24187214*
	70	82	8,7	9,6	6	5	H	24236857*
	70	85	10	11	7,5	5,5	W	24233880*

* Tool available;

Fitting: H = by hand; W = with fitting tool

Further dimensions are available on request.



Housing	d	D	H	L	Profile	C	Fitting	Article No.
ISO	70	85	11,4	12,5	7,5	5,5	W	24212669*
	70	85	11,4	13	7,5	5,5	W	24223302*
	70	86	14	15,5	8	5,5	W	24363001
	70	90	11,4	13	10	6	W	24223304*
ISO	70	90	14,6	16	10	6	W	24223303*
	72	84	8,7	9,6	6	5	H	24362391
	72	92	14,6	16	10	6	W	24358384
	73	85	8,7	9,6	6	5	H	24374940
	73	85	11,4	12,5	6	5	H	24363261
	75	85	12	12,5	5	4,5	H	24227939*
	75	87	8,7	9,6	6	5	H	24266875*
	75	88	10	11	6,5	5	H	24374792*
	75	90	9	9,9	7,5	5,5	H	24374761
	75	90	10	11	7,5	5,5	W	24223305*
	75	95	14,6	16	10	6	W	24370708*
	80	90	7,3	8	5	4,5	H	24363199
	80	90	10	11	5	4,5	H	24187219*
	80	90	11,8	13	5	4,5	H	24223306*
	80	92	8,7	9,6	6	5	H	24241622*
	80	95	9	9,9	7,5	5,5	H	24374809
	80	95	10	11	7,5	5,5	H	24373621
ISO	80	95	11,4	12,5	7,5	5,5	H	24223307*
	80	95	11,4	13	7,5	5,5	H	24187220*
	80	100	11,4	13	10	6	W	24223308*
ISO	80	100	14,6	16	10	6	W	24223309*
	85	95	11,8	12,5	5	4,5	H	24213882*

* Tool available;

Fitting: H = by hand; W = with fitting tool

Further dimensions are available on request.

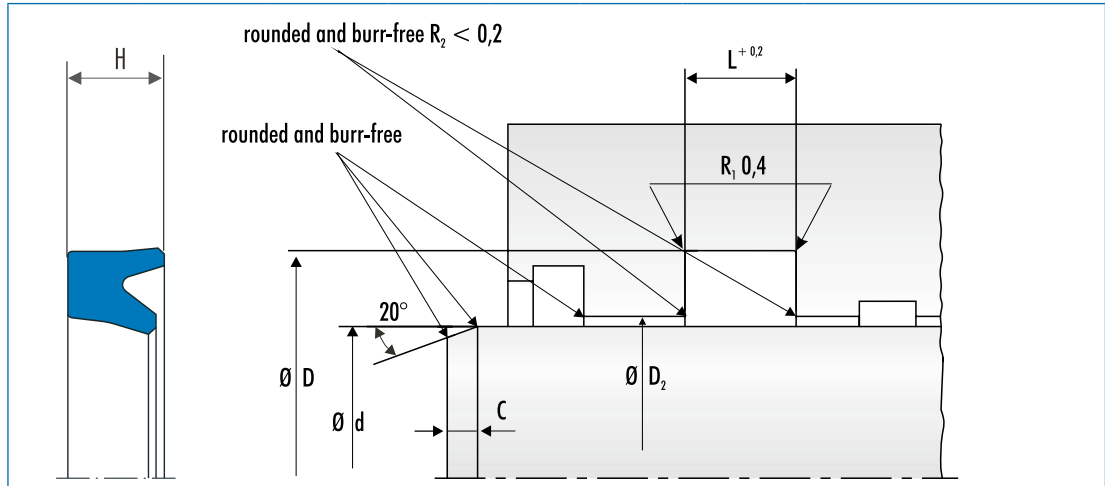


Housing	d	D	H	L	Profile	C	Fitting	Article No.
ISO	90	105	11,4	12,5	7,5	5,5	H	24223311*
	90	105	11,4	13	7,5	5,5	H	24223312*
	90	110	11,4	13	10	6	W	24223313*
ISO	90	110	14,6	16	10	6	W	24289376*
	95	110	9	9,9	7,5	5,5	H	24374785
	95	110	10	11	7,5	5,5	H	24374810
	95	110	11,8	13	7,5	5,5	H	24369674
	95	115	11,4	13	10	6	W	24265228*
	95	115	12	13,2	10	6	W	24374811
	100	115	9	9,9	7,5	5,5	H	24374763
	100	115	10	11	7,5	5,5	H	24235802*
	100	115	10,9	12	7,5	5,5	H	24266877*
	100	115	11,4	13	7,5	5,5	H	24223314*
	100	120	11,4	13	10	6	W	24223316*
	100	120	12	13,2	10	6	W	24374793
ISO	100	120	14,6	16	10	6	H	24187222*
	102	117	10,9	12	7,5	5,5	H	24360191
	105	115	10	11	5	4,5	H	24366780
	105	115	12	13	5	4,5	H	24213883*
	105	120	11,4	12,5	7,5	5,5	H	24300392*
	105	125	14,6	16	10	6	H	24223317*
	108	127	12,3	13,5	9,5	6	H	24315960*
	110	120	7,7	8,5	5	4,5	H	24369546
	110	125	9	9,9	7,5	5,5	H	24374786
ISO	110	125	9,6	10,6	7,5	5,5	H	24368411
	110	125	10,9	12	7,5	5,5	H	24239427*
	110	125	12	13	7,5	5,5	H	24242341*
	110	130	11,8	13	10	6	H	24376016*
ISO	110	130	14,6	16	10	6	W	24223318*
	115	130	10,9	12	7,5	5,5	H	24251889*
	115	135	14,6	16	10	6	W	24223319*
	115	140	17,3	19	12,5	6,5	W	24361949
	120	135	10,9	12	7,5	5,5	H	24360190*
	120	140	14,6	16	10	6	H	24223320*
	120	145	17,3	19	12,5	6,5	W	24371176
	125	140	10,9	12	7,5	5,5	H	24251890*
ISO	125	145	14,6	16	10	6	H	24223321*
	125	155	17,3	19	15	7,5	W	24371643

* Tool available;

Fitting: H = by hand; W = with fitting tool

Further dimensions are available on request.



Housing	d	D	H	L	Profile	C	Fitting	Article No.
	130	140	15	16	5	5,5	H	24213884*
	130	145	10	11	7,5	5,5	H	24359621
	130	145	13,7	15	7,5	5,5	H	24362610
	130	145	14,6	16	7,5	5,5	H	24358619
	130	150	14,6	16	10	6	H	24223322*
	130	160	17,3	19	15	7,5	W	24370486
	135	155	14,6	16	10	6	H	24360106
	135	165	17,3	19	15	7,5	W	24362625
	140	152	8,6	9,5	6	5	H	49003440
	140	155	11,4	13	7,5	5,5	H	24357236
	140	160	11,8	13	10	6	H	24376017
ISO	140	160	14,6	16	10	6	H	24223323*
	140	170	17,3	19	15	7,5	W	24377812
	145	157	8,5	9,5	6	5	H	24380733
	145	165	14,6	16	10	6	H	24375686*
	150	170	11,8	13	10	6	H	24295710*
	150	170	14,6	16	10	6	H	24223324*
	150	180	17,3	19	15	7,5	W	24223325*
	155	175	14,6	16	10	6	H	49019096
	160	175	14,6	16	7,5	5,5	H	24374166
	160	180	14,6	16	10	6	H	24266878*
	160	180	17,3	19	10	6	H	24362611
ISO	160	185	14,6	16	12,5	6,5	H	24223326*
	160	190	17,3	19	15	7,5	W	530551*
	165	180	14,6	16	7,5	5,5	H	24363184
	165	185	14,6	16	10	6	H	24370604

* Tool available;

Fitting: H = by hand; W = with fitting tool

Further dimensions are available on request.

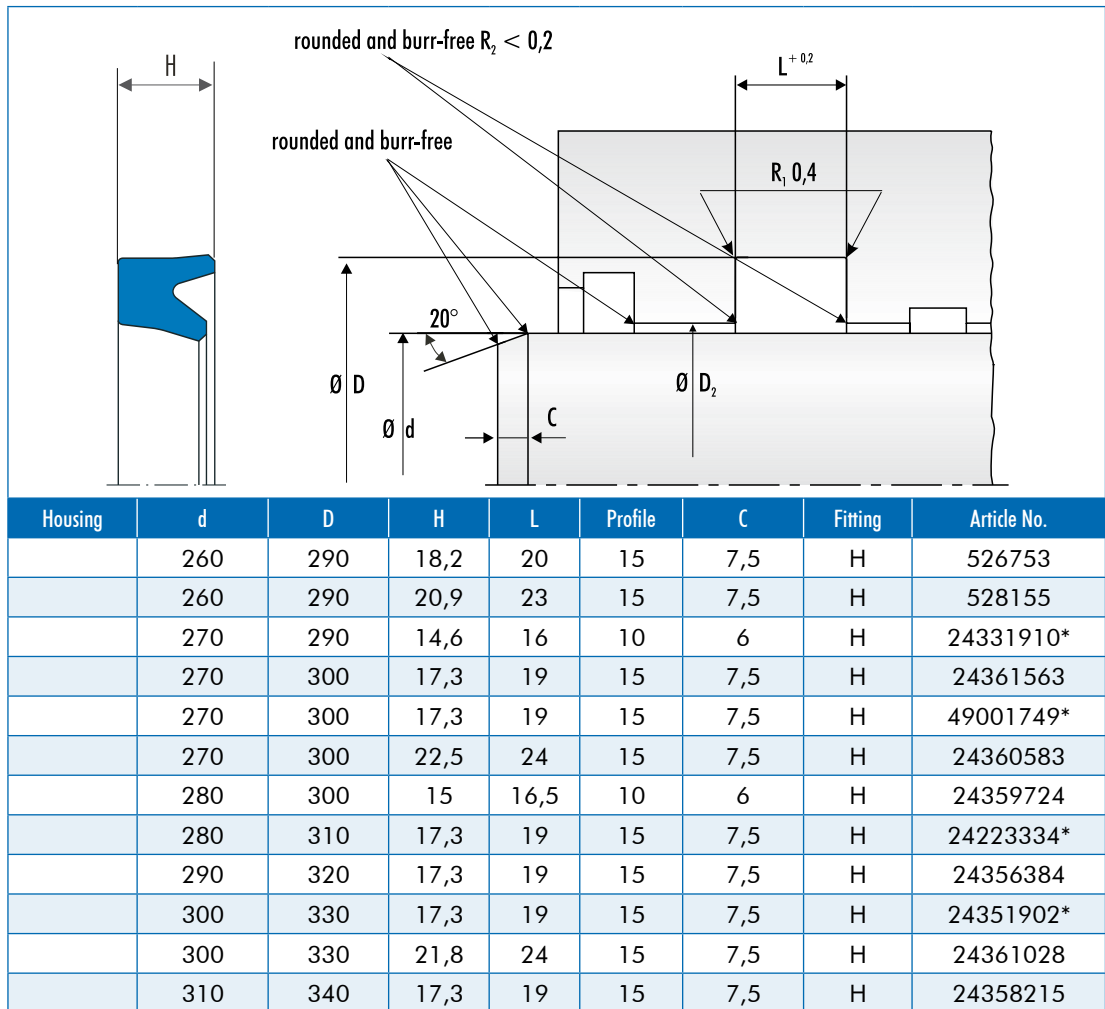


Housing	d	D	H	L	Profile	C	Fitting	Article No.
	170	190	14,6	16	10	6	H	24338964
	175	195	14,6	16	10		H	49030797*
	180	200	11,8	13	10	6	H	24374656
	180	200	14,6	16	10	6	H	24223327*
ISO	180	205	14,6	16	12,5	6,5	H	24223328*
	180	205	18,2	20	12,5	6,5	H	24380944
	180	210	17,3	19	15	7,5	W	24375978
ISO	180	210	22,8	25	15	7,5	W	24359904
	185	200	11,4	12,5	7,5	5,5	H	24373150
	190	210	13,7	15	10	6	H	24368634
	190	210	14,6	16	10	6	H	24328527*
	190	215	17,1	18,8	12,5	6,5	H	24370226
	200	215	11,4	12,5	7,5	5,5	H	24339703*
	200	220	14,6	16	10	6	H	24223329*
ISO	200	225	14,6	16	12,5	6,5	H	24223330
	200	225	18,2	20	12,5	6,5	H	24380945
	205	235	21,8	24	15	7,5	W	24361564
	210	230	14,6	16	10	6	H	24337781*
	215	235	14,6	16	10	6	H	49030353*
	215	235	14,6	16	10	6	H	24356092
	215	240	18,2	20	12,5	6,5	H	24372392
	215	245	20,9	23	15	7,5	H	24362845
	220	240	14,6	16	10	6	H	24223331*
	220	250	17,3	19	15	7,5	H	24223332*
ISO	220	250	18,2	20	15	7,5	H	24375979
	220	250	21,8	24	15	7,5	H	24367393
	220	250	22,8	25	15	7,5	H	24380946
	225	245	14,6	16	10	6	H	24376131
	230	250	14,6	16	10	6	H	24223336*
	235	255	14,6	16	10	6	H	24366784
	240	260	14,6	16	10	6	H	24290247
	240	270	17,3	19	15	7,5	H	24352222
	245	267	14,1	15,5	11	6,5	H	24362532
	250	270	14,6	16	10	6	H	24291160*
	250	280	17,3	19	15	7,5	H	24223333*
	250	280	20,9	23	15	7,5	H	24373997
	250	280	22,8	25	15	7,5	H	49009475
	260	280	14,6	16	10	6	H	24339213*

* Tool available;

Fitting: H = by hand; W = with fitting tool

Further dimensions are available on request.



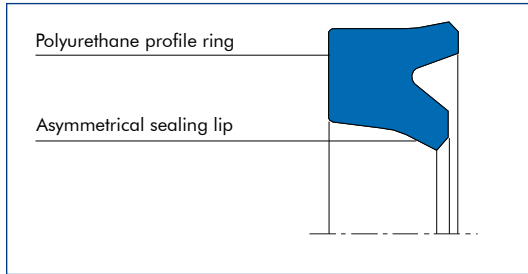
* Tool available;

Fitting: H = by hand; W = with fitting tool

Further dimensions are available on request.



Merkel Rod Seal U-Ring TM 20



Product description

U-ring with asymmetrical profile for sealing piston rods.

Product advantages

- Low breakaway force
- Good media resistance
- Wide operating temperature range
- Very good static and dynamic tightness
- Dynamic return capability
- Use as an individual seal or as a secondary seal in sealing systems possible
- Large range of dimensions
- No moulding tools

Material

Material	Designation	Color
Polyurethane	95 AU V142	dark blue
Polyurethane	94 AU 925	light blue

The material is determined by the nominal diameter and the production process involved.

Applications

- Secondary seal in a sealing system
- Single seal in the pressure range up to 26 MPa
- Single seal for subordinate applications in the pressure range up to 40 MPa
- Nominal diameter up to 2,000 mm

Operating conditions

Material	95 AU V142/94 AU 925
Hydraulic oils, HL, HLP	-30 ... +110 °C
HFA fluids	+5 ... +50 °C
HFB fluids	+5 ... +50 °C
HFC fluids	-30 ... +40 °C
HFD fluids	-
Water	+5 ... +40 °C
HETG (rape-seed oil)	-30 ... +60 °C
HEES (synth. ester)	-30 ... +60 °C
HEPG (glycol)	-30 ... +40 °C
Mineral greases	-30 ... +110 °C
Pressure	40 MPa
Running speed	0,5 m/s*

* When the TM 20 is used as a secondary seal, running speed of up to 1.5 m/s can be permitted.

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
	Ra	> 0,05 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion See also *Merkel Technical Manual*.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension	Max. permissible gap dimension			
	16 MPa	26 MPa	32 MPa	40 MPa
Profile				
> 7,5 ... 12,5	0,55	0,5	0,45	0,4
> 12,5 ... 15,0	0,6	0,55	0,45	0,4
> 15,0 ... 20,0	0,65	0,6	0,5	0,45
> 20,0 ... 25,0	0,65	0,6	0,5	0,45

If the T 20 U-ring is used as a secondary seal in a sealing system, a larger gap dimension can be set. The general rule applying here is $D2 = d + 1$ mm with a tolerance of H11 for $D2 \leq 400$ or +0.4 for $D2 > 400$.



Housing recommendations for new equipment

TM 20 Primary seal

d	D	L	C
>320 ... 600	d + 30	25	11
>320 ... 720	d + 40	32	12
>720 ... 2000	d + 40	40	16

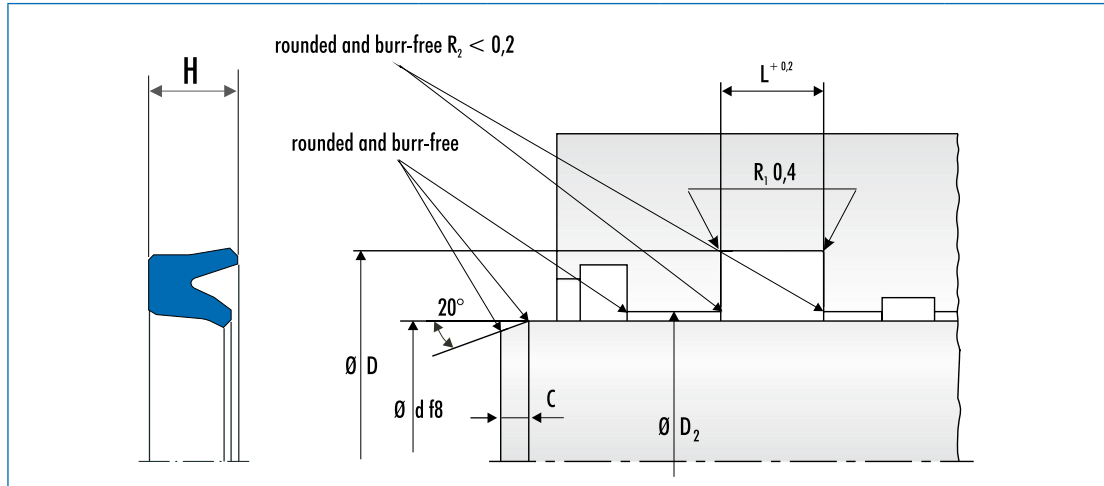
TM 20 Secondary seal in the sealing system

d	D	L	C
>320 ... 650	d + 20	16	8
>650 ... 950	d + 25	20	10
>950 ... 2000	d + 30	25	11

Fitting & installation

Rod seals can be sprung into grooves by hand or with a fitting tool.

For different housings, e.g. in old plant, please consult our advisory service.



d	D	H	L	Profile	C	Function*	Material	Article No.
320	340	14,6	16	10	8	s	95 AU V142	24357237
320	350	22,8	25	15	11		95 AU V142	24359549
320	360	29,1	32	20	12		95 AU V142	24359550
330	360	22,8	25	15	11		95 AU V142	24359743
340	360	14,6	16	10	8	s	95 AU V142	24369208
340	370	22,8	26	15	11		95 AU V142	24360008
350	370	14,6	16	10	8	s	95 AU V142	24357238
350	380	22,8	25	15	11		95 AU V142	24359746
360	380	14,6	16	10	8	s	95 AU V142	24359719
360	400	29,1	32	20	12		95 AU V142	49022458
370	400	22,8	25	15	11		95 AU V142	24359749
370	400	23,8	26	15	11		95 AU V142	49036122
380	400	14,6	16	10	8	s	95 AU V142	24359750
380	410	22,8	25	15	11		95 AU V142	49001346
380	420	29,1	32	20	12		95 AU V142	24359751
390	420	22,8	25	15	11		95 AU V142	24359752
400	420	14,6	16	10	8	s	95 AU V142	24359753
400	430	22,8	25	15	11		95 AU V142	24359755
400	440	29,1	32	20	12		95 AU V142	24359754
410	430	14,6	16	10	8	s	95 AU V142	24357239
420	440	14,6	16	10	8	s	95 AU V142	24379339
420	450	23,8	26	15	11		95 AU V142	24359756
420	460	29,1	32	20	12		95 AU V142	24359757
430	460	22,8	25	15	11		95 AU V142	24359758
440	460	14,6	16	10	8	s	95 AU V142	24357240
440	470	22,8	25	15	11		95 AU V142	24370501

*s = only as secondary seal

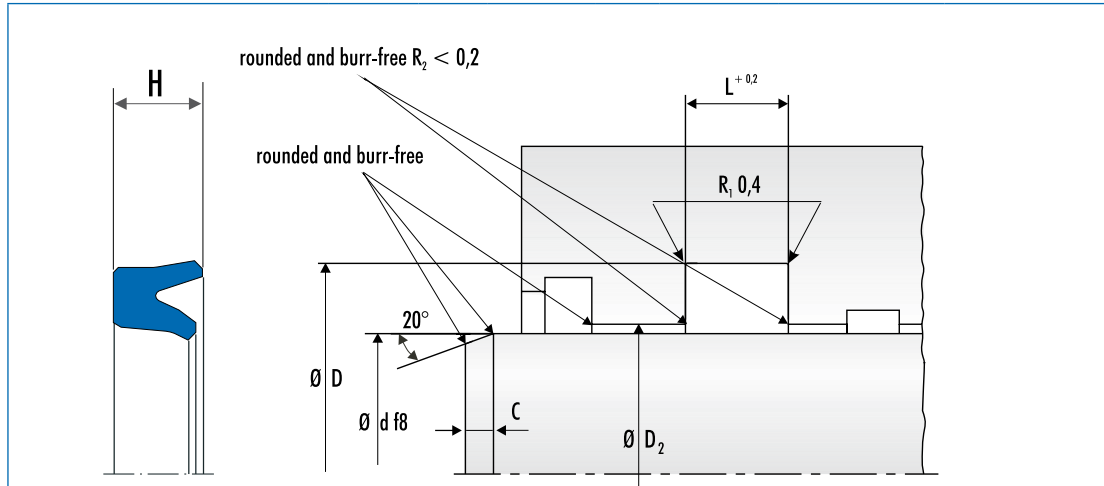
Further dimensions are available on request.



d	D	H	L	Profile	C	Function	Material	Article No.
450	470	14,6	16	10	8	s	95 AU V142	24359760
450	480	22,8	25	15	11		95 AU V142	24359761
450	490	29,1	32	20	12		95 AU V142	24359763
460	480	14,6	16	10	8	s	95 AU V142	49006630
460	500	29,1	32	20	12	s	95 AU V142	24374652
480	500	14,6	16	10	8	s	95 AU V142	24357241
500	520	14,6	16	10	8	s	94 AU 925	49017450
500	530	22,8	25	15	11		93 AU V168	24359768
500	540	29,1	32	20	12		93 AU V168	24359769
520	540	14,6	16	10	8	s	94 AU 925	49015056
520	560	29,1	32	20	12		93 AU V168	24359770
530	560	22,8	25	15	11		93 AU V168	24359771
540	560	14,6	16	10	8	s	94 AU 925	49066449
540	580	29,1	32	20	12		93 AU V168	24359772
550	570	14,6	16	10	8	s	93 AU V168	24357242
550	590	29,1	32	20	12		93 AU V168	24359204
560	580	14,6	16	10	8	s	94 AU 925	49066450
560	600	29,1	32	20	12		93 AU V168	24359773
580	600	14,6	16	10	8	s	94 AU 925	49066451
580	610	22,8	25	15	11		93 AU V168	49001720
580	620	29,1	32	20	12		93 AU V168	24359774
600	620	14,6	16	10	8	s	94 AU 925	49029053
600	630	22,8	25	15	11		93 AU V168	24359776
600	640	29,1	32	20	12		93 AU V168	24359777
620	640	14,6	16	10	8	s	93 AU V168	24359551
620	645	18,2	20	12,5	10	s	94 AU 925	49066482
630	670	29,1	32	20	12		93 AU V168	24359778
640	660	14,6	16	10	8	s	93 AU V168	24358387
640	665	18,2	20	12,5	10	s	94 AU 925	49066483
660	685	18,2	20	12,5	10	s	94 AU 925	49064940
670	695	18,2	20	12,5	10	s	93 AU V168	24359552
670	710	29,1	32	20	12		93 AU V168	24359779
680	705	18,2	20	12,5	10	s	94 AU 925	49066484
700	725	18,2	20	12,5	10	s	94 AU 925	49066485
710	750	29,1	32	20	12		93 AU V168	24359780
720	745	18,2	20	12,5	10	s	94 AU 925	49054686
720	760	29,1	32	20	12		93 AU V168	24359781
720	770	36,4	40	25	16		93 AU V168	24357182

*s =only as secondary seal

Further dimensions are available on request.



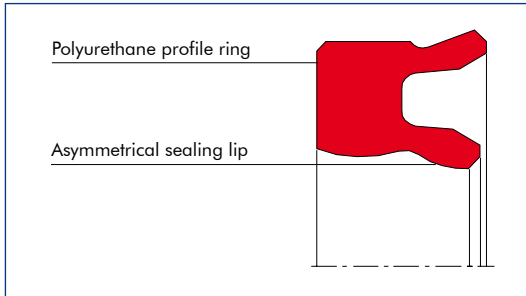
d	D	H	L	Profile	C	Function	Material	Article No.
740	765	18,2	20	12,5	10	s	94 AU 925	49066486
750	800	36,4	40	25	16		93 AU V168	24359782
760	785	18,2	20	12,5	10	s	94 AU 925	24380543
780	805	18,2	20	12,5	10	s	94 AU 925	49032355
800	825	18,2	20	12,5	10	s	93 AU V168	24359783
800	825	18,2	20	12,5	10	s	94 AU 925	49028614
820	845	18,2	20	12,5	10	s	94 AU 925	49066487
820	870	36,4	40	25	16		93 AU V168	24357250
830	855	18,2	20	12,5	10	s	93 AU V168	49003544
840	865	18,2	20	12,5	10	s	94 AU 925	49066488
860	885	18,2	20	12,5	10	s	94 AU 925	49066489
880	905	18,2	20	12,5	10	s	94 AU 925	49062164
900	925	18,2	20	12,5	10	s	94 AU 925	49066490
900	950	36,4	40	25	16		93 AU V168	24359789
920	945	18,2	20	12,5	10	s	94 AU 925	24378523
940	965	18,2	20	12,5	10	s	94 AU 925	49022199
950	975	18,2	20	12,5	10	s	93 AU V168	24359554
960	990	22,8	25	15	11	s	94 AU 925	49066491
980	1010	22,8	25	15	11	s	94 AU 925	49066492
1000	1030	22,8	25	15	11	s	94 AU 925	49066493
1000	1050	36,4	40	25	16		93 AU V168	24359792
1040	1070	22,8	25	15	11	s	93 AU V168	49017258
1050	1100	36,4	40	25	16		93 AU V168	24359793
1200	1250	36,4	40	25	16		93 AU V168	24362258
1250	1300	36,4	40	25	16		93 AU V168	24359556

s = only as secondary seal

Further dimensions are available on request.



Merkel U-Ring TMP 20



Product description

Single-acting rod seal made of abrasion-resistant polyurethane.

Product advantages

Owing to new production technology special sizes can also be manufactured quickly and flexibly. The U-rings are designed for pressure on one side.

- High tightness
- Suitable for dry air
- Large range of dimensions
- No mould tools required

Application

Rod seal for heavy pneumatic loads and high operating requirements.

Material

Material	Designation	Color
Polyurethane	93 AU V167	red
Polyurethane	93 AU V168	rot

The material is determined by the diameter.

Operating conditions

Material	93 AU V167/93 AU V168
Pneumatic: air, dry or lubricated	-10 ... +80 °C
Pressure	2 MPa*
Running speed	1,5 m/s

Surface finish

Peak-to-valley heights	R_v	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Percentage contact area $M_r > 50\%$ up to max. 90% at cutting depth $c = RZ/2$ and reference line $C_{ref} = 0\%$. Abrasive surfaces, scores, scratches and blowholes are to be avoided.

Design notes

Please note our general design remarks in the *Merkel Technical Manual*.

Housing recommendations for new design

d	D	L	C
>50 ... 200	d + 20	16	8,5
>100 ... 320	d + 25	20	10
>150 ... 630	d + 30	24	11,5
>400 ... 800	d + 40	32	12,5
>800 ... 1200	d + 50	40	16
>1000 ... 2000	d + 60	48	18

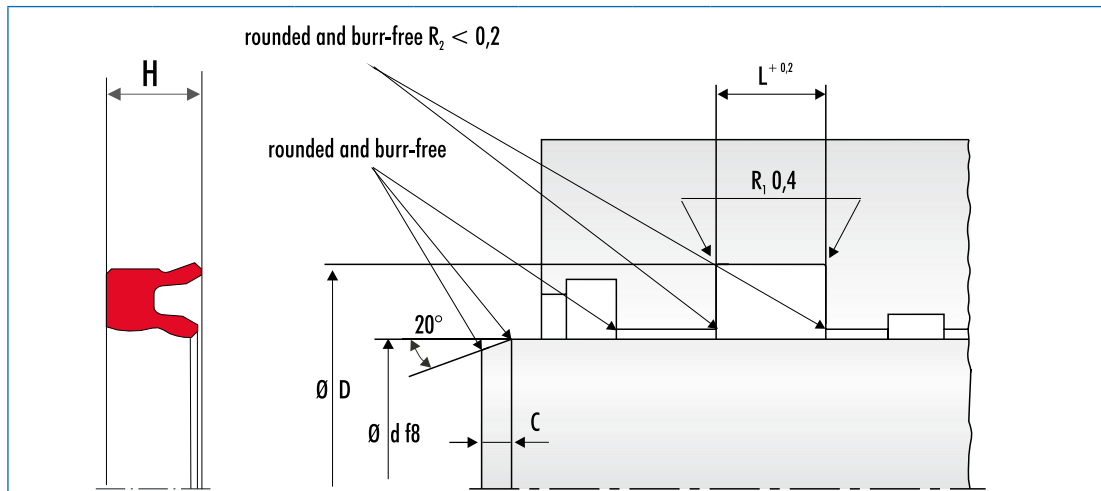
Tolerances

Diameter D	Tolerance
< 250	H10
>250	H11

Installation & assembly

The rod seals can be snapped into plunge-cut grooves by hand or with a fitting tool. Please contact our application consultants about different housings, e. g. in old plants.

To achieve optimum running-in and operation behaviour, the U-rings should be oiled or greased slightly prior to use (initial lubrication).



d	D	H	L	Profile	C	Material	Article No.
60	80	11,8	13	10	8,5	93 AU V167	24370303
60	80	14,6	16	10	8,5	93 AU V167	24377711
70	90	11,8	13	10	8,5	93 AU V167	24370304
80	100	11,8	13	10	8,5	93 AU V167	49001218
80	100	14,6	16	10	8,5	93 AU V167	24370305
90	110	14,6	16	10	8,5	93 AU V167	24370306
100	120	14,6	16	10	8,5	93 AU V167	24370307
110	130	14,6	16	10	8,5	93 AU V167	24370308
120	150	17,3	19	15	11,5	93 AU V167	24370309
130	160	17,3	19	15	11,5	93 AU V167	24370311
140	170	17,3	19	15	11,5	93 AU V167	24370312
150	180	17,3	19	15	11,5	93 AU V167	24370313
160	180	14,6	16	10	8,5	93 AU V167	24371779
170	200	20,9	23	15	11,5	93 AU V167	24368238
180	210	20,9	23	15	11,5	93 AU V167	24368239
210	240	20,9	23	15	11,5	93 AU V167	24368242
220	250	20,9	23	15	11,5	93 AU V167	24368243
240	270	20,9	23	15	11,5	93 AU V167	24367642
250	280	20,9	23	15	11,5	93 AU V167	24368244
260	280	14,6	16	10	8,5	93 AU V167	49001222
270	300	20,9	23	15	11,5	93 AU V167	24368245
280	310	20,9	23	15	11,5	93 AU V167	24368246
330	360	20,9	23	15	11,5	93 AU V167	49001221
350	380	23,7	26	15	11,5	93 AU V167	24368249
370	400	23,7	26	15	11,5	93 AU V167	24368250
390	420	23,7	26	15	11,5	93 AU V167	24368251

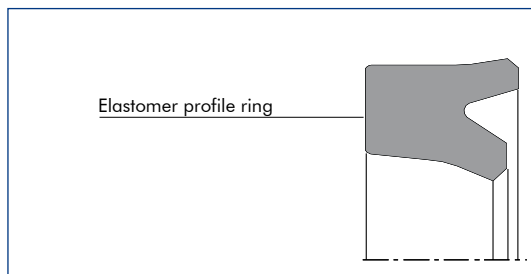
Further dimensions are available on request.



d	D	H	L	Profile	C	Material	Article No.
400	430	23,7	26	15	11,5	93 AU V167	24368252
420	450	23,7	26	15	11,5	93 AU V167	24368253
430	470	20	22	20	11,5	93 AU V168	24369478
440	470	23,7	26	15	11,5	93 AU V167	526870
450	480	23,7	26	15	11,5	93 AU V167	24367970
460	500	20	22	20	11,5	93 AU V167	24370362
500	530	23,7	26	15	11,5	93 AU V167	24368255
570	610	20	22	20	11,5	93 AU V168	528837
750	800	32	34	25	16	93 AU V168	24368261
800	850	32	34	25	16	93 AU V168	24368262

Further dimensions are available on request.

Merkel Elastomer U-Ring L 20



Product description

Merkel elastomer U-ring with asymmetrical profile for sealing piston rods.

Product advantages

- adapted for operating medium water or water-emulsion

Material

Material	Designation	Color
Nitrile rubber	85 NBR B247	black

Application

- Suitable as a secondary seal within a sealing system
- Nominal-diameter up to 1000 mm

Operating conditions

Material	85 NBR B247
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +110 °C
Pressure	16 MPa
Running speed	0,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface. See also *Merkel Technical Manual*.



Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion. See also *Merkel Technical Manual*.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension	Max. permissible gap dimension		
	5 MPa	10 MPa	16 MPa
Profile			
10	0,8	0,55	0,2
12,5	0,85	0,6	0,25
15	0,95	0,65	0,3

Tolerances

Diameter D	Tolerance
< 400	H11
> 400	+0,4

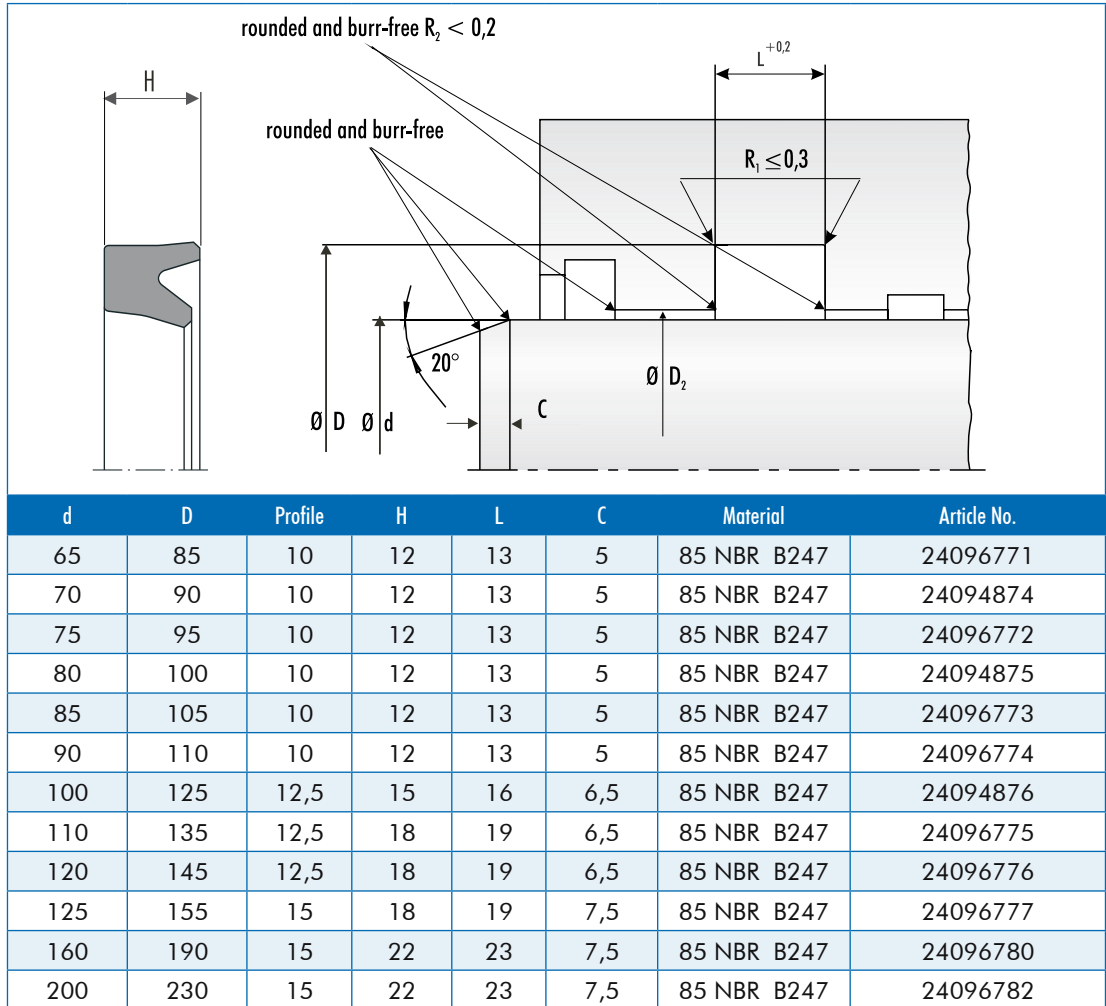
The tolerance for the diameters d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

Design notes

Please note our general design remarks in the *Merkel Technical Manual*.

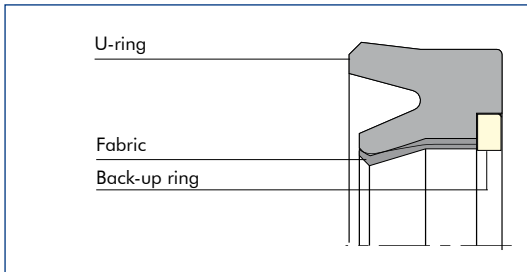
Installation & assembly

Please note our general remarks on hydraulic seal assembly in the *Merkel Technical Manual*.



Further dimensions are available on request.

Merkel U-ring Seal Set 0214



Product description

Two-piece seal set comprising an elastomer U-ring with an elastomer sealing edge, fabric reinforcement on the running surface and an active back-up ring.

Product advantages

- Low friction due to fabric reinforcement
- Large dimension range
- Resistant to extrusion owing to activated back-up ring
- Low return capability (not suitable for sealing systems)
- Easy to install in non-axial housings from
- 100 mm diameter upwards

Applications

Single-acting rod seal for use in hydraulics and pneumatics.

Material

Profile ring

Material	Description	Color
Nitrile rubber	NBR	black
Cotton fabric	BI-NBR	black

Back-up ring

Material	Description	Color
D < 300 mm Polyacetal	POM	white
D > 300 mm Polyamide	PA	white

Operating conditions

Material	NBR/BI-NBR/POM or PA
Hydraulic oils HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rapeseed oil)	-30 ... +80 °C
HEES (synthetic esters)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure Hydraulic	25 or 40* MPa
Pressure Pneumatic	5 MPa
Sliding speed v in m/s	1,5 m/s

*max. pressure depends on the profile

The figures given are maximum values and must not be applied simultaneously. With U-ring 0214 the max. pressure should only be exploited in the last section (closing pressure) if long strokes are executed; during the stroke max. 16 MPa.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content Mr > 50 % to max. 90 %, with cut depth c = Rz/2 and reference line Cref = 0 %

Design notes

Please note our general design remarks in the *Merkel Technical Manual*

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion See also *Merkel Technical Manual*.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension	Max. permissible gap dimension			
Profile	16 MPa	26 MPa	32 MPa	40 MPa
< 15	1,2	1,0	0,65	0,5
> 15	1,8	1,4	0,9	0,7

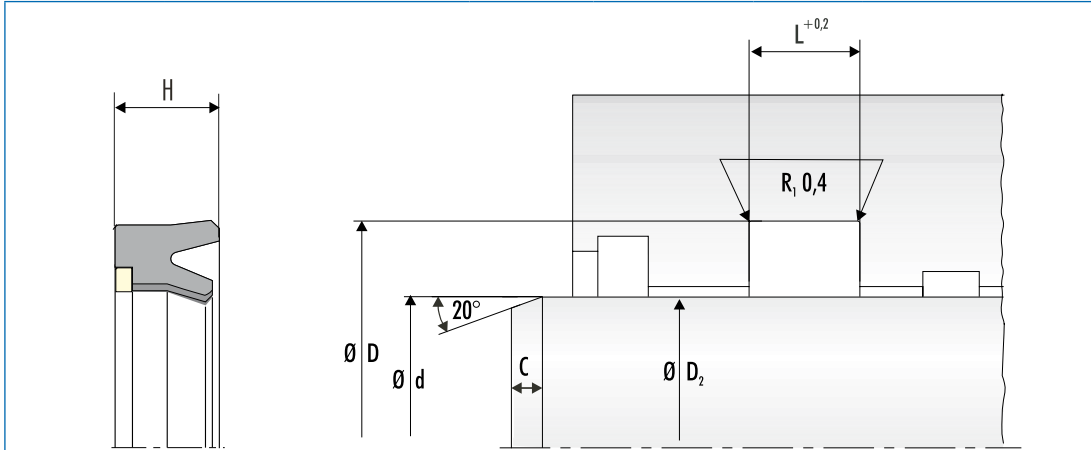
Tolerances

Diameter	Tolerance
D	H10

The tolerance for the diameters d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

Installation & assembly

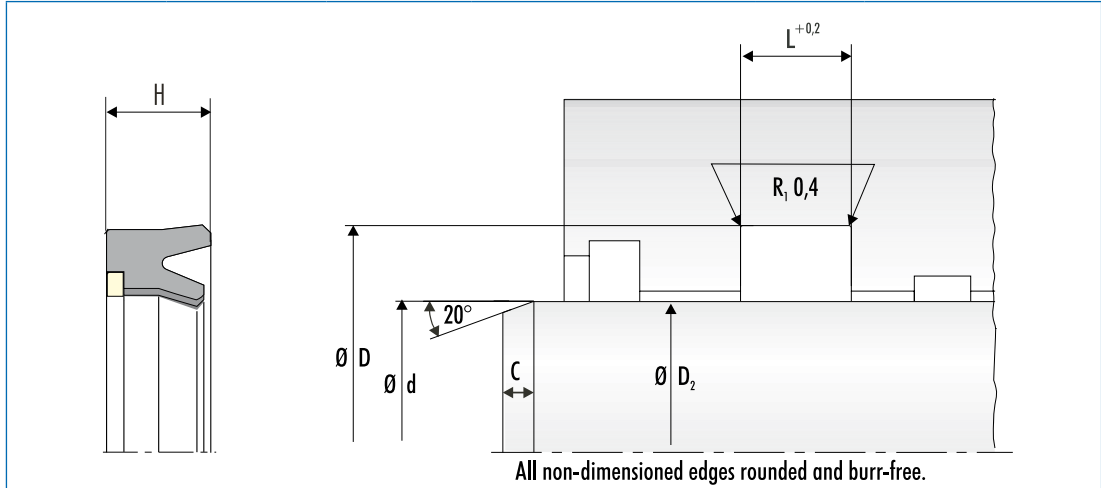
Careful assembly is a precondition for the perfect functioning of the seal. See also *Merkel Technical Manual*.



All non-dimensioned edges rounded and burr-free.

d	D	H	L	Profile	C	Article No.
140	170	18	19	15	7,5	24314112
150	180	18	19	15	7,5	24296304
160	190	18	19	15	7,5	24245483
170	200	22	23	15	7,5	24294436
180	210	18	19	15	7,5	24245484
180	210	22	23	15	7,5	24315582
190	220	22	23	15	7,5	24262669
200	230	22	23	15	7,5	24290484
210	240	22	23	15	7,5	24251000
220	250	19	20	15	7,5	24245485
240	270	22	23	15	7,5	24243972
250	280	22	23	15	7,5	24265061
260	290	22	23	15	7,5	24316627
270	300	22	23	15	7,5	24266413
280	310	22	23	15	7,5	24265062
300	330	22	23	15	7,5	24237123
320	350	22	23	15	7,5	24265063
320	360	30	32	20	10	24262827
350	380	25	26	15	7,5	24248695
350	390	30	32	20	10	24245109
370	400	25	26	15	7,5	24310654
380	420	30	32	20	10	24265065
390	420	25	26	15	7,5	24289371
400	430	22	23	15	7,5	24329114
420	450	25	26	15	7,5	24299742
450	490	30	32	20	10	24227265

Further dimensions are available on request.

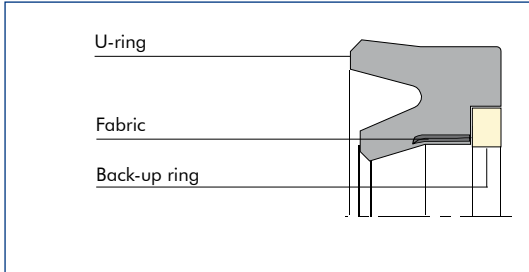


d	D	H	L	Profile	C	Article No.
480	520	30	32	20	10	24245108
500	540	30	32	20	10	24245110
530	560	25	26	15	7,5	24293085
540	580	30	32	20	10	24288821
560	600	25	26	20	10	24287009
580	620	30	32	20	10	24245106
600	640	30	32	20	10	24228864
670	710	25	26	20	10	24293603
800	850	32	34	25	12,5	24300506
850	890	30	32	20	10	24311337

Further dimensions are available on request.



Merkel U-ring Seal Set 0216



Product description

Two-piece seal set comprising an elastomer U-ring with an elastomer sealing edge, fabric reinforcement on the running surface and an active back-up ring.

Product advantages

- Low friction due to fabric reinforcement
- Large dimension range
- Resistant to extrusion owing to activated back-up ring
- Low return capability (not suitable for sealing systems)
- Easy to install in non-axial housings from 100 mm diameter upwards

Applications

Single-acting rod seal for use in hydraulics and pneumatics.

Material

Profile ring

Material	Description	Color
Nitrile rubber	NBR	black
Cotton fabric	BI-NBR	black

Back-up ring

Material	Description	Color
D < 300 mm Polyacetal	POM	white
D > 300 mm Polyamide	PA	white

Operating conditions

Material	NBR/BI-NBR/POM or PA
Hydraulic oils HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rapeseed oil)	-30 ... +80 °C
HEES (synthetic esters)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure Hydraulic	25 or 40* MPa
Pressure Pneumatic	5 MPa
Sliding speed v in m/s	1,5 m/s

*max. pressure depends on the Profile

The figures given are maximum values and must not be applied simultaneously.

With U-ring 0216 the max. pressure should only be exploited in the last section (closing pressure) if long strokes are executed; during the stroke max. 16 MPa.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90%, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

Design notes

Please note our general design remarks in the *Merkel Technical Manual*

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion See also *Merkel Technical Manual*.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension	Max. permissible gap dimension			
Profile	16 MPa	26 MPa	32 MPa	40 MPa
< 15	1,2	1,0	0,65	0,5
> 15	1,8	1,4	0,9	0,7

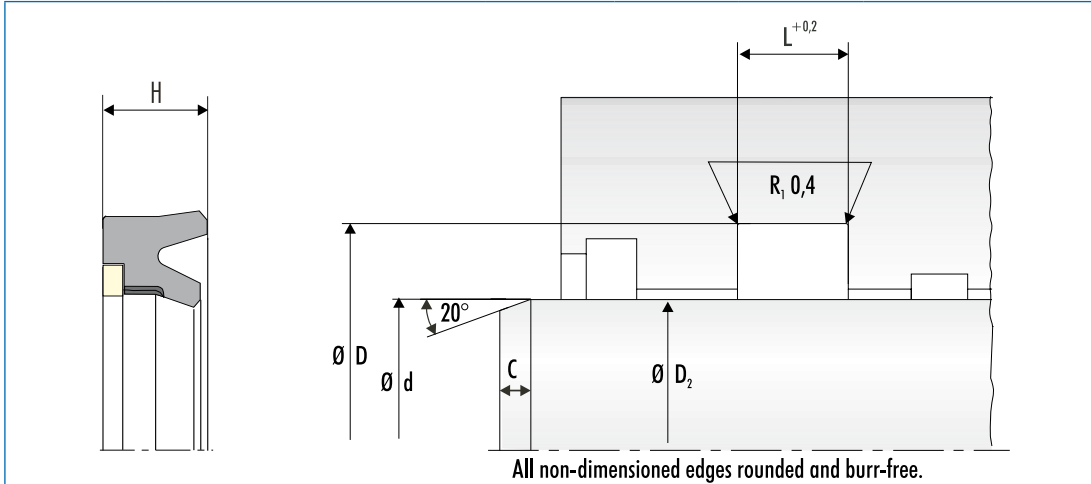
Tolerances

Diameter	Tolerance
D	H10

The tolerance for the diameters d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

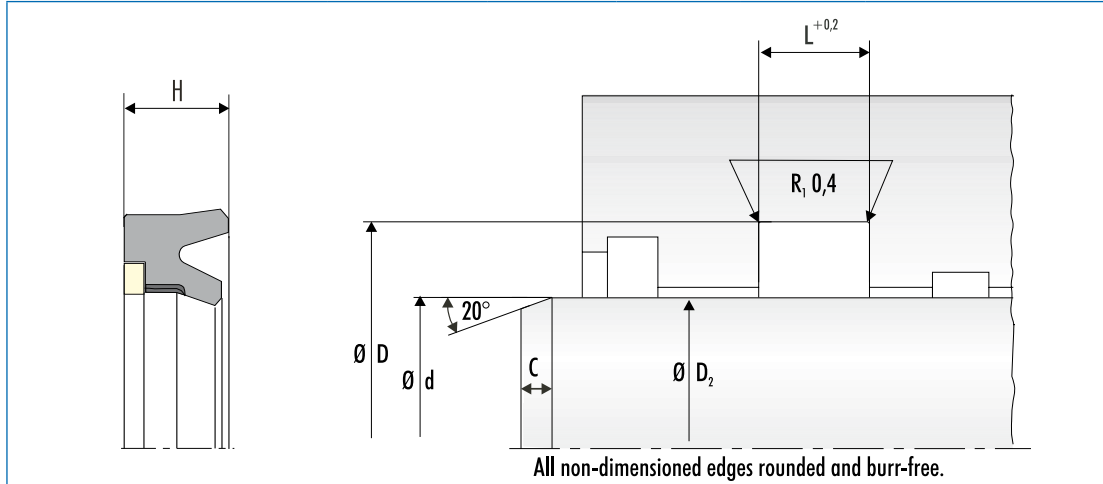
Installation & assembly

Careful assembly is a precondition for the perfect functioning of the seal. See also *Merkel Technical Manual*.



d	D	H	L	Profile	C	Article No.
125	155	18	19	15	7,5	24291122
140	170	18	19	15	7,5	24314111
170	200	22	23	15	7,5	24275197
180	210	18	19	15	7,5	24245114
190	220	22	23	15	7,5	24275208
200	230	22	23	15	7,5	24290483
210	240	22	23	15	7,5	24275209
220	250	19	20	15	7,5	24245118
230	260	22	23	15	7,5	24263292
240	270	22	23	15	7,5	24245116
250	280	22	23	15	7,5	24269898
260	290	22	23	15	7,5	24316621
270	300	22	23	15	7,5	24266414
280	310	22	23	15	7,5	24269899
300	330	22	23	15	7,5	24245117
300	340	24	25	20	10	24245113
320	350	22	23	15	7,5	24269900
320	360	20	21	20	10	24245915
320	360	30	32	20	10	24248351
350	380	25	26	15	7,5	24250321
360	400	30	32	20	10	24290064
370	400	25	26	15	7,5	24345322
370	400	25	26	15	7,5	24310655
380	420	30	32	20	10	24275210
390	420	25	26	15	7,5	24289372
400	430	22	23	15	7,5	24308105

Further dimensions are available on request.

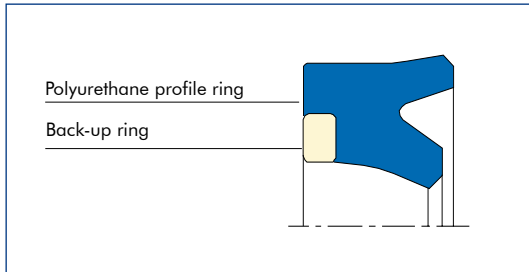


d	D	H	L	Profile	C	Article No.
420	450	25	26	15	7,5	24299741
450	480	25	26	15	7,5	24274570
450	490	30	32	20	10	24228307
480	520	30	32	20	10	24232822
500	530	25	26	15	7,5	24289342
500	540	30	32	20	10	24228867
530	560	25	26	15	7,5	24293086
540	580	30	32	20	10	24288874
560	600	25	26	20	10	24287008
580	620	30	32	20	10	24234580
600	630	25	26	15	7,5	24275198
850	890	30	32	20	10	24311336

Further dimensions are available on request.



Merkel U-Ring Type 0503



Product description

Two-piece Merkel seal set with asymmetrical profile, used as rod seal.

Product advantages

- Functional safety in case of radial shaft misalignment by using large Profile overlap.
- Operational safety due to robust polyurethane Profile ring.
- High sealing function due to distinctive sealing edge (high line load)
- Safety against metallic contact due to large extrusion gaps by using back-up ring for high extrusion resistance.
- Easy and secure mounting.

Applications

- Single seal for working pressures up to 50 MPa.
- Suitable for large extrusion gaps.
- Nominal diameter up to 2000 mm.

Material

Profile ring

Material	Designation	Color
Polyurethane	95 AU V142	dark blue

or

Material	Designation	Color
Polyurethane	94 AU 925	light blue

Back-up ring

Material	Designation	Color
Polyamide	PA	withe

or

Material	Designation	Color
Polyoxymethylen	POM	withe

The material is determined by the nominal diameter and the production process involved.

Operating conditions

Material	95 AU V142 94 AU 925
Hydraulic oils, HL, HLP	-30 ... +110 °C
HFA fluids	+5 ... +50 °C
HFB fluids	+5 ... +50 °C
HFC fluids	-30 ... +40 °C
HFD fluids	-
Water	+5 ... +40 °C
HETG (rape-seed oil)	-30 ... +60 °C
HEES (synth. ester)	-30 ... +60 °C
HEPG (glycol)	-30 ... +40 °C
Mineral greases	-30 ... +110 °C
Pressure	50 MPa
Running speed	0,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
	Ra	> 0,05 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion See also *Merkel Technical Manual*.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension	Max. permissible gap dimension				
	16 MPa	26 MPa	32 MPa	40 MPa	50 MPa
Profile					
10,0 ... < 15,0	0,7	0,7	0,7	0,6	0,5
15,0 ... 30,0	1,1	1,1	1,0	0,9	0,7

Tolerances

Diameter D	Tolerance
≤ 400	H11
> 400	+0,4

The tolerance for the diameters d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

Design notes

U-Ring seal sets can be generally mounted into a pierced groove by hand. Dependent on the relation of Profile and nominal diameter, in some cases an axial accessible installation space might be necessary.

Housing recommendation for larger diameters

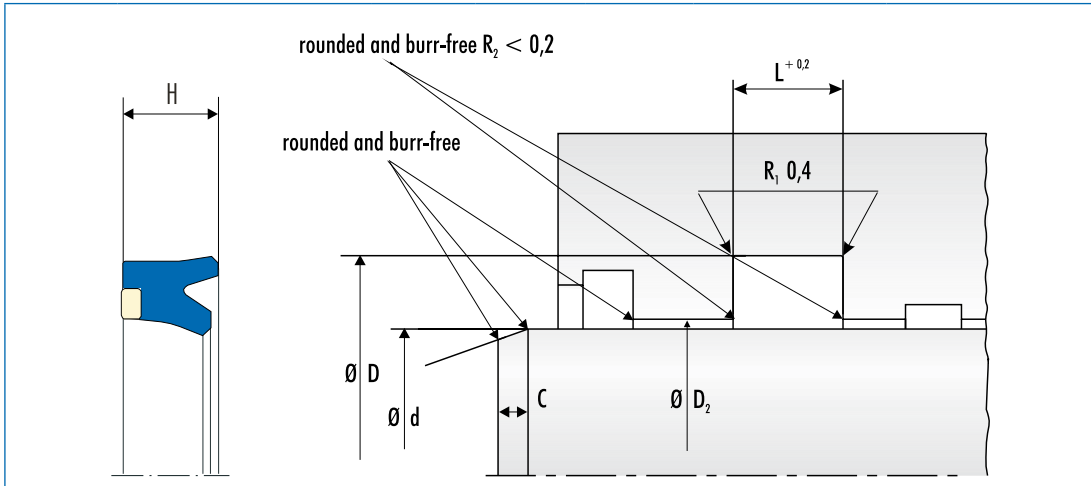
d	D	L	C
> 320 ... 600	d - 30	25	11
> 320 ... 720	d - 40	32	12
> 720 ... 2000	d - 50	40	16

Please note our general design remarks in the *Merkel Technical Manual*.

Installation & assembly

Dependent on the diameter ordered, the back-ring is delivered with a certain over-length and has to be cut to size just before mounting on site.

Precondition for a flawless function of the seal is its accurate mounting. See also *Merkel Technical Manual*.

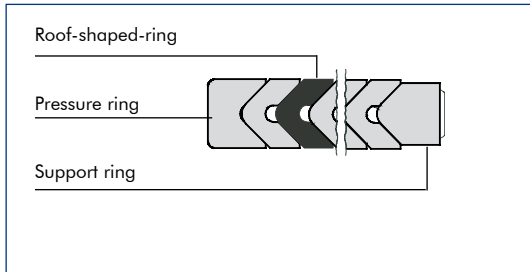


d	D	H	L	Profile	C	Material	Article No.
90	100	15	16	5	4,5	95 AU V142	24257838
110	120	15	16	5	4,5	95 AU V142	24187249
160	175	15	16	7,5	5,5	95 AU V142	24249242
160	185	14,6	16	12,5	6,5	95 AU V142	24360091
190	205	15	16	7,5	5,5	95 AU V142	24187259
200	230	28	30	15	7,5	95 AU V142	49045084
200	240	32	34	20	14	95 AU V142	49041960
260	290	22	24	15	7,5	95 AU V142	49064769
300	320	14,6	16	10	10	95 AU V142	49021013
300	330	22	24	15	7,5	95 AU V142	49033965
340	380	30	32	20	14	94 AU 925	49022624
350	380	22	24	15	7,5	94 AU 925	49026704
370	390	14,6	16	10	10	95 AU V142	49021014
380	430	30	32	25	16	95 AU V142	524856
390	420	23	25	15	7,5	95 AU V142	24371212
390	420	33	35	15	7,5	95 AU V142	49044818
400	430	22	24	15	7,5	94 AU 925	49019806
450	480	22	24	15	7,5	95 AU V142	49021808
450	480	23	25	15	7,5	95 AU V142	24371213
600	640	28	30	20	14	94 AU 925	49032832

Further dimensions are available on request.



Merkel Roof Shaped Seal Set ES/ESV



Product description

Multi-part seal set for sealing piston rods, comprising one thrust ring, at least three V-rings and one support ring. The Roof shaped seal seal sets are put together in 3 different versions.

Type A

has 3 to 5 fabric seals, and can be installed in re-adjustable and non-re-adjustable sealing spaces.

Type B

has 3 to 5 fabric seals, a rubber-mounted support ring and can be installed in non-re-adjustable installation spaces. Constant axial prestress.

Type C

has 2 to 4 fabric seals, one rubber seal and can be installed in re-adjustable and non-re-adjustable installation spaces.

For an enhanced sealing effect:

Type A and Type B can be supplied in an open version. Type C is always supplied in an endless version.

Product advantages

- field-proven under ultra-tough conditions
- long useful lifetime
- can be optimally matched to the application concerned
- functions for a certain period even on poor surfaces
- depending on the application and design involved, fluctuations in the leakage and friction behavior must be anticipated

Material

Design type	Material	Designation
ES	Cotton fabric/NBR	BI-NBR
ESV	Cotton fabric/FKM	BI-FKM

Operating conditions

Material	BI-NBR/85 NBR
Hydraulic oils HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rapeseed oil)	-30 ... +80 °C
HEES (synthetic ester)	-30 ... +80 °C
HEPG (glykol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Sliding speed	0,5 m/s

Material	BI-FKM
Hydraulic oils HL, HLP	-15 ... +140 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-15 ... +60 °C
HFD fluids	-15 ... +140 °C
Water	+5 ... +80 °C
HETG (rapeseed oil)	-15 ... +80 °C
HEES (synthetic ester)	-15 ... +100 °C
HEPG (glykol)	-15 ... +80 °C
Mineral greases	-15 ... +140 °C
Pressure	40 MPa
Sliding speed	0,5 m/s

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Profile bearing length ratio $M > 50\%$ up to max. 90% with average depth $c = Rz/2$ and reference line $C_{ref} = 0\%$. $c = Rz/2$ and reference line $C_{ref} = 0$

The long-time behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. A precise description and assessment of the surface is thus indispensable.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface.

See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

In the case of the ES and ESV series, the gap on the side facing away from the pressure will depend on the metal guide being used, and the fit pairing. In order to avoid gap extrusion, the fits listed in the table below should be used. See also *Merkel Technical Manual*

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion. (See also *Merkel Technical Manual*).

The maximum permissible extrusion gap with a one-sided position of the piston is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material.

Tolerances

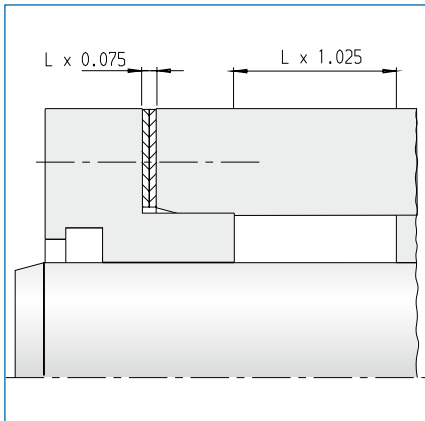
Nominal-diameter d	Tolerance
≤ 80	H9/f8
>80 ... 120	H8/f8
> 120 ... 500	H8/f7
> 500 ... 630	H8/f7
> 630 ... 800	H8/f7
> 800 ... 1000	H8/f7
> 1000 ... 1250	H8/f7

Nominal-diameter D	Tolerance
≤ 500	H11
> 500	H10

The tolerance for the diameters d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.



Housing



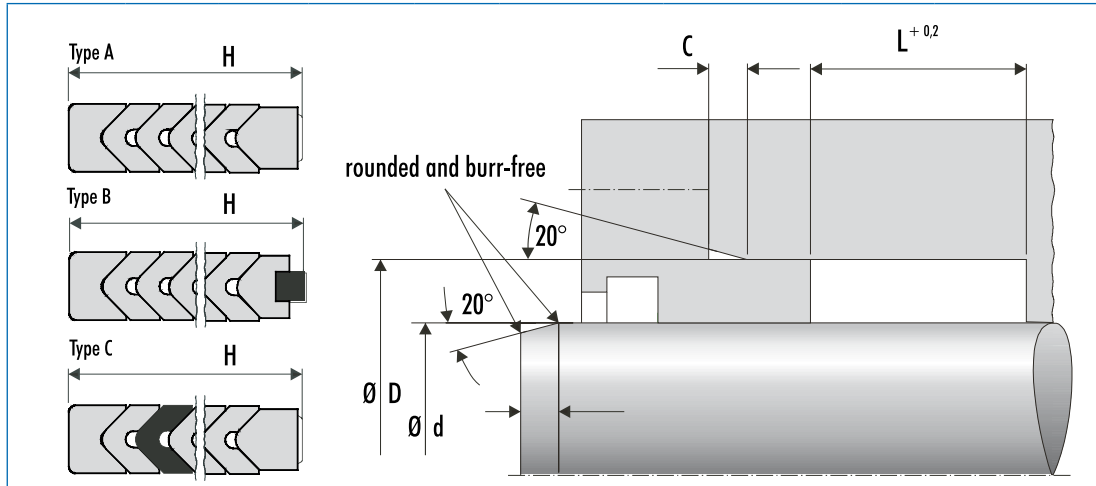
Re-adjustable installation spaces have the advantage of an optimal adjustment option for the sealing effect with minimal idling friction. After a lengthy period of running and incipient wear on the seal, tightening the gland can extend the useful lifetime and significantly delay a system standstill.

For re-adjustable installation spaces, an extension of 2.5 % and a re-adjustability level of 7.5 % of the „L“ dimension is recommended.

Non-re-adjustable installation spaces have the advantage of more affordable production, since shims are not required. For these installation spaces, the Type B seal set is particularly recommended. The rubber-mounted support rings handle the function of initial compression and of re-adjustment continuously during operation. There is no need for maintenance of the seal. The seal set's lifetime is optimally utilized.

Installation & assembly

Careful fitting is a prerequisite for the correct function of the seal. Before installation all individual parts of the seal set must be greased. Mineral-oil-based greases can be used so long as they have a good seal-compatibility. The rod must be in the cylinder's installation space before installation. Merkel Chevron Seal Sets can also be built-in in an open form. This has the advantage that in the event of a repair and replacement of the seal set, e.g. in a large system, it does not require a large amount of work for installation. The sealing rings are installed on the plunger or the piston rod and pushed into the housing one by one. See also *Merkel Technical Manual*.



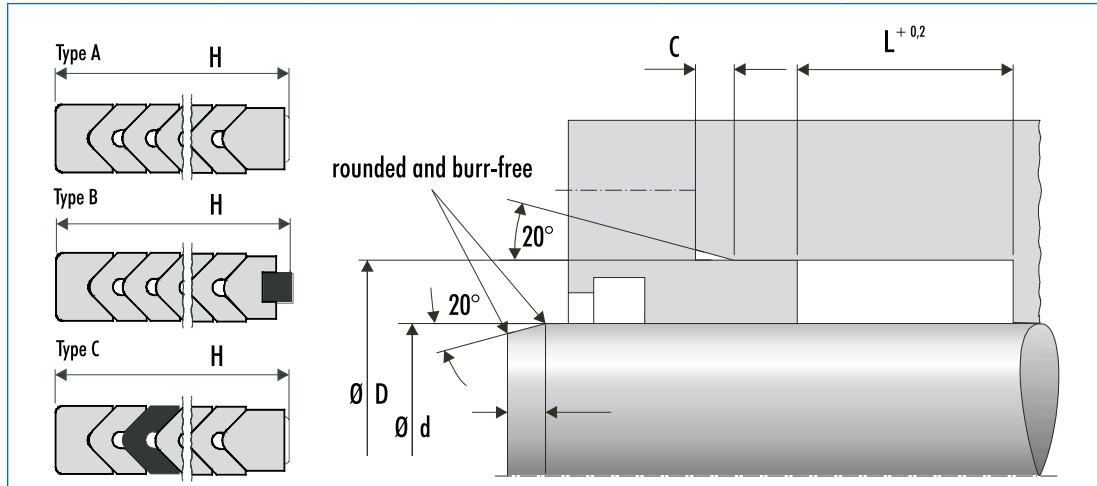
Housing	d	D	L	C	Type	Material	Type	Article No.
ISO	16	26	18,5	3	C closed	BI-FKM	ESV	24148034
	20	28	14,5	3	C closed	BI-NBR	ES	24120639
	20	30	13,5	3	C closed	BI-NBR	ES	24077934
ISO	20	30	13,5	3	C closed	BI-FKM	ESV	24192811
ISO	20	30	16	3	C closed	BI-NBR	ES	24220043
	20	30	16	3	C closed	BI-FKM	ESV	24219984
	20	30	18,5	3	C closed	BI-NBR	ES	24070179
	20	30	18,5	3	C closed	BI-FKM	ESV	24139067
ISO	20	32	22,5	3	C closed	BI-FKM	ESV	24139053
	22	30	14,5	3	C closed	BI-NBR	ES	24120640
	22	32	13,5	3	C closed	BI-NBR	ES	24062158
ISO	22	32	13,5	3	C closed	BI-FKM	ESV	24144548
ISO	22	32	16	3	C closed	BI-NBR	ES	24220044
	22	32	16	3	C closed	BI-FKM	ESV	24219986
	22	32	18,5	3	C closed	BI-NBR	ES	24070180
ISO	22	32	18,5	3	C closed	BI-FKM	ESV	24148036
ISO	25	33	14,5	3	C closed	BI-NBR	ES	24120641
ISO	25	35	16	3	C closed	BI-NBR	ES	24220045
	25	35	16	3	C closed	BI-FKM	ESV	24219988
	25	37	16,5	3	C closed	BI-NBR	ES	24062166
	25	37	16,5	3	C closed	BI-FKM	ESV	24219989
	25	37	22,5	3	C closed	BI-NBR	ES	24070181
ISO	25	37	22,5	3	C closed	BI-FKM	ESV	24148037
ISO	28	38	16	3	C closed	BI-NBR	ES	24120642
	28	38	16	3	C closed	BI-FKM	ESV	24219990
	28	40	16,5	3	C closed	BI-NBR	ES	24062159
	28	40	16,5	3	C closed	BI-FKM	ESV	24144546
	28	40	22,5	3	C closed	BI-NBR	ES	24070182
ISO	28	40	22,5	3	C closed	BI-FKM	ESV	24139068
ISO	28	43	25	5	C closed	BI-NBR	ES	24220046
	28	43	25	5	C closed	BI-FKM	ESV	24219991

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	30	42	16,5	3	C closed	BI-NBR	ES	24220047
	30	42	16,5	3	C closed	BI-FKM	ESV	24219992
	30	42	22,5	3	C closed	BI-NBR	ES	24070183
	30	42	22,5	3	C closed	BI-FKM	ESV	24139069
ISO	32	42	16	3	C closed	BI-NBR	ES	24120643
ISO	32	42	16	3	C closed	BI-FKM	ESV	24219993
	32	44	16,5	3	C closed	BI-NBR	ES	24078187
	32	44	16,5	3	C closed	BI-FKM	ESV	24191167
	32	44	22,5	3	C closed	BI-NBR	ES	24070184
	32	44	22,5	3	C closed	BI-FKM	ESV	24139070
ISO	32	47	25	5	C closed	BI-NBR	ES	24327287
ISO	32	47	25	5	C closed	BI-FKM	ESV	24219994
	35	47	16,5	3	C closed	BI-NBR	ES	24062171
	35	47	16,5	3	C closed	BI-FKM	ESV	24219995
	35	47	22,5	3	C closed	BI-NBR	ES	24070185
	35	47	22,5	3	C closed	BI-FKM	ESV	24139071
ISO	36	46	16	3	C closed	BI-NBR	ES	24120644
ISO	36	46	16	3	C closed	BI-FKM	ESV	24219996
	36	46	22,5	3	C closed	BI-FKM	ESV	527783
	36	48	16,5	3	C closed	BI-NBR	ES	24084373
	36	48	16,5	3	C closed	BI-FKM	ESV	24149112
	36	48	22,5	3	C closed	BI-NBR	ES	24070186
	36	48	22,5	3	C closed	BI-FKM	ESV	24138994
ISO	36	51	25	5	C closed	BI-NBR	ES	24327286
ISO	36	51	25	5	C closed	BI-FKM	ESV	24219997
ISO	40	50	16	3	C closed	BI-NBR	ES	24120645
ISO	40	50	16	3	C closed	BI-FKM	ESV	24219998
	40	52	16,5	3	C closed	BI-NBR	ES	24062173
	40	52	16,5	3	C closed	BI-FKM	ESV	24175597
	40	52	22,5	3	C closed	BI-NBR	ES	24070187
	40	52	22,5	3	C closed	BI-FKM	ESV	24139072
ISO	40	55	25	5	C closed	BI-NBR	ES	24220050
ISO	40	55	25	5	C closed	BI-FKM	ESV	24219999
ISO	45	55	16	3	C closed	BI-NBR	ES	24120646
ISO	45	55	16	3	C closed	BI-FKM	ESV	24220000
	45	60	16,5	5	C closed	BI-NBR	ES	24062175
	45	60	16,5	5	C closed	BI-FKM	ESV	24149108
	45	60	22,5	5	C closed	BI-NBR	ES	24070189
	45	60	22,5	5	C closed	BI-FKM	ESV	24138993
ISO	45	60	25	5	C closed	BI-NBR	ES	24327285
ISO	45	60	25	5	C closed	BI-FKM	ESV	24220001
ISO	50	60	16	3	C closed	BI-NBR	ES	24120647
ISO	50	60	16	3	C closed	BI-FKM	ESV	24220002
	50	65	16,5	5	C closed	BI-NBR	ES	24062178
	50	65	16,5	5	C closed	BI-FKM	ESV	24186958

Further dimensions are available on request.



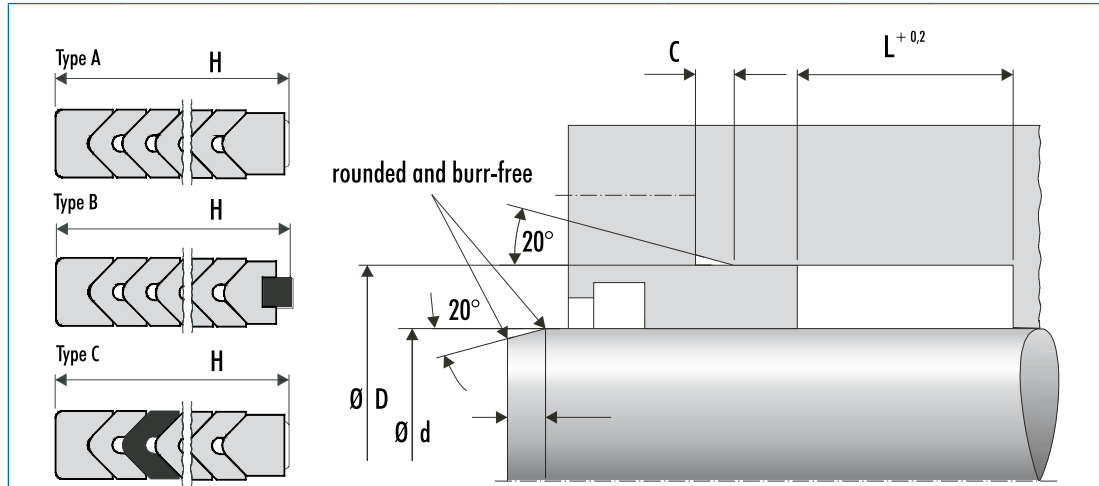
Housing	d	D	L	C	Type	Material	Type	Article No.
	50	65	22,5	5	C closed	BI-NBR	ES	24070190
	50	65	22,5	5	C closed	BI-FKM	ESV	24139074
ISO	50	65	25	5	C closed	BI-NBR	ES	24327284
ISO	50	65	25	5	C closed	BI-FKM	ESV	24220003
	55	70	16,5	5	C closed	BI-NBR	ES	24063126
	55	70	16,5	5	C closed	BI-FKM	ESV	24194608
	55	70	22,5	5	C closed	BI-NBR	ES	24070191
	55	70	22,5	5	C closed	BI-FKM	ESV	24129136
	55	75	30	5	C closed	BI-FKM	ESV	24139318
	56	71	16,5	5	C closed	BI-NBR	ES	24112157
	56	71	16,5	5	C closed	BI-FKM	ESV	24149111
	56	71	22,5	5	C closed	BI-NBR	ES	24070192
	56	71	22,5	5	C closed	BI-FKM	ESV	24139076
ISO	56	71	25	5	C closed	BI-NBR	ES	24327283
ISO	56	71	25	5	C closed	BI-FKM	ESV	24220004
ISO	56	76	32	5	C closed	BI-NBR	ES	24220054
ISO	56	76	32	5	C closed	BI-FKM	ESV	24220005
	56	76	37	5	C closed	BI-FKM	ESV	24139131
	60	75	16,5	5	C closed	BI-NBR	ES	24062181
	60	75	16,5	5	C closed	BI-FKM	ESV	24194385
	60	75	22,5	5	C closed	BI-NBR	ES	24070193
	60	75	22,5	5	C closed	BI-FKM	ESV	24148038
	60	80	37	5	C closed	BI-FKM	ESV	24103349
	63	78	16,5	5	C closed	BI-NBR	ES	24114075
	63	78	16,5	5	C closed	BI-FKM	ESV	24220006
	63	78	22,5	5	C closed	BI-NBR	ES	24070194
	63	78	22,5	5	C closed	BI-FKM	ESV	24148039
ISO	63	78	25	5	C closed	BI-NBR	ES	24327282
ISO	63	78	25	5	C closed	BI-FKM	ESV	24220007
ISO	63	83	32	5	C closed	BI-NBR	ES	24220056
ISO	63	83	32	5	C closed	BI-FKM	ESV	24220008

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	65	80	16,5	5	C closed	BI-NBR	ES	24062183
	65	80	16,5	5	C closed	BI-FKM	ESV	24220009
	65	80	22,5	5	C closed	BI-NBR	ES	24070195
	65	80	22,5	5	C closed	BI-FKM	ESV	24139077
	70	85	16,5	5	C closed	BI-NBR	ES	24062188
	70	85	16,5	5	C closed	BI-FKM	ESV	24144001
	70	85	22,5	5	C closed	BI-NBR	ES	24070196
	70	85	22,5	5	C closed	BI-FKM	ESV	24138992
ISO	70	85	25	5	C closed	BI-NBR	ES	24327280
ISO	70	85	25	5	C closed	BI-FKM	ESV	24220010
ISO	70	90	32	5	C closed	BI-NBR	ES	24220058
ISO	70	90	32	5	C closed	BI-FKM	ESV	24220011
	70	90	40	5	C closed	BI-FKM	ESV	24104730
	75	90	16,5	5	C closed	BI-NBR	ES	24061639
	75	90	16,5	5	C closed	BI-FKM	ESV	24220012
	75	90	22,5	5	C closed	BI-NBR	ES	24070197
	75	90	22,5	5	C closed	BI-FKM	ESV	24148040
	80	95	16,5	5	C closed	BI-NBR	ES	24062194
	80	95	16,5	5	C closed	BI-FKM	ESV	24149110
	80	95	22,5	5	C closed	BI-NBR	ES	24070198
	80	95	22,5	5	C closed	BI-FKM	ESV	24139078
ISO	80	95	25	5	C closed	BI-NBR	ES	24060905
ISO	80	95	25	5	C closed	BI-FKM	ESV	24220013
ISO	80	100	32	5	C closed	BI-NBR	ES	24220060
ISO	80	100	32	5	C closed	BI-FKM	ESV	24220014
	80	100	40	5	C closed	BI-FKM	ESV	24104763
	85	100	16,5	5	C closed	BI-NBR	ES	24078907
	85	100	16,5	5	C closed	BI-FKM	ESV	24194607
	85	100	22,5	5	C closed	BI-NBR	ES	24070199
	85	100	22,5	5	C closed	BI-FKM	ESV	24106403
	90	105	22,5	5	C closed	BI-FKM	ESV	24138991
ISO	90	105	25	5	C closed	BI-FKM	ESV	24220015
	90	110	30	5	C closed	BI-NBR	ES	24062197
	90	110	30	5	C closed	BI-FKM	ESV	24194606
ISO	90	110	32	5	C closed	BI-NBR	ES	24220061
ISO	90	110	32	5	C closed	BI-FKM	ESV	24220016
	90	110	40	5	C closed	BI-NBR	ES	24070231
	90	110	40	5	C closed	BI-FKM	ESV	24119600
	100	115	30	5	C closed	BI-FKM	ESV	24099496
	100	120	30	5	C closed	BI-NBR	ES	24062201
	100	120	30	5	C closed	BI-FKM	ESV	24220017
ISO	100	120	32	5	C closed	BI-NBR	ES	24126541
ISO	100	120	32	5	C closed	BI-FKM	ESV	24220018
	100	120	39	5	C closed	BI-NBR	ES	24132386
	100	120	40	5	C closed	BI-FKM	ESV	24104764
ISO	100	125	40	7,5	C closed	BI-NBR	ES	24220062

Further dimensions are available on request.



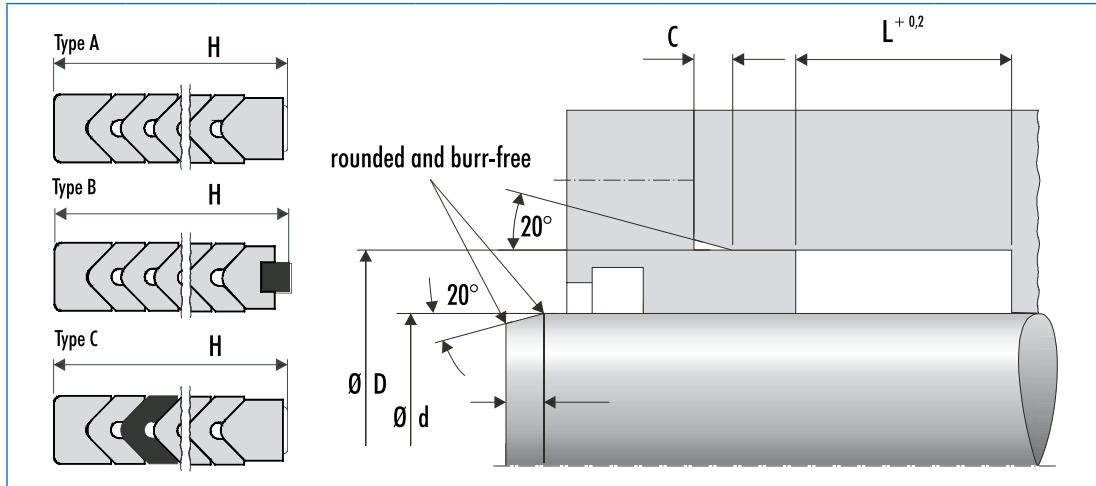
Housing	d	D	L	C	Type	Material	Type	Article No.
ISO	100	125	40	7,5	C closed	BI-FKM	ESV	24220019
	110	125	30	5	C closed	BI-FKM	ESV	24099500
	110	130	30	5	C closed	BI-NBR	ES	24062205
	110	130	30	5	C closed	BI-FKM	ESV	24220020
ISO	110	130	32	5	C closed	BI-NBR	ES	24220063
ISO	110	130	32	5	C closed	BI-FKM	ESV	24220021
	110	130	40	5	C closed	BI-NBR	ES	24070233
	110	130	40	5	C closed	BI-FKM	ESV	24107792
ISO	110	135	40	7,5	C closed	BI-NBR	ES	24220064
ISO	110	135	40	7,5	C closed	BI-FKM	ESV	24220022
	115	140	34	7,5	C closed	BI-NBR	ES	24081735
	115	140	34	7,5	C closed	BI-FKM	ESV	24220023
	115	140	46	7,5	C closed	BI-NBR	ES	24070234
	115	140	46	7,5	C closed	BI-FKM	ESV	24119599
	125	140	34	7,5	C closed	BI-FKM	ESV	24139062
ISO	125	145	32	5	C closed	BI-NBR	ES	24220065
ISO	125	145	32	5	C closed	BI-FKM	ESV	24220024
	125	150	34	7,5	C closed	BI-NBR	ES	24062207
	125	150	34	7,5	C closed	BI-FKM	ESV	24220025
ISO	125	150	40	7,5	C closed	BI-NBR	ES	24220066
ISO	125	150	40	7,5	C closed	BI-FKM	ESV	24220026
	125	150	46	7,5	C closed	BI-NBR	ES	24070235
	125	150	46	7,5	C closed	BI-FKM	ESV	24139162
	140	155	34	7,5	C closed	BI-FKM	ESV	24139063
ISO	140	160	32	5	C closed	BI-NBR	ES	24194357
ISO	140	160	32	5	C closed	BI-FKM	ESV	24220027
	140	165	34	7,5	C closed	BI-NBR	ES	24220067
	140	165	34	7,5	C closed	BI-FKM	ESV	24220028
ISO	140	165	40	7,5	C closed	BI-NBR	ES	24220068
ISO	140	165	40	7,5	C closed	BI-FKM	ESV	24220029
	140	165	46	7,5	C closed	BI-NBR	ES	24070236

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	140	165	46	7,5	C closed	BI-FKM	ESV	24139305
	150	180	45	7,5	A closed	BI-NBR	ES	24061736
	150	180	45	7,5	A closed	BI-FKM	ESV	24220030
	150	180	60	7,5	A closed	BI-NBR	ES	24070237
	150	180	60	7,5	A open	BI-NBR	ES	24170282
	150	180	60	7,5	A closed	BI-FKM	ESV	24148030
	160	180	40	7,5	A closed	BI-FKM	ESV	24139064
ISO	160	185	40	7,5	A closed	BI-NBR	ES	24220069
ISO	160	185	40	7,5	A closed	BI-FKM	ESV	24220031
	160	190	45	7,5	A closed	BI-NBR	ES	24061737
	160	190	45	7,5	A closed	BI-FKM	ESV	24220032
ISO	160	190	50	7,5	A closed	BI-FKM	ESV	24220033
	160	190	60	7,5	A closed	BI-NBR	ES	24070238
	160	190	60	7,5	A open	BI-NBR	ES	24087331
	160	190	60	7,5	A closed	BI-FKM	ESV	24107183
	180	200	40	7,5	A closed	BI-FKM	ESV	24143887
ISO	180	205	40	7,5	A closed	BI-NBR	ES	24220071
ISO	180	205	40	7,5	A closed	BI-FKM	ESV	24220034
	180	210	45	7,5	A closed	BI-NBR	ES	24061739
	180	210	45	7,5	A closed	BI-FKM	ESV	24149739
ISO	180	210	50	7,5	A closed	BI-NBR	ES	24131959
ISO	180	210	50	7,5	A closed	BI-FKM	ESV	24220035
	180	210	60	7,5	A closed	BI-NBR	ES	24070239
	180	210	60	7,5	A closed	BI-FKM	ESV	24139298
	190	220	60,5	7,5	A closed	BI-FKM	ESV	533505
ISO	200	225	40	7,5	A closed	BI-NBR	ES	24220072
	200	230	45	7,5	A closed	BI-NBR	ES	24064261
	200	230	45	7,5	A closed	BI-FKM	ESV	24173014
ISO	200	230	50	7,5	A closed	BI-NBR	ES	24076302
ISO	200	230	50	7,5	A closed	BI-FKM	ESV	24220037
	200	230	50,5	7,5	A open	BI-NBR	ES	24218873
	200	230	50,5	7,5	A closed	BI-NBR	ES	24219156
ISO	200	230	51,5	7,5	B open	BI-NBR	ES	24145843
	200	230	52	7,5	B closed	BI-NBR	ES	24218713
	200	230	60	7,5	A closed	BI-NBR	ES	24070240
	200	230	60	7,5	B open	BI-NBR	ES	24079136
	200	230	60	7,5	A open	BI-NBR	ES	24135050
	200	230	60	7,5	A closed	BI-FKM	ESV	24107185
	200	230	61,5	7,5	B closed	BI-NBR	ES	24146349
ISO	220	250	50	7,5	A closed	BI-NBR	ES	24061745
	220	250	50,5	7,5	A open	BI-NBR	ES	24114136
	220	250	50,5	7,5	A closed	BI-NBR	ES	24219165
	220	250	52	7,5	B open	BI-NBR	ES	24218512
	220	250	52	7,5	B closed	BI-NBR	ES	24218722
	220	250	60	7,5	A closed	BI-NBR	ES	24063737
	220	250	60	7,5	A open	BI-NBR	ES	24218891

Further dimensions are available on request.



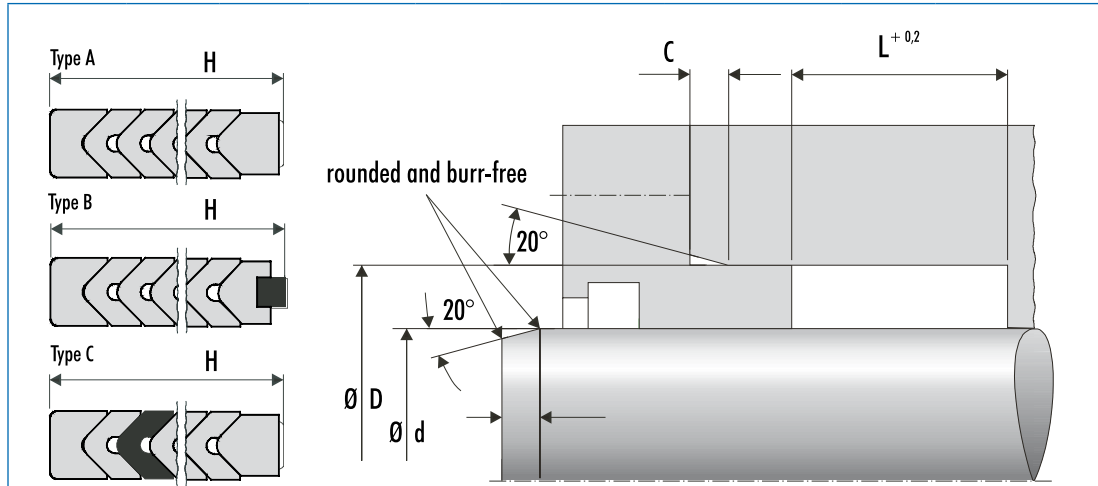
Housing	d	D	L	C	Type	Material	Type	Article No.
	220	250	61,5	7,5	B closed	BI-NBR	ES	24100511
	220	250	61,5	7,5	B open	BI-NBR	ES	24114159
	225	255	50,5	7,5	A closed	BI-NBR	ES	24100216
	225	255	50,5	7,5	A open	BI-NBR	ES	24218892
	225	255	60	7,5	A closed	BI-NBR	ES	24067706
	225	255	60	7,5	A open	BI-NBR	ES	24218895
	225	255	61,5	7,5	B closed	BI-NBR	ES	24064015
	225	255	61,5	7,5	B open	BI-NBR	ES	24218517
	240	270	50,5	7,5	A open	BI-NBR	ES	24218903
	240	270	50,5	7,5	A closed	BI-NBR	ES	24219174
	240	270	52	7,5	B open	BI-NBR	ES	24218522
	240	270	52	7,5	B closed	BI-NBR	ES	24218734
	240	270	60	7,5	A closed	BI-NBR	ES	24061635
	240	270	60	7,5	A open	BI-NBR	ES	24177276
	240	270	61,5	7,5	B closed	BI-NBR	ES	24083267
	240	270	61,5	7,5	B open	BI-NBR	ES	24083524
	250	280	50,5	7,5	A closed	BI-NBR	ES	24100419
	250	280	50,5	7,5	A open	BI-NBR	ES	24218910
	250	280	52	7,5	B open	BI-NBR	ES	24218527
	250	280	52	7,5	B closed	BI-NBR	ES	24218737
	250	280	60	7,5	A closed	BI-NBR	ES	24061638
	250	280	60	7,5	A open	BI-NBR	ES	24218913
	250	280	61,5	7,5	B closed	BI-NBR	ES	24104086
	250	280	61,5	7,5	B open	BI-NBR	ES	24218529
	260	290	50,5	7,5	A closed	BI-NBR	ES	24067374
	260	290	50,5	7,5	A open	BI-NBR	ES	24218917
	260	290	52	7,5	B open	BI-NBR	ES	24218534
	260	290	52	7,5	B closed	BI-NBR	ES	24218739
	260	290	60	7,5	A open	BI-NBR	ES	24218920
	260	290	60	7,5	A closed	BI-NBR	ES	24219178

Further dimensions are available on request.



	260	290	61,5	7,5	B closed	BI-NBR	ES	24101540
	260	290	61,5	7,5	B open	BI-NBR	ES	24218537
	280	310	50,5	7,5	A closed	BI-NBR	ES	24219179
	280	310	60	7,5	A closed	BI-NBR	ES	24066929
	280	310	60	7,5	A open	BI-NBR	ES	24218933
	280	310	61,5	7,5	B closed	BI-NBR	ES	24064013
	280	310	61,5	7,5	B open	BI-NBR	ES	24071155
	280	320	80	10	A closed	BI-NBR	ES	24072791
	280	320	80	10	A open	BI-NBR	ES	24114214
	280	320	81,5	10	B closed	BI-NBR	ES	24113699
	280	320	81,5	10	B open	BI-NBR	ES	24121893
	300	330	50,5	7,5	A open	BI-NBR	ES	24218941
	300	330	52	7,5	B open	BI-NBR	ES	24121478
	300	330	58	7,5	A closed	BI-NBR	ES	24074670
	300	330	60	7,5	A open	BI-NBR	ES	24218944
	300	330	61,5	7,5	B open	BI-NBR	ES	24071159
	300	340	80	10	A closed	BI-NBR	ES	24073340
	300	340	80	10	A open	BI-NBR	ES	24078123
	300	340	81,5	10	B closed	BI-NBR	ES	24066737
	300	340	81,5	10	B open	BI-NBR	ES	24114599
	320	350	50,5	7,5	A open	BI-NBR	ES	24218956
	320	350	52	7,5	B open	BI-NBR	ES	24218559
	320	350	60	7,5	A open	BI-NBR	ES	24218959
	320	350	61,5	7,5	B open	BI-NBR	ES	24071163
ISO	320	360	64,5	10	B open	BI-NBR	ES	24145831
	320	360	80	10	A closed	BI-NBR	ES	24066450
	320	360	80	10	A open	BI-NBR	ES	24218961
	320	360	81,5	10	B closed	BI-NBR	ES	24084628
	320	360	81,5	10	B open	BI-NBR	ES	24111755
	340	370	50,5	7,5	A open	BI-NBR	ES	24099882
	340	370	52	7,5	B open	BI-NBR	ES	24218566
	340	370	58	7,5	A open	BI-NBR	ES	24081906
	340	370	60	7,5	A open	BI-NBR	ES	24218968
	340	380	80	10	A closed	BI-NBR	ES	24063605
	340	380	80	10	A open	BI-NBR	ES	24218969
	340	380	81,5	10	B closed	BI-NBR	ES	24069050
	340	380	81,5	10	B open	BI-NBR	ES	24148207
	360	390	50,5	7,5	A open	BI-NBR	ES	24218979
	360	390	50,5	7,5	A closed	BI-NBR	ES	24087305
	360	390	52	7,5	B open	BI-NBR	ES	24218577
	360	390	58	7,5	A closed	BI-NBR	ES	24097554
	360	390	60	7,5	A open	BI-NBR	ES	24218982
	360	390	60	7,5	A closed	BI-NBR	ES	24219196
	360	390	61,5	7,5	B open	BI-NBR	ES	24073530
	360	390	61,5	7,5	B closed	BI-NBR	ES	24218775

Further dimensions are available on request.



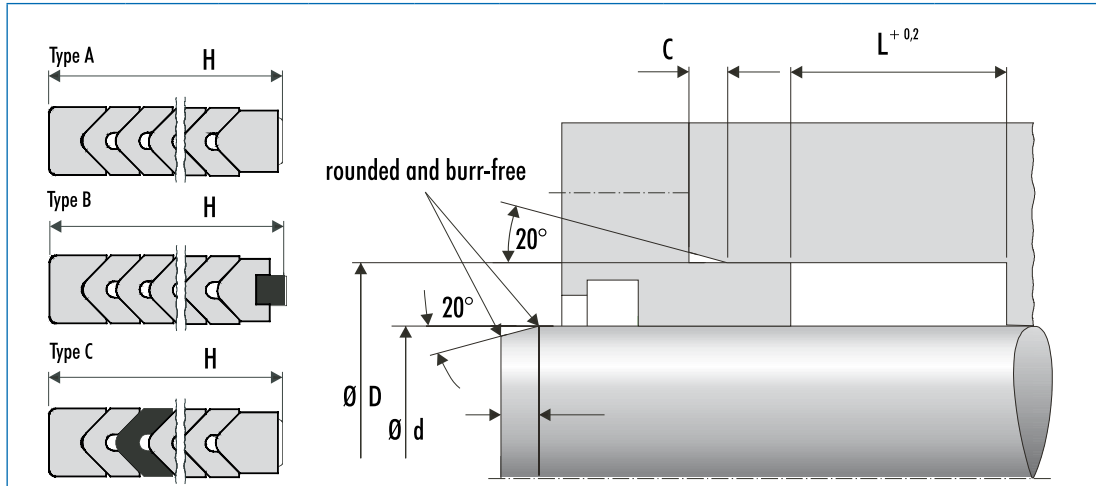
Housing	d	D	L	C	Type	Material	Type	Article No.
ISO	360	400	64,5	10	B open	BI-NBR	ES	24145834
	360	400	80	10	A closed	BI-NBR	ES	24061644
	360	400	80	10	A open	BI-NBR	ES	24084039
	360	400	81,5	10	B closed	BI-NBR	ES	24068143
	360	400	81,5	10	B open	BI-NBR	ES	24123407
	370	400	50,5	7,5	A open	BI-NBR	ES	24218984
	370	400	52	7,5	B open	BI-NBR	ES	24218580
	370	400	60	7,5	A open	BI-NBR	ES	24218987
	370	400	61,5	7,5	B open	BI-NBR	ES	24107401
	370	410	80	10	A closed	BI-NBR	ES	24099626
	370	410	80	10	A open	BI-NBR	ES	24218989
	370	410	81,5	10	B open	BI-NBR	ES	24097789
	370	410	81,5	10	B closed	BI-NBR	ES	24194332
	380	410	50,5	7,5	A open	BI-NBR	ES	24218990
	380	410	60	7,5	A open	BI-NBR	ES	24218993
	380	410	61,5	7,5	B open	BI-NBR	ES	24213225
	380	420	80	10	A closed	BI-NBR	ES	24069067
	380	420	81,5	10	B closed	BI-NBR	ES	24069165
	390	420	50,5	7,5	A open	BI-NBR	ES	24218996
	390	420	52	7,5	B open	BI-NBR	ES	24218588
	390	420	60	7,5	A open	BI-NBR	ES	24187142
	390	420	61,5	7,5	B open	BI-NBR	ES	24126556
	390	430	80	10	A open	BI-NBR	ES	24145527
	390	430	81,5	10	B open	BI-NBR	ES	24100035
	400	430	50,5	7,5	A open	BI-NBR	ES	24219000
	400	430	50,5	7,5	A closed	BI-NBR	ES	24219197
	400	430	52,5	7,5	A open	BI-NBR	ES	24198468
	400	430	52,5	7,5	A closed	BI-NBR	ES	24219198
	400	430	60	7,5	A open	BI-NBR	ES	24087212
	400	430	60	7,5	A closed	BI-NBR	ES	24219200
	400	430	61,5	7,5	B open	BI-NBR	ES	24071209

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	400	430	61,5	7,5	B closed	BI-NBR	ES	24087903
	400	440	70	10	A open	BI-NBR	ES	24219002
	400	440	70	10	A closed	BI-NBR	ES	24219201
	400	440	79	10	A closed	BI-NBR	ES	24219202
	400	440	80	10	A closed	BI-NBR	ES	24071557
	400	440	80	10	A open	BI-NBR	ES	24219004
	400	440	81,5	10	B closed	BI-NBR	ES	24086147
	400	440	81,5	10	B open	BI-NBR	ES	24113319
	400	440	89	10	A closed	BI-NBR	ES	24219203
	400	440	90,5	10	B open	BI-NBR	ES	24218593
	410	440	52,5	7,5	A open	BI-NBR	ES	24219006
	410	440	54	7,5	B open	BI-NBR	ES	24218594
	410	440	60	7,5	A open	BI-NBR	ES	24219007
	410	440	61,5	7,5	B open	BI-NBR	ES	24116167
	410	445	60	10	A closed	BI-NBR	ES	24114451
	410	450	70	10	A closed	BI-NBR	ES	24108466
	410	450	70	10	A open	BI-NBR	ES	24219008
	410	450	71,5	10	B closed	BI-NBR	ES	24140331
	410	450	71,5	10	B open	BI-NBR	ES	24218595
	410	450	79	10	A open	BI-NBR	ES	24219009
	410	450	79	10	A closed	BI-NBR	ES	24219204
	410	450	80	10	A closed	BI-NBR	ES	24196025
	410	450	80	10	A open	BI-NBR	ES	24219010
	410	450	80,5	10	B open	BI-NBR	ES	24218596
	410	450	80,5	10	B closed	BI-NBR	ES	24218780
	410	450	81,5	10	B open	BI-NBR	ES	24136066
	410	450	81,5	10	B closed	BI-NBR	ES	24218781
	410	450	89	10	A open	BI-NBR	ES	24219011
	410	450	89	10	A closed	BI-NBR	ES	24219205
	410	450	90,5	10	B closed	BI-NBR	ES	24218782
	410	450	90,5	10	B open	BI-NBR	ES	24218597
	415	455	61,5	10	B open	BI-NBR	ES	24267389
	415	455	81,5	10	B open	BI-NBR	ES	24128991
	420	450	52,5	7,5	A open	BI-NBR	ES	24219012
	420	450	54	7,5	B open	BI-NBR	ES	24218598
	420	450	60	7,5	A open	BI-NBR	ES	24219013
	420	450	61,5	7,5	B open	BI-NBR	ES	24071213
	420	460	60	10	A closed	BI-NBR	ES	24098516
	420	460	60	10	A open	BI-NBR	ES	24289410
	420	460	70	10	A closed	BI-NBR	ES	24109496
	420	460	70	10	A open	BI-NBR	ES	24134937
	420	460	71,5	10	B open	BI-NBR	ES	24069492
	420	460	71,5	10	B closed	BI-NBR	ES	24074765
	420	460	79	10	A open	BI-NBR	ES	24219014
	420	460	79	10	A closed	BI-NBR	ES	24219206
	420	460	80	10	A closed	BI-NBR	ES	24077332

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	420	460	80	10	A open	BI-NBR	ES	24219015
	420	460	80,5	10	B open	BI-NBR	ES	24218599
	420	460	80,5	10	B closed	BI-NBR	ES	24218783
	420	460	81,5	10	B open	BI-NBR	ES	24129597
	420	460	81,5	10	B closed	BI-NBR	ES	24218784
	420	460	81,5	10	B closed	BI-NBR	ES	24218785
	420	460	89	10	A open	BI-NBR	ES	24219016
	420	460	89	10	A closed	BI-NBR	ES	24219207
	420	460	90,5	10	B open	BI-NBR	ES	24218600
	425	465	70	10	A open	BI-NBR	ES	24090496
	425	465	71,5	10	B open	BI-NBR	ES	24121155
	425	465	81,5	10	B open	BI-NBR	ES	24083265
	430	460	52,5	7,5	A open	BI-NBR	ES	24219017
	430	460	54	7,5	B open	BI-NBR	ES	24218601
	430	460	60	7,5	A open	BI-NBR	ES	24219018
	430	460	61,5	7,5	B open	BI-NBR	ES	24218602
	430	470	60	10	A open	BI-NBR	ES	24298359
	430	470	61,5	10	B open	BI-NBR	ES	24082970
	430	470	70	10	A open	BI-NBR	ES	24219019
	430	470	71,5	10	B open	BI-NBR	ES	24177234
	430	470	79	10	A open	BI-NBR	ES	24219020
	430	470	80	10	A open	BI-NBR	ES	24219021
	430	470	80,5	10	B open	BI-NBR	ES	24218603
	430	470	81,5	10	B open	BI-NBR	ES	24097838
	430	470	89	10	A open	BI-NBR	ES	24219022
	430	470	90,5	10	B open	BI-NBR	ES	24218604
	440	470	52,5	7,5	A open	BI-NBR	ES	24219023
	440	470	54	7,5	B open	BI-NBR	ES	24218605
	440	470	60	7,5	A open	BI-NBR	ES	24219024
	440	470	61,5	7,5	B open	BI-NBR	ES	24218606
	440	480	60	10	A closed	BI-NBR	ES	24072171

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	440	480	61,5	10	B closed	BI-NBR	ES	24148125
	440	480	70	10	A closed	BI-NBR	ES	24099123
	440	480	70	10	A open	BI-NBR	ES	24219025
	440	480	71,5	10	B closed	BI-NBR	ES	24137057
	440	480	71,5	10	B open	BI-NBR	ES	24218607
	440	480	79	10	A open	BI-NBR	ES	24219026
	440	480	79	10	A closed	BI-NBR	ES	24219208
	440	480	80	10	A closed	BI-NBR	ES	24073676
	440	480	80	10	A open	BI-NBR	ES	24219027
	440	480	80,5	10	B open	BI-NBR	ES	24218608
	440	480	80,5	10	B closed	BI-NBR	ES	24218786
	440	480	81,5	10	B open	BI-NBR	ES	24104141
	440	480	81,5	10	B closed	BI-NBR	ES	24218787
	440	480	89	10	A open	BI-NBR	ES	24219028
	440	480	89	10	A closed	BI-NBR	ES	24219209
	440	480	90,5	10	B open	BI-NBR	ES	24218609
	440	480	90,5	10	B closed	BI-NBR	ES	24218788
	450	480	52,5	7,5	A open	BI-NBR	ES	24219029
	450	480	54	7,5	B open	BI-NBR	ES	24218610
	450	480	60	7,5	A open	BI-NBR	ES	24219030
	450	480	60	10	A closed	BI-FKM	ESV	49008946
	450	480	61,5	7,5	B open	BI-NBR	ES	24218611
	450	490	60	10	A closed	BI-NBR	ES	24071968
	450	490	60	10	A open	BI-NBR	ES	24082110
	450	490	61,5	10	B closed	BI-NBR	ES	24083442
	450	490	61,5	10	B open	BI-NBR	ES	24287165
	450	490	70	10	A open	BI-NBR	ES	24072716
	450	490	70	10	A closed	BI-NBR	ES	24114458
	450	490	71,5	10	B open	BI-NBR	ES	24149535
	450	490	71,5	10	B closed	BI-NBR	ES	24218789
	450	490	79	10	A closed	BI-NBR	ES	24144269
	450	490	79	10	A open	BI-NBR	ES	24219031
	450	490	80	10	A closed	BI-NBR	ES	24066931
	450	490	80	10	A open	BI-NBR	ES	24089042
	450	490	80,5	10	B open	BI-NBR	ES	24218612
	450	490	80,5	10	B closed	BI-NBR	ES	24218790
	450	490	81,5	10	B open	BI-NBR	ES	24075890
	450	490	81,5	10	B closed	BI-NBR	ES	24087320
	450	490	89	10	A open	BI-NBR	ES	24219032
	450	490	89	10	A closed	BI-NBR	ES	24219210
	450	490	90,5	10	B open	BI-NBR	ES	24021861
	450	490	90,5	10	B closed	BI-NBR	ES	24218791
	460	490	52,5	7,5	A open	BI-NBR	ES	24219033
	460	490	52,5	7,5	A closed	BI-NBR	ES	24219211
	460	490	54	7,5	B open	BI-NBR	ES	24218614
	460	490	54	7,5	B closed	BI-NBR	ES	24218792

Further dimensions are available on request.

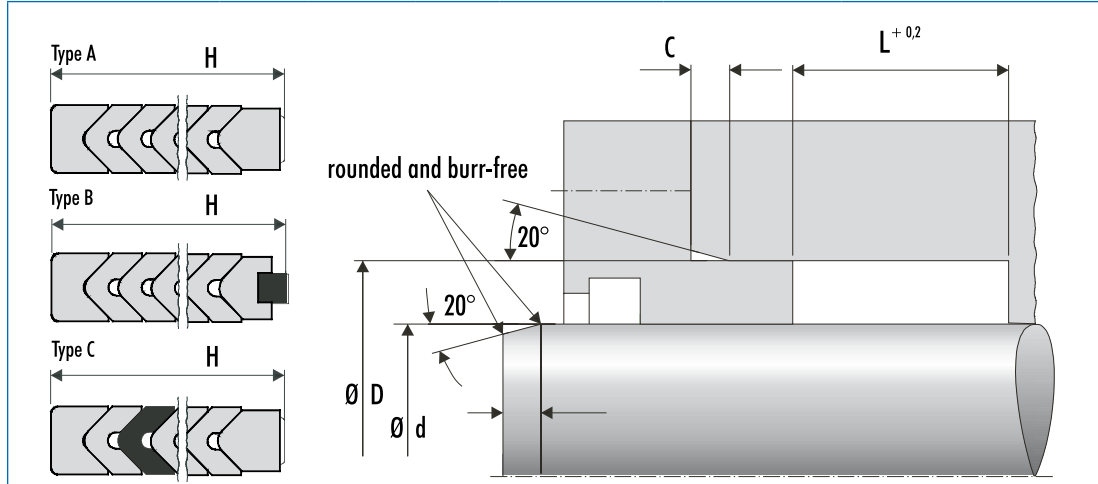
Housing	d	D	L	C	Type	Material	Type	Article No.
	460	490	60	7,5	A open	BI-NBR	ES	24219034
	460	490	60	7,5	A closed	BI-NBR	ES	24219212
	460	490	61,5	7,5	B open	BI-NBR	ES	24218615
	460	490	61,5	7,5	B closed	BI-NBR	ES	24218793
	460	500	60	10	A closed	BI-NBR	ES	24235023
	460	500	60	10	A open	BI-NBR	ES	24355016
	460	500	70	10	A open	BI-NBR	ES	24219035
	460	500	70	10	A closed	BI-NBR	ES	24219213
	460	500	71,5	10	B open	BI-NBR	ES	24135172
	460	500	71,5	10	B closed	BI-NBR	ES	24148439
	460	500	79	10	A closed	BI-NBR	ES	24138356
	460	500	79	10	A open	BI-NBR	ES	24219036
	460	500	80	10	A open	BI-NBR	ES	24219037
	460	500	80	10	A closed	BI-NBR	ES	24219214
	460	500	80,5	10	B open	BI-NBR	ES	24218616
	460	500	80,5	10	B closed	BI-NBR	ES	24218794
	460	500	81,5	10	B closed	BI-NBR	ES	24076722
	460	500	81,5	10	B open	BI-NBR	ES	24188047
	460	500	89	10	A closed	BI-NBR	ES	24079459
	460	500	89	10	A open	BI-NBR	ES	24219038
	460	500	90,5	10	B open	BI-NBR	ES	24218617
	460	500	90,5	10	B closed	BI-NBR	ES	24218795
	470	500	52,5	7,5	A open	BI-NBR	ES	24219043
	470	500	54	7,5	B open	BI-NBR	ES	24218622
	470	500	60	7,5	A closed	BI-NBR	ES	24114088
	470	500	61,5	7,5	B open	BI-NBR	ES	24218623
	470	500	61,5	7,5	B closed	BI-NBR	ES	24218799
	470	510	60	10	A closed	BI-NBR	ES	24077623
	470	510	60	10	A open	BI-NBR	ES	24328827
	470	510	61,5	10	B closed	BI-NBR	ES	24261800
	470	510	70	10	A closed	BI-NBR	ES	24086461
	470	510	71,5	10	B open	BI-NBR	ES	24218624

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	470	510	71,5	10	B closed	BI-NBR	ES	24218800
	470	510	79	10	A open	BI-NBR	ES	24219046
	470	510	79	10	A closed	BI-NBR	ES	24219219
	470	510	80	10	A closed	BI-NBR	ES	24086152
	470	510	80	10	A open	BI-NBR	ES	24102327
	470	510	80,5	10	B open	BI-NBR	ES	24218625
	470	510	80,5	10	B closed	BI-NBR	ES	24218801
	470	510	81,5	10	B closed	BI-NBR	ES	24073484
	470	510	81,5	10	B open	BI-NBR	ES	24218626
	470	510	89	10	A closed	BI-NBR	ES	24219220
	470	510	90,5	10	B open	BI-NBR	ES	24218627
	470	510	90,5	10	B closed	BI-NBR	ES	24218802
	470	520	102	12,5	B open	BI-NBR	ES	24195501
	475	505	61,5	7,5	B open	BI-NBR	ES	24350425
	475	515	61,5	10	B open	BI-NBR	ES	24266457
	475	515	71,5	10	B open	BI-NBR	ES	24191587
	475	515	81,5	10	B open	BI-NBR	ES	24076698
	480	510	52,5	7,5	A open	BI-NBR	ES	24219048
	480	510	54	7,5	B open	BI-NBR	ES	24218628
	480	510	60	7,5	A open	BI-NBR	ES	24219049
	480	510	61,5	7,5	B open	BI-NBR	ES	24218629
	480	520	60	10	A closed	BI-NBR	ES	24067704
	480	520	61,5	10	B closed	BI-NBR	ES	24234854
	480	520	70	10	A closed	BI-NBR	ES	24105043
	480	520	70	10	A open	BI-NBR	ES	24219050
	480	520	71,5	10	B open	BI-NBR	ES	24088276
	480	520	71,5	10	B closed	BI-NBR	ES	24218803
	480	520	79	10	A open	BI-NBR	ES	24219051
	480	520	79	10	A closed	BI-NBR	ES	24219221
	480	520	80	10	A closed	BI-NBR	ES	24073331
	480	520	80	10	A open	BI-NBR	ES	24219052
	480	520	80,5	10	B open	BI-NBR	ES	24218630
	480	520	80,5	10	B closed	BI-NBR	ES	24218804
	480	520	81,5	10	B open	BI-NBR	ES	24083647
	480	520	81,5	10	B closed	BI-NBR	ES	24097319
	480	520	89	10	A open	BI-NBR	ES	24219053
	480	520	89	10	A closed	BI-NBR	ES	24219222
	480	520	90,5	10	B open	BI-NBR	ES	24218631
	480	520	90,5	10	B closed	BI-NBR	ES	24218805
	490	520	52,5	7,5	A open	BI-NBR	ES	24219054
	490	520	54	7,5	B open	BI-NBR	ES	24218632
	490	520	60	7,5	A open	BI-NBR	ES	24219055
	490	520	61,5	7,5	B open	BI-NBR	ES	24149532
	490	530	70	10	A open	BI-NBR	ES	24219056
	490	530	71,5	10	B open	BI-NBR	ES	24218633
	490	530	71,5	10	B closed	BI-NBR	ES	24218806
	490	530	79	10	A open	BI-NBR	ES	24219057

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	490	530	80	10	A open	BI-NBR	ES	24219058
	490	530	80,5	10	B open	BI-NBR	ES	24218634
	490	530	80,5	10	B closed	BI-NBR	ES	24218807
	490	530	81,5	10	B open	BI-NBR	ES	24077972
	490	530	81,5	10	B closed	BI-NBR	ES	24218808
	490	530	89	10	A open	BI-NBR	ES	24219059
	490	530	90,5	10	B open	BI-NBR	ES	24218635
	490	530	90,5	10	B closed	BI-NBR	ES	24218809
	500	530	54	7,5	B open	BI-NBR	ES	24135092
	500	540	60	10	A closed	BI-NBR	ES	24073680
	500	540	60	10	A open	BI-NBR	ES	24289408
	500	540	61,5	10	B closed	BI-NBR	ES	24101974
	500	540	70	10	A closed	BI-NBR	ES	24078095
	500	540	70	10	A open	BI-NBR	ES	24219060
	500	540	71,5	10	B open	BI-NBR	ES	24071463
	500	540	71,5	10	B closed	BI-NBR	ES	24122836
	500	540	79	10	A open	BI-NBR	ES	24219061
	500	540	79	10	A closed	BI-NBR	ES	24219223
	500	540	80	10	A open	BI-NBR	ES	24069526
	500	540	80	10	A closed	BI-NBR	ES	24075177
	500	540	80,5	10	B open	BI-NBR	ES	24218636
	500	540	80,5	10	B closed	BI-NBR	ES	24232446
	500	540	81,5	10	B closed	BI-NBR	ES	24084839
	500	540	81,5	10	B open	BI-NBR	ES	24089167
	500	540	89	10	A open	BI-NBR	ES	24219062
	500	540	89	10	A closed	BI-NBR	ES	24219224
	500	540	90,5	10	B open	BI-NBR	ES	24218637
	500	540	90,5	10	B closed	BI-NBR	ES	24218810
	500	550	100	12,5	A open	BI-NBR	ES	24219064
	500	550	102	10	B closed	BI-NBR	ES	24021863

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	510	550	61,5	10	B open	BI-NBR	ES	24124812
	510	550	70	10	A open	BI-NBR	ES	24111575
	510	550	70	10	A closed	BI-NBR	ES	24266458
	510	550	71,5	10	B open	BI-NBR	ES	24087359
	510	550	81,5	10	B closed	BI-NBR	ES	24287922
	510	560	100	12,5	A closed	BI-NBR	ES	24082070
	510	560	100	12,5	A open	BI-NBR	ES	24219068
	510	560	102	12,5	B closed	BI-NBR	ES	24124279
	510	560	102	12,5	B open	BI-NBR	ES	24218642
	520	550	60	7,5	A open	BI-NBR	ES	24246917
	520	560	61,5	10	B open	BI-NBR	ES	24250502
	520	560	70	10	A open	BI-NBR	ES	24219069
	520	560	71,5	10	B open	BI-NBR	ES	24098086
	520	560	80	10	A open	BI-NBR	ES	24080048
	520	560	81,5	10	B open	BI-NBR	ES	24096048
	520	570	100	12,5	A open	BI-NBR	ES	24183857
	520	570	102	12,5	B open	BI-NBR	ES	24218644
	525	565	81,5	10	B open	BI-NBR	ES	24147763
	530	570	60	10	A closed	BI-NBR	ES	24214284
	530	570	70	10	A open	BI-NBR	ES	24219071
	530	570	70	10	A closed	BI-NBR	ES	24219226
	530	570	71,5	10	B open	BI-NBR	ES	24109362
	530	570	71,5	10	B closed	BI-NBR	ES	24218812
	530	570	80	10	A open	BI-NBR	ES	24219072
	530	570	80	10	A closed	BI-NBR	ES	24219227
	530	570	81,5	10	B open	BI-NBR	ES	24071221
	530	570	81,5	10	B closed	BI-NBR	ES	24218813
	530	580	100	12,5	A closed	BI-NBR	ES	24114578
	530	580	100	12,5	A open	BI-NBR	ES	24184291
	530	580	102	12,5	B closed	BI-NBR	ES	24218815
	535	575	60	10	A open	BI-NBR	ES	24339801
	540	580	60	10	A closed	BI-NBR	ES	24145861
	540	580	61,5	10	B open	BI-NBR	ES	24250612
	540	580	70	10	A open	BI-NBR	ES	24219074
	540	580	70	10	A closed	BI-NBR	ES	24219228
	540	580	71,5	10	B open	BI-NBR	ES	24218645
	540	580	71,5	10	B closed	BI-NBR	ES	24218816
	540	580	80	10	A open	BI-NBR	ES	24075336
	540	580	80	10	A closed	BI-NBR	ES	24170936
	540	580	81,5	10	B open	BI-NBR	ES	24076138
	540	580	81,5	10	B closed	BI-NBR	ES	24218817
	540	580	90,5	10	B closed	BI-NBR	ES	24251957
	545	585	81,5	10	B open	BI-NBR	ES	24198570
	550	590	60	10	A closed	BI-NBR	ES	24067721
	550	590	61,5	10	B closed	BI-NBR	ES	24146457

Further dimensions are available on request.

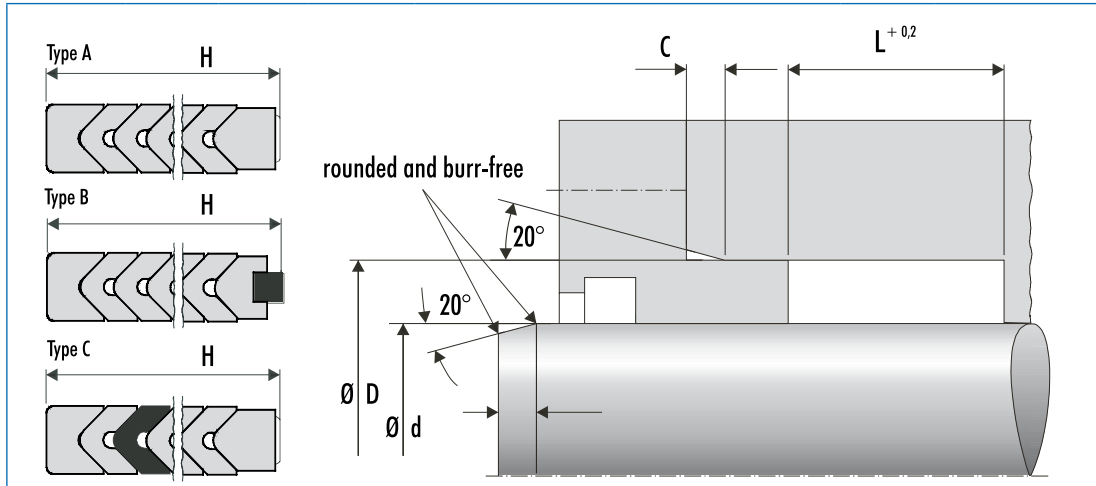
Housing	d	D	L	C	Type	Material	Type	Article No.
	550	590	70	10	A open	BI-NBR	ES	24099983
	550	590	70	10	A closed	BI-NBR	ES	24114443
	550	590	71,5	10	B open	BI-NBR	ES	24093548
	550	590	71,5	10	B closed	BI-NBR	ES	24218818
	550	590	80	10	A closed	BI-NBR	ES	24068523
	550	590	80	10	A open	BI-NBR	ES	24076184
	550	590	81,5	10	B open	BI-NBR	ES	24092719
	550	590	81,5	10	B closed	BI-NBR	ES	24118024
	555	595	70	10	A open	BI-NBR	ES	24219077
	555	595	70	10	A closed	BI-NBR	ES	24219229
	555	595	71,5	10	B closed	BI-NBR	ES	24218819
	555	595	80	10	A open	BI-NBR	ES	24219078
	555	595	80	10	A closed	BI-NBR	ES	24219230
	555	595	81,5	10	B open	BI-NBR	ES	24218647
	555	595	81,5	10	B closed	BI-NBR	ES	24218820
	560	600	60	10	A closed	BI-NBR	ES	24067725
	560	600	61,5	10	B closed	BI-NBR	ES	24146345
	560	600	70	10	A closed	BI-NBR	ES	24079662
	560	600	70	10	A open	BI-NBR	ES	24219079
	560	600	71,5	10	B open	BI-NBR	ES	24079390
	560	600	71,5	10	B closed	BI-NBR	ES	24218821
	560	600	80	10	A closed	BI-NBR	ES	24066933
	560	600	80	10	A open	BI-NBR	ES	24219080
	560	600	81,5	10	B closed	BI-NBR	ES	24064031
	560	600	81,5	10	B open	BI-NBR	ES	24071225
	560	600	90,5	10	B closed	BI-NBR	ES	24244771
	560	610	100	12,5	A closed	BI-NBR	ES	24066944
	560	610	102	12,5	B closed	BI-NBR	ES	24218823
	570	610	71,5	10	B open	BI-NBR	ES	24243007
	570	610	80	10	A open	BI-NBR	ES	24343524
	570	610	81,5	10	B open	BI-NBR	ES	24101408
	580	620	60	10	A open	BI-NBR	ES	24330921

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	580	620	60	10	A closed	BI-NBR	ES	24340889
	580	620	61,5	10	B open	BI-NBR	ES	24268708
	580	620	70	10	A closed	BI-NBR	ES	24114437
	580	620	70	10	A open	BI-NBR	ES	24219083
	580	620	71,5	10	B closed	BI-NBR	ES	24218824
	580	620	71,5	10	B open	BI-NBR	ES	24233518
	580	620	80	10	A closed	BI-NBR	ES	24114580
	580	620	80	10	A open	BI-NBR	ES	24145786
	580	620	81,5	10	B open	BI-NBR	ES	24218649
	580	620	81,5	10	B closed	BI-NBR	ES	24218825
	580	630	100	12,5	A closed	BI-NBR	ES	24219231
	580	630	102	12,5	B open	BI-NBR	ES	24107260
	580	630	102	12,5	B closed	BI-NBR	ES	24218827
	590	630	60	10	A closed	BI-NBR	ES	24114340
	590	630	70	10	A closed	BI-NBR	ES	24091257
	590	630	70	10	A open	BI-NBR	ES	24219084
	590	630	71,5	10	B open	BI-NBR	ES	24218651
	590	630	71,5	10	B closed	BI-NBR	ES	24218828
	590	630	80	10	A closed	BI-NBR	ES	24083741
	590	630	81,5	10	B closed	BI-NBR	ES	24009812
	590	630	81,5	10	B closed	BI-NBR	ES	24218829
	600	630	52,5	7,5	A open	BI-NBR	ES	24199064
	600	640	60	10	A closed	BI-NBR	ES	24116145
	600	640	70	10	A closed	BI-NBR	ES	24078738
	600	640	70	10	A open	BI-NBR	ES	24219086
	600	640	71,5	10	B closed	BI-NBR	ES	24063849
	600	640	71,5	10	B open	BI-NBR	ES	24232447
	600	640	80	10	A closed	BI-NBR	ES	24219232
	600	640	81,5	10	B closed	BI-NBR	ES	24068954
	600	640	81,5	10	B open	BI-NBR	ES	24071227
	600	650	100	12,5	A open	BI-NBR	ES	24219089
	600	650	102	12,5	B open	BI-NBR	ES	24132508
	600	650	102	12,5	B closed	BI-NBR	ES	24218831
	610	650	70	10	A open	BI-NBR	ES	24316425
	610	650	80	10	A open	BI-NBR	ES	24222956
	610	650	81,5	10	B open	BI-NBR	ES	24351998
	620	650	52,5	7,5	A open	BI-NBR	ES	24346337
	620	660	61,5	10	B open	BI-NBR	ES	24291254
	620	660	70	10	A open	BI-NBR	ES	24219092
	620	660	71,5	10	B open	BI-NBR	ES	24218655
	620	660	80	10	A open	BI-NBR	ES	24219093
	620	660	81,5	10	B open	BI-NBR	ES	24087689
	620	670	100	12,5	A open	BI-NBR	ES	24219095
	620	670	102	12,5	B open	BI-NBR	ES	24218657
	630	670	61,5	10	B closed	BI-NBR	ES	24064701
	630	670	61,5	10	B open	BI-NBR	ES	24106809
	630	670	70	10	A open	BI-NBR	ES	24084675

Further dimensions are available on request.



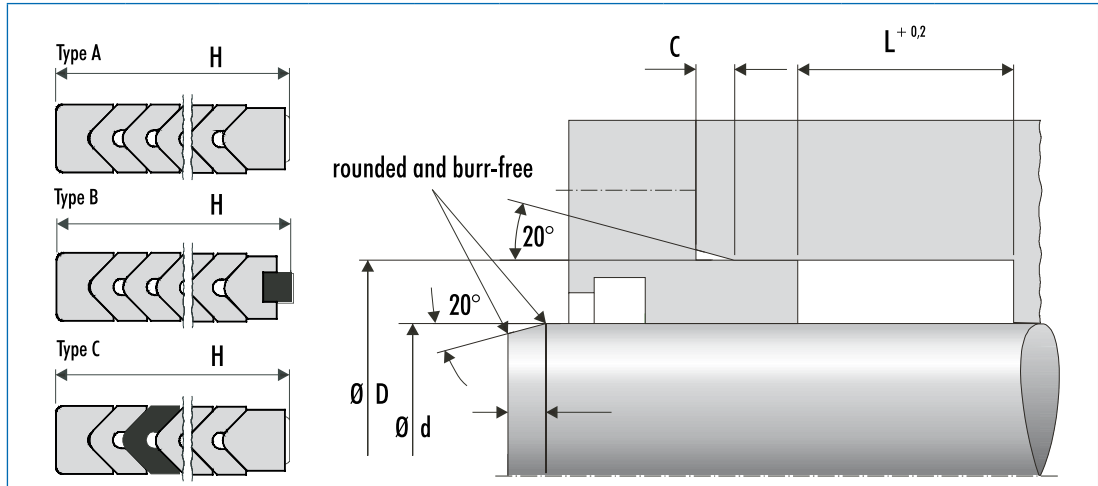
Housing	d	D	L	C	Type	Material	Type	Article No.
	630	670	70	10	A closed	BI-NBR	ES	24219238
	630	670	71,5	10	B open	BI-NBR	ES	24218658
	630	670	71,5	10	B closed	BI-NBR	ES	24218835
	630	670	80	10	A open	BI-NBR	ES	24219096
	630	670	80	10	A closed	BI-NBR	ES	24219239
	630	670	81,5	10	B open	BI-NBR	ES	24218659
	630	670	81,5	10	B closed	BI-NBR	ES	24218836
	630	680	100	12,5	A open	BI-NBR	ES	24219098
	630	680	102	12,5	B open	BI-NBR	ES	24218661
	640	680	70	10	A open	BI-NBR	ES	24219099
	640	680	71,5	10	B open	BI-NBR	ES	24218662
	640	680	80	10	A open	BI-NBR	ES	24087777
	640	680	81,5	10	B open	BI-NBR	ES	24218663
	640	690	100	12,5	A open	BI-NBR	ES	24219101
	640	690	102	12,5	B open	BI-NBR	ES	24148978
	650	690	70	10	A open	BI-NBR	ES	24219102
	650	690	70	10	A closed	BI-NBR	ES	24219240
	650	690	71,5	10	B open	BI-NBR	ES	24074106
	650	690	71,5	10	B closed	BI-NBR	ES	24218839
	650	690	80	10	A open	BI-NBR	ES	24081546
	650	690	80	10	A closed	BI-NBR	ES	24172074
	650	690	81,5	10	B open	BI-NBR	ES	24116502
	650	690	81,5	10	B closed	BI-NBR	ES	24218840
	650	700	100	12,5	A open	BI-NBR	ES	24267972
	660	700	70	10	A open	BI-NBR	ES	24219103
	660	700	71,5	10	B open	BI-NBR	ES	24218665
	660	700	80	10	A open	BI-NBR	ES	24219104
	660	700	81,5	10	B open	BI-NBR	ES	24218666
	660	710	80	12,5	A closed	BI-NBR	ES	24197590
	660	710	100	12,5	A open	BI-NBR	ES	24219106

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	660	710	102	12,5	B open	BI-NBR	ES	24218668
	670	710	81,5	10	B open	BI-NBR	ES	24071181
	670	720	100	12,5	A closed	BI-NBR	ES	24176117
	670	720	100	12,5	A open	BI-NBR	ES	24219108
	670	720	102	12,5	B open	BI-NBR	ES	24218670
	670	720	102	12,5	B closed	BI-NBR	ES	24218842
	675	725	100	12,5	A open	BI-NBR	ES	24103976
	680	710	60	7,5	A open	BI-NBR	ES	24348073
	680	720	70	10	A open	BI-NBR	ES	24219109
	680	720	71,5	10	B open	BI-NBR	ES	24218671
	680	720	80	10	A open	BI-NBR	ES	24219110
	680	720	81,5	10	B open	BI-NBR	ES	24218673
	680	730	100	12,5	A open	BI-NBR	ES	24219112
	680	730	102	12,5	B open	BI-NBR	ES	24218672
	685	725	81,5	10	B open	BI-NBR	ES	24192820
	690	730	61,5	10	B closed	BI-NBR	ES	24293797
	690	730	70	10	A open	BI-NBR	ES	24219113
	690	730	70	10	A closed	BI-NBR	ES	24219242
	690	730	71,5	10	B open	BI-NBR	ES	24218674
	690	730	71,5	10	B closed	BI-NBR	ES	24218843
	690	730	80	10	A open	BI-NBR	ES	24219114
	690	730	80	10	A closed	BI-NBR	ES	24219243
	690	730	81,5	10	B open	BI-NBR	ES	24109229
	690	730	81,5	10	B closed	BI-NBR	ES	24218844
	695	735	80	10	A open	BI-NBR	ES	24296289
	700	730	60	7,5	A open	BI-NBR	ES	24120063
	700	740	60	10	A closed	BI-NBR	ES	24106925
	700	740	61,5	10	B open	BI-NBR	ES	24193914
	700	740	70	10	A closed	BI-NBR	ES	24078869
	700	740	70	10	A open	BI-NBR	ES	24219115
	700	740	71,5	10	B open	BI-NBR	ES	24103215
	700	740	71,5	10	B closed	BI-NBR	ES	24218845
	700	740	80	10	A open	BI-NBR	ES	24219116
	700	740	80	10	A closed	BI-NBR	ES	24219261
	700	740	81,5	10	B open	BI-NBR	ES	24218675
	700	740	81,5	10	B closed	BI-NBR	ES	24218846
	700	740	90,5	10	B closed	BI-NBR	ES	24239435
	700	750	100	12,5	A open	BI-NBR	ES	24219118
	700	750	102	12,5	B open	BI-NBR	ES	24128272
	710	750	60	10	A closed	BI-NBR	ES	24195814
	710	750	61,5	10	B closed	BI-NBR	ES	24238814
	710	750	70	10	A closed	BI-NBR	ES	24074993
	710	750	70	10	A open	BI-NBR	ES	24219121
	710	750	71,5	10	B closed	BI-NBR	ES	24082443
	710	750	71,5	10	B open	BI-NBR	ES	24218679

Further dimensions are available on request.



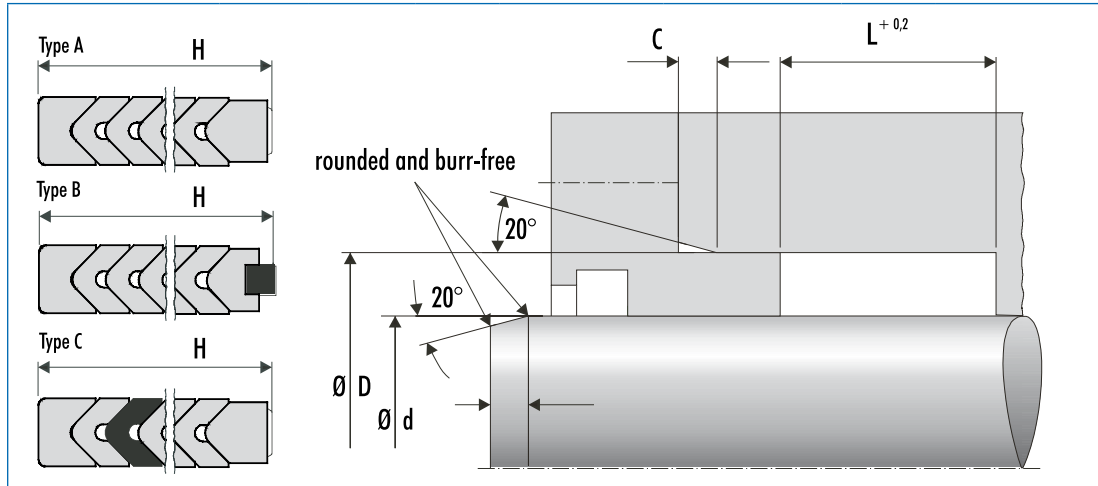
Housing	d	D	L	C	Type	Material	Type	Article No.
	710	750	80	10	A open	BI-NBR	ES	24219122
	710	750	80	10	A closed	BI-NBR	ES	24219245
	710	750	81,5	10	B open	BI-NBR	ES	24071177
	710	750	81,5	10	B closed	BI-NBR	ES	24218849
	710	750	90,5	10	B closed	BI-NBR	ES	24129422
	710	760	100	12,5	A closed	BI-NBR	ES	24114586
	710	760	100	12,5	A open	BI-NBR	ES	24186413
	710	760	102	12,5	B open	BI-NBR	ES	24218680
	710	760	102	12,5	B closed	BI-NBR	ES	24218851
	720	760	70	10	A open	BI-NBR	ES	24219123
	720	760	71,5	10	B open	BI-NBR	ES	24218681
	720	760	80	10	A open	BI-NBR	ES	24187283
	720	770	100	12,5	A open	BI-NBR	ES	24219125
	720	770	100	12,5	A closed	BI-NBR	ES	24219247
	720	770	102	12,5	B open	BI-NBR	ES	24218684
	720	770	102	12,5	B closed	BI-NBR	ES	24218853
	740	780	60	10	A open	BI-NBR	ES	24249215
	740	780	70	10	A open	BI-NBR	ES	24219126
	740	780	71,5	10	B open	BI-NBR	ES	24083448
	740	780	80	10	A open	BI-NBR	ES	24219127
	740	780	81,5	10	B open	BI-NBR	ES	24218685
	740	790	100	12,5	A open	BI-NBR	ES	24219129
	740	790	102	12,5	B open	BI-NBR	ES	24218687
	750	790	60	10	A closed	BI-NBR	ES	24095999
	750	790	61,5	10	B closed	BI-NBR	ES	24180151
	750	790	70	10	A open	BI-NBR	ES	24219130
	750	790	70	10	A closed	BI-NBR	ES	24219248
	750	790	71,5	10	B closed	BI-NBR	ES	24132429
	750	790	71,5	10	B open	BI-NBR	ES	24218688
	750	790	80	10	A open	BI-NBR	ES	24219131
	750	790	80	10	A closed	BI-NBR	ES	24219249

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	750	790	81,5	10	B closed	BI-NBR	ES	24213562
	750	790	81,5	10	B open	BI-NBR	ES	24218689
	750	800	100	12,5	A closed	BI-NBR	ES	24193397
	750	800	100	12,5	A open	BI-NBR	ES	24193398
	750	800	102	12,5	B open	BI-NBR	ES	24140930
	750	800	102	12,5	B closed	BI-NBR	ES	24218854
	760	800	80	10	A open	BI-NBR	ES	24235532
	760	810	89	12,5	B open	BI-NBR	ES	24259129
	775	825	71,5	12,5	B open	BI-NBR	ES	24343719
	780	820	60	10	A open	BI-NBR	ES	24256704
	780	820	61,5	10	B open	BI-NBR	ES	24291255
	780	830	100	12,5	A open	BI-NBR	ES	24239957
	780	830	102	12,5	B open	BI-NBR	ES	24134874
	790	840	100	12,5	A open	BI-NBR	ES	24308317
	800	840	60	10	A open	BI-NBR	ES	24188792
	800	840	60	10	A closed	BI-NBR	ES	24339222
	800	840	70	10	A closed	BI-NBR	ES	24259099
	800	840	71,5	10	B open	BI-NBR	ES	24218691
	800	840	80	10	A open	BI-NBR	ES	24219134
	800	840	80	10	A closed	BI-NBR	ES	24259100
	800	840	81,5	10	B open	BI-NBR	ES	24071169
	800	850	70	12,5	A open	BI-NBR	ES	24192354
	800	850	80	12,5	A closed	BI-NBR	ES	24067763
	800	850	82	12,5	B closed	BI-NBR	ES	24077894
	800	850	100	12,5	A closed	BI-NBR	ES	24066922
	800	850	100	12,5	A open	BI-NBR	ES	24094794
	800	850	102	12,5	B closed	BI-NBR	ES	24103851
	800	850	102	12,5	B open	BI-NBR	ES	24104080
	810	850	81,5	10	B open	BI-NBR	ES	24353087
	820	860	71,5	10	B open	BI-NBR	ES	24263168
	820	870	100	12,5	A closed	BI-NBR	ES	24114587
	820	870	100	12,5	A open	BI-NBR	ES	24219137
	820	870	102	12,5	B open	BI-NBR	ES	24218694
	820	870	102	12,5	B closed	BI-NBR	ES	24218857
	825	875	102	12,5	B open	BI-NBR	ES	24267024
	830	880	100	12,5	A open	BI-NBR	ES	24342533
	840	880	81,5	10	B open	BI-NBR	ES	24335687
	840	890	100	12,5	A open	BI-NBR	ES	24357980
	850	890	60	10	A closed	BI-NBR	ES	24339224
	850	890	61,5	10	B closed	BI-NBR	ES	24263169
	850	890	70	10	A closed	BI-NBR	ES	24114461
	850	890	70	10	A open	BI-NBR	ES	24219138
	850	890	71,5	10	B open	BI-NBR	ES	24218695
	850	890	71,5	10	B closed	BI-NBR	ES	24218858
	850	890	80	10	A open	BI-NBR	ES	24131119
	850	890	80	10	A closed	BI-NBR	ES	24219250

Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	850	890	81,5	10	B closed	BI-NBR	ES	24077013
	850	890	81,5	10	B open	BI-NBR	ES	24218696
	850	900	70	12,5	A closed	BI-NBR	ES	24114382
	850	900	100	12,5	A open	BI-NBR	ES	24219140
	850	900	100	12,5	A closed	BI-NBR	ES	24219252
	850	900	102	12,5	B open	BI-NBR	ES	24218698
	850	900	102	12,5	B closed	BI-NBR	ES	24218860
	860	900	60	10	A open	BI-NBR	ES	24359911
	860	910	102	12,5	B open	BI-NBR	ES	24199041
	870	920	100	12,5	A open	BI-NBR	ES	24219142
	870	920	100	12,5	A closed	BI-NBR	ES	24219254
	870	920	102	12,5	B open	BI-NBR	ES	24117560
	870	920	102	12,5	B closed	BI-NBR	ES	24218862
	875	925	100	12,5	A closed	BI-NBR	ES	24101244
	875	925	102	12,5	B open	BI-NBR	ES	24085902
	880	930	101	12,5	B open	BI-NBR	ES	24244245
	900	940	70	10	A closed	BI-NBR	ES	24219257
	900	940	71,5	10	B closed	BI-NBR	ES	24218865
	900	940	80	10	A closed	BI-NBR	ES	24219258
	900	940	81,5	10	B closed	BI-NBR	ES	24218866
	900	950	100	12,5	A closed	BI-NBR	ES	24066945
	900	950	100	12,5	A open	BI-NBR	ES	24219146
	900	950	102	12,5	B open	BI-NBR	ES	24218703
	900	950	102	12,5	B closed	BI-NBR	ES	24218868
	925	975	100	12,5	A open	BI-NBR	ES	24351206
	930	980	102	12,5	B open	BI-NBR	ES	24261784
	950	1000	91	12,5	B closed	BI-NBR	ES	24214711
	950	1000	100	12,5	A closed	BI-NBR	ES	24114590
	950	1000	100	12,5	A open	BI-NBR	ES	24219150
	950	1000	102	12,5	B open	BI-NBR	ES	24218707
	950	1000	102	12,5	B closed	BI-NBR	ES	24218870

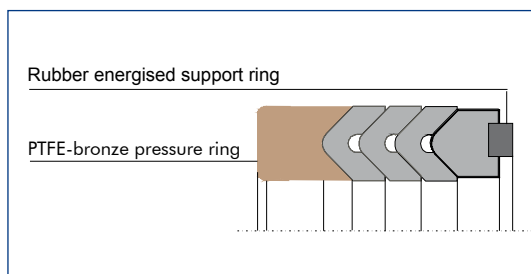
Further dimensions are available on request.



Housing	d	D	L	C	Type	Material	Type	Article No.
	960	1010	100	12,5	A open	BI-NBR	ES	24073190
	960	1010	102	12,5	B open	BI-NBR	ES	24218709
	975	1015	61,5	10	B open	BI-NBR	ES	24263162
	980	1020	81,5	10	B open	BI-NBR	ES	24078616
	1000	1040	61,5	10	B open	BI-NBR	ES	24267847
	1000	1040	71,5	10	B open	BI-NBR	ES	24218710
	1000	1040	81,5	10	B open	BI-NBR	ES	24071280
	1000	1050	100	12,5	A closed	BI-NBR	ES	24114995
	1000	1050	100	12,5	A open	BI-NBR	ES	24219155
	1000	1050	102	12,5	B closed	BI-NBR	ES	24137135
	1000	1050	102	12,5	B open	BI-NBR	ES	24218712
	1020	1070	102	12,5	B open	BI-NBR	ES	24343588
	1050	1100	100	12,5	A closed	BI-NBR	ES	24071553
	1060	1110	100	12,5	A open	BI-NBR	ES	24356608
	1070	1120	100	12,5	A open	BI-NBR	ES	24352076
	1080	1130	102	12,5	B open	BI-NBR	ES	24359160
	1100	1140	80	10	A open	BI-NBR	ES	24098392
	1100	1150	102	12,5	B open	BI-NBR	ES	24122700
	1130	1170	60	10	A open	BI-NBR	ES	24144932
	1150	1200	70	12,5	A open	BI-NBR	ES	24175251
	1220	1270	100	12,5	A closed	BI-NBR	ES	24335019

Further dimensions are available on request.

Merkel Roof Shaped Set Type ES 61



Product description

Multipart seal set for sealing piston rods, comprising one PTFE-bronze-compound pressure ring, rubber-fabric V-rings and one rubber energised support ring.

Product advantages

- High extrusion resistance by using robust PTFE-bronze-compound pressure ring
- High operational safety by using robust rubber-fabric V-rings
- Improved friction behaviour
- Constant axial initial tension by using rubber springs at support ring
- Can be used in applications with both, metallic or laminated fabric guide bushes
- Availability in open or endless version
- Mounting in non-adjustable housings

Material

Pressure ring

Material	Designation	Coöor
PTFE-Bronze	PTFE B570	brown

Roof-shaped ring

Material	Designation	Coöor
Cotton fabric/NBR	BI-NBR	black

Support ring

Material	Designation	Coöor
Cotton fabric/NBR	BI-NBR	black

Other material combinations available on request.

Application

- Seal set for tough applications and large extrusion gaps.

Operating conditions

Material	NBR
Hydraulic oils HL, HLP	-30 ... +100
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-
Water	-
HETG (rapeseed oil)	-30 ... +80
HEES (synthetic ester)	-30 ... +80
HEPG (glykol)	-30 ... +60
Mineral greases	-30 ... +100
Pressure	40 MPa
Running speed	0,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Profile bearing length ratio $M > 50\%$ up to max. 90% with average depth $c = Rz/2$ and reference line $C_{ref} = 0\%$. $c = Rz/2$ and reference line $C_{ref} = 0\%$

The long-time behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface.

A precise description and assessment of the surface is thus indispensable.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface.

See also *Merkel Technical Manual*.



Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion. (See also *Merkel Technical Manual*).

The maximum permissible extrusion gap with a one-sided position of the piston is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material.

Profile dimension	Max. permissible gap dimension			
	16 MPa	26 MPa	32 MPa	40 MPa
7,5	0,65	0,60	0,55	0,50
10	0,70	0,65	0,60	0,55
12,5	0,75	0,70	0,65	0,60
15	0,80	0,75	0,70	0,65
20	0,95	0,90	0,85	0,80
25	1,00	0,95	0,90	0,85
30	1,10	1,05	1,00	0,95

Tolerances

Diameter	Tolerances
D	H8/f8

The tolerance for the diameters d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

Design notes

For the mounting an axial accessible installation space is necessary. For new designs we recommend to consider the use of a modern sealing system. Please note our general design remarks in the *Merkel Technical Manual*.

Installation & assembly

For an ideal result, please comply with the mounting sequence as described in the following:

- Before mounting, all single parts of the sealing set must be equally coated with a thin layer of grease or oil.
- The piston rod must be installed in the cylinder before mounting.
- Each part of the sealing set must be placed individually. Please begin with the support ring, continue with each V-ring and end the mounting with the pressure ring.
- Please do not twist the V-rings while mounting. If air cushions are trapped between the V-rings, the rings can not be placed in their final position. In this case, please relieve the pressure by partially lifting each sealing edge with a smooth-edged tool. Finally adjust the fitting of each V-ring in the housing.

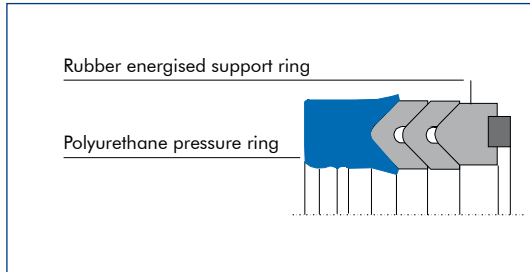
Additional details for the mounting of open roof shaped seal sets:

- To assure sufficient oil tightness of open roof shaped seal sets, these versions are generally delivered oversized regarding circumference and with layed-in Profiled rubber strings of each split V-shaped ring of the seal set. Therefore, never split an endless seal set in order to use it as an open version of the same size.
- The mounting of an open seal set is sequently done as described above. For each part of the seal set, primarily start to mount both ends of the split ring into the housing while aligning and pressing both ends together thoroughly. Then continue to insert the opposite part of the ring. Arrange equally the two remaining oversize slopes of the ring, and push them into the housing as well. Once inserted, each ring finally can be equally guided and pushed in its final position.
- While mounting V-rings of an open seal set, air cushions can be trapped as well. In this case, please relieve the pressure by partially lifting each sealing edge with a smooth-edged tool. Finally adjust the fitting of each V-ring in the housing.
- While mounting an open roof shaped seal set, please make sure, that the position of the cutting site of each ring has an offset of 120° to its neighbours.

Please note our general remarks for the mounting of hydraulic seals in the Merkel Technical Manual.



Merkel Roof Shaped Seal Type ES 81



Product description

Multipart seal set for sealing piston rods, comprising one polyurethane pressure ring with a grooved contact surface on the inner diameter, rubber-fabric V-rings and one rubber energised support ring.

Product advantages

- High sealing capability due to modern PU pressure ring with Finite-Element-Analysis-optimised design.
- Additional static sealing edge to prevent air flow from the outside in case of low-pressure in the sealing system.
- Improved friction behaviour due to grooved contact surface.
- High extrusion resistance by using robust PU pressure ring.
- Functional safety in case of pressure peaks by using inherently stable PU pressure ring.
- Constant axial initial tension by using rubber springs at support ring.
- Availability in open or endless version.
- Mounting in non-adjustable housings.

Material

Pressure ring

Material	Designation	Color
Polyurethane	94 AU 925	Light blue

Roof shaped seal

Material	Designation	Color
Fabric/nitrile rubber	BI-NBR	Black

Support ring

Material	Designation	Color
Fabric/nitrile rubber	BI-NBR/NBR	Black

Application

- Existing designs
- Temporary low-pressure

Operating conditions

Material	NBR
Hydraulic oils HL, HLP	-30 ... +100
HFA fluids	+5 ... +50
HFB fluids	+5 ... +50
HFC fluids	-30 ... +40
HFD fluids	-
Water	+5 ... +40
HETG (rapeseed oil)	-30 ... +60
HEES (synthetic ester)	-30 ... +60
HEPG (glykol)	-30 ... +40
Mineral greases	-30 ... +100
Pressure	40 MPa
Running speed	0,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Profile bearing length ratio $M > 50\%$ up to max. 90% with average depth $c = Rz/2$ and reference line $C_{ref} = 0\%$.
 $c = Rz/2$ and reference line $C_{ref} = 0\%$

The long-time behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface.

A precise description and assessment of the surface is thus indispensable.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface.

See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion. (See also *Merkel Technical Manual*).

The maximum permissible extrusion gap with a one-sided position of the piston is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material.

Profile dimension	Max. permissible gap dimension			
	16 MPa	26 MPa	32 MPa	40 MPa
7,5	0,55	0,45	0,4	0,35
10	0,6	0,5	0,45	0,4
12,5	0,6	0,5	0,45	0,4
15	0,65	0,55	0,45	0,4
20	0,7	0,6	0,5	0,45
25	0,75	0,65	0,55	0,5
30	0,8	0,7	0,6	0,55

Tolerances

Recommended fit, if a both-sided metallic guiding is used:

Diameter d	Tolerance
≤ 800	H8 / f8
> 800	+0,1 / f7

Diameter D	Tolerance
≤ 800	H8 / f8
> 800	+0,1 / f7



Design notes

For the mounting an axial accessible installation space is necessary. For new designs we recommend to consider the use of a modern sealing system. Please note our general design remarks in the Merkel Technical Manual.

Installation and assembly

For an ideal result, please comply with the mounting sequence as described in the following:

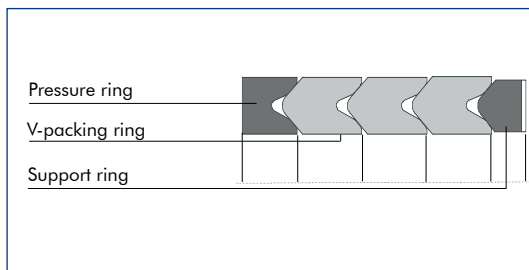
- Before mounting, all single parts of the sealing set must be equally coated with a thin layer of grease or oil.
- The piston rod must be installed in the cylinder before mounting.
- Each part of the sealing set must be placed individually. Please begin with the support ring, continue with each V-ring and end the mounting with the pressure ring.
- Please do not twist the V-rings while mounting. If air cushions are trapped between the V-rings, the rings can not be placed in their final position. In this case, please relief the pressure by partially lifting each sealing edge with a smooth-edged tool. Finally adjust the fitting of each V-ring in the housing.

Additional details for the mounting of open roof shaped seal sets:

- To assure sufficient oil tightness of open roof shaped seal sets, these versions are generally delivered oversized regarding circumference and with layed-in Profiled rubber strings of each split V-shaped ring of the seal set. Therefore, never split an endless seal set in order to use it as an open version of the same size.
- The mounting of an open seal set is sequently done as described above. For each part of the seal set, primarily start to mount both ends of the split ring into the housing while aligning and pressing both ends together thoroughly. Then continue to insert the opposite part of the ring. Arrange equally the two remaining oversize slopes of the ring, and push them into the housing as well. Once inserted, each ring finally can be equally guided and pushed in its final position.
- While mounting V-rings of an open seal set, air cushions can be trapped as well. In this case, please relief the pressure by partially lifting each sealing edge with a smooth-edged tool. Finally adjust the fitting of each V-ring in the housing.
While mounting an open roof shaped seal set, please make sure, that the position of the cutting site of each ring has an offset of 120° to its neighbours.

Please note our general remarks for the mounting of hydraulic seals in the Merkel Technical Manual.

Merkel V-Packing V 1000



Product description

V-packings are used for sealing piston rods, plungers and, in exceptional cases, pistons. Due to their robust design, these are very good for use in highly demanding, heavy and horizontal compressors, especially when the plungers are subjected to large side forces. V-packings can even be employed when piston rods or plungers can no longer be safely used due to excessive wear. Because of their good post-tensioning properties and robust design, V-packings in combination with thrust collars and backup-rings are used mainly in the demanding field of heavy hydraulics.

V-packing rings are delivered open, with an internal diameter of up to 400 mm, dependent on the nominal diameter requested.

In the case of larger diameters the rings are given additional length and must be fitted exactly in the compression packing. Endless rings can also be delivered on request.

If no design, fluid or temperature details are provided, the delivered goods will be those listed as standard productions B/B (see table on fields of application)

Material

Material	Designation	Color
Cotton fabric/ NBR	BI-N B6B210	black
Cotton fabric/ NBR	BI-N B6A151	black

Operating conditions

Material	BI-N B6B210 BI-N B6A151
Hydraulic oils HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rapeseed oil)	-30 ... +80 °C
HEES (synthetic ester)	-30 ... +80 °C
HEPG (glykol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$



Determination of the housing

The dimensions of the V-Packing 1000 are given in the following lists. Correct dimensioning of the seals is very important for both operating safety and service life, since too small a Profile width can give rise to operating difficulties and can reduce the service life. In terms of the nominal diameters required, we recommend the following Profile widths.

Nominal $\varnothing d$	Profile width B
... 25	7,5
> 25 ... 80	10
> 80 ... 120	12,5
> 120 ... 250	15
> 250 ... 500	20
> 500 ... 1000	25
> 1000	30

V-packings are delivered with a height plus tolerance. The fitting areas must therefore be correspondingly adjustable in the axial direction. The number and height of the shims below the gland depends on the Profile width and thereby also on the set height. The recommended minimum z values and the recommended lead-in chamfers are indicated in the table.

Profile width B		7,5	10	12,5	15	20	25	30
Tightening dimension z	$\varnothing \leq 500$	4	8	10	12	15	20	30
	$\varnothing > 500$	5	6,5	7,5	10	12,5	15	15

Fits

Diameter D	Clearance fit	Housing diameter D
... 80	H9/f8	H11
>80 ... 120	H8/f8	
>120 ... 500	H8/e8	
>500 ... 630	450 μm	H10
>630 ... 800	500 μm	
>800 ... 1000	550 μm	
>1000 ... 1250	700 μm	
>1250 ... 1600	750 μm	
>1600 ... 1800	850 μm	
>1800	950 μm	

To obtain the desired sealing effect from open or pre-cut seal sets the length of the circumference must be larger than that calculated from the nominal diameter. The specific added length effects the required pressing in the joint section.

V-packings with a nominal diameter of up to 400 mm

These packings have the correct assembly dimensions. They can be fitted without any further advance preparation.

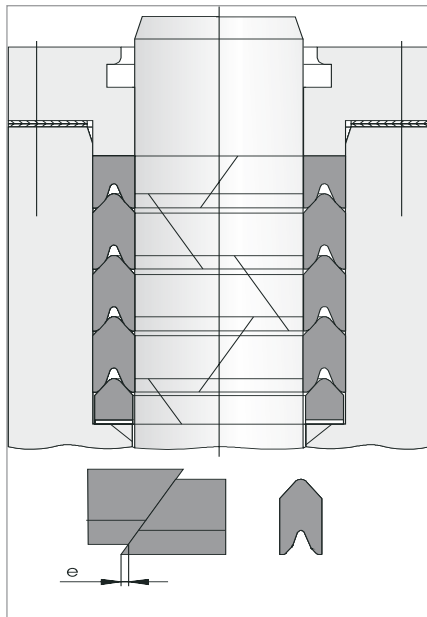
V-packings with a nominal diameter of more than 400 mm

Changes in circumference length can occur if the packings are stored for very long periods or are subjected to a variety of environmental influences. For this reason these sizes are always delivered with an extra circumference length.

Packings with a nominal diameter of over 400 mm must therefore be cut to the required size immediately prior to use: nominal length of circumference plus extra length “e” in accordance with the table. This table applies to the packings and to the thrust collars. The backup are cut at a blunt angle such that, when centred in the packing seal, they have a gap of 1 to 5 mm. Any plastic back-up rings will be given an oblique cut to fit exactly.

Fitting & installation

Careful fitting is a prerequisite for correct function of the seal. When assembling, each ring is placed singly in the seal housing – the joint section first – at the same time. The joint sections must be positioned as indicated in the illustration “position after installation” and should be offset, from ring to ring, at an angle of 120°, as shown in the illustration. Before installation, the seals should be lubricated. It is beneficial to use a neutral, compatible grease. This grease greatly reduces friction and also make the assembly easier. On tightening the gland, all of the rings in the seal set are brought into their final position.

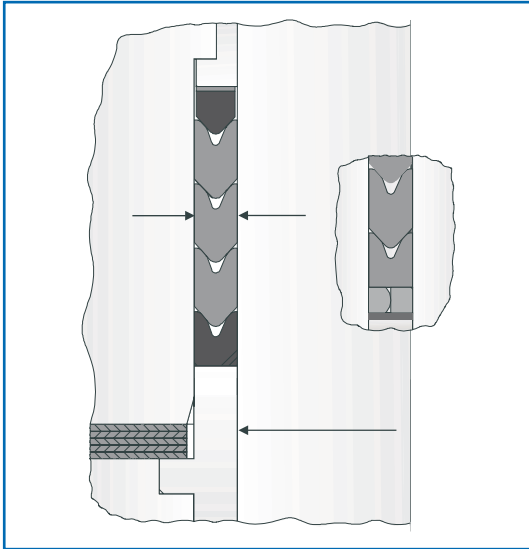


$\varnothing d$	Added length
200 ... 250	7
>250 ... 500	9
>500 ... 750	12
>750 ... 1000	15
>1000 ... 1500	20
>1500 ... 2000	25



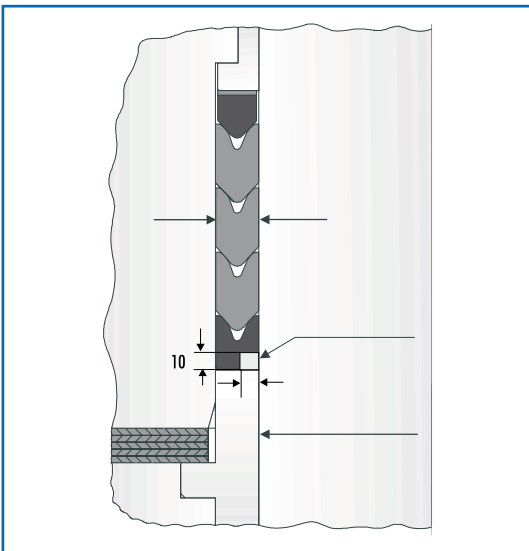
Special designs with anti-extrusion rings (back-up rings)

For new designs

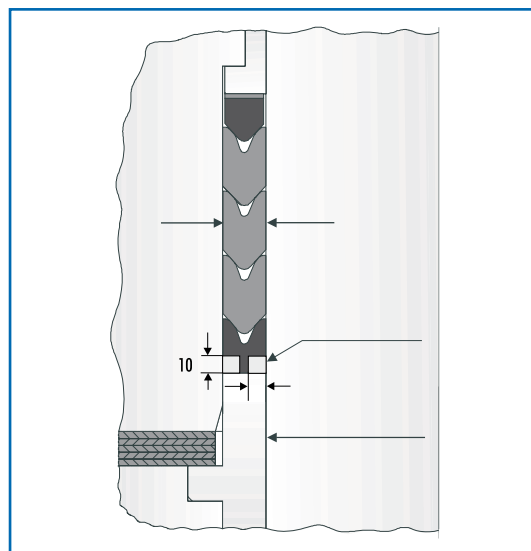


Open
 B 25 Ø 400 ... 3000; further dimensions
 available on request
 B 30 Ø 650 ... 3000; further dimensions
 available on request

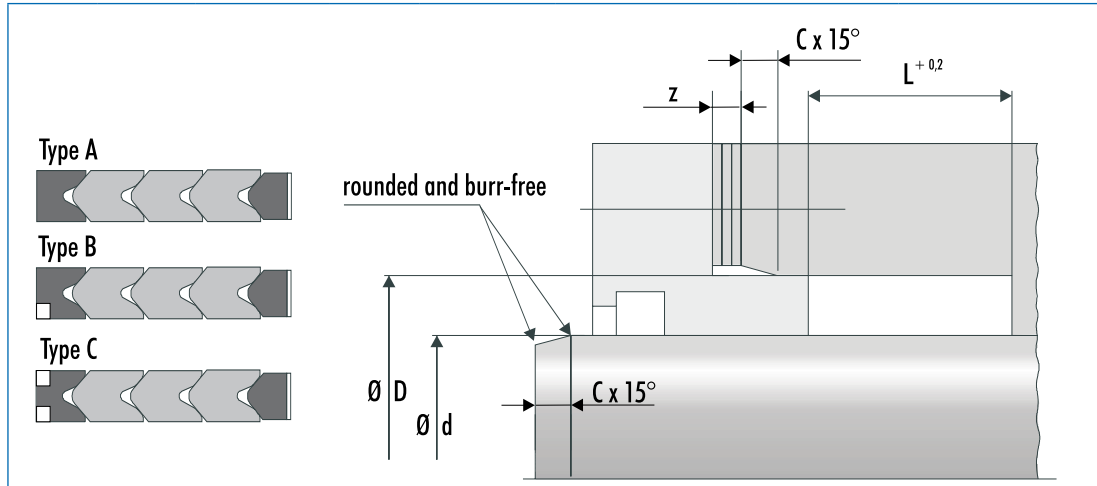
For repairs (greater play)



Open
 Ø 650 ... 3000;
 over Ø 3000 on request



Open
 B 27,5 Ø 720 ... 3000;
 over Ø 3000 on request
 B 30 Ø 650 ... 3000;
 over Ø 3000 on request



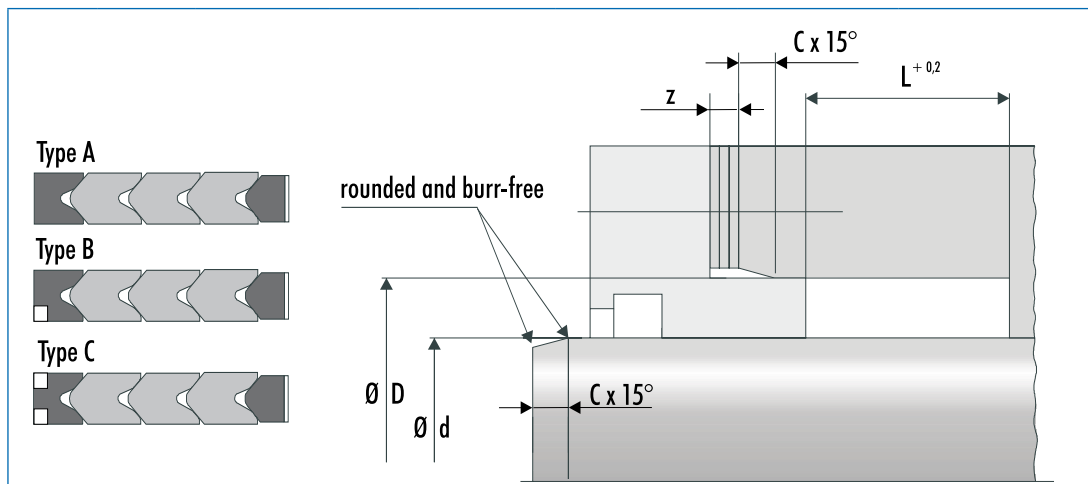
d	D	Profile	L	C	Material	Type	Article No.
650	690	20	126	12,5	BI-N B6B210	A	24293784
650	690	20	158	12,5	BI-N B6A151	A	24127989
650	690	20	190	12,5	BI-N B6B210	A	24341706
650	700	25	110	15	BI-N B6B210	A	24349718
650	700	25	150	15	BI-N B6B210	A	24349319
650	700	25	200	15	BI-N B6A151	A	24328457
655	705	25	200	15	BI-N B6A151	A	49007019
660	700	20	175,1	12,5	BI-N B6B210	A	24312114
660	710	25	190	15	BI-N B6B210	A	24188712
660	710	25	230	15	BI-N B6A151	A	24103429
660	712	26	198	15	BI-N B6B210	A	24073266
670	714	22	199,9	12,5	BI-N B6B210	A	24175477
670	720	25	142	15	BI-N B6B210	A	24346269
670	720	25	200	15	BI-N B6B210	A	24081923
680	720	20	143	12,5	BI-N B6B210	A	24130360
680	730	25	195	15	BI-N B6B210	B	24233952
680	730	25	195	15	BI-N B6B210	A	24079296
690	740	25	176	15	BI-N B6B210	A	24363225
700	740	20	126	12,5	BI-N B6B210	A	24192973
700	750	25	195	15	BI-N B6A151	A	24344128
700	754	27	160	15	BI-N B6B210	A	24354734
700	755	27,5	208	15	BI-N B6B210	C	529520
700	760	30	190	15	BI-N B6B210	A	528695
710	750	20	143	12,5	BI-N B6A151	A	24369743
710	750	20	143	12,5	BI-N B6B210	A	24363082
710	750	20	170	12,5	BI-N B6B210	A	24370546

Further dimensions are available on request.



d	D	Profile	L	C	Material	Type	Article No.
710	756	23	164	15	BI-N B6A151	A	24195065
710	760	25	127	15	BI-N B6B210	A	24358000
710	760	25	190	15	BI-N B6B210	A	24099757
710	760	25	200	15	BI-N B6A151	A	24136846
710	760	25	230	15	BI-N B6A151	A	24373181
710	760	25	230	15	BI-N B6B210	A	24227204
720	760	20	222	12,5	BI-N B6B210	A	24177947
720	760	20	143	12,5	BI-N B6B210	A	24290043
720	760	20	158	12,5	BI-N B6B210	A	24306127
720	770	25	190	15	BI-N B6B210	A	24239607
720	770	25	200	15	BI-N B6B210	A	24356307
720	780	30	205	15	BI-N B6B210	A	24334188
725	775	25	200	15	BI-N B6B210	A	24328468
730	780	25	129	15	BI-N B6A151	A	24219420
730	780	25	160	15	BI-N B6B210	A	24341821
730	780	25	161	15	BI-N B6A151	A	24209213
730	780	25	161	15	BI-N B6B210	A	24072739
730	780	25	230	15	BI-N B6A151	A	24258590
740	780	20	143	12,5	BI-N B6B210	A	24290757
740	790	25	190	15	BI-N B6B210	A	24190601
740	790	25	230	15	BI-N B6B210	A	24145292
750	790	20	143	12,5	BI-N B6A151	A	24138734
750	790	20	143	12,5	BI-N B6B210	A	24351539
750	790	20	190	12,5	BI-N B6B210	A	24332683
750	800	25	200	15	BI-N B6B210	A	24075462
760	800	20	143	12,5	BI-N B6B210	A	24380166
760	810	25	230	15	BI-N B6B210	A	529609
760	810	25	190	15	BI-N B6A151	A	49004692
760	810	25	190	15	BI-N B6B210	A	24377920
760	810	25	200	15	BI-N B6A151	A	24330958
760	810	25	230	15	BI-N B6A151	A	49005116
770	820	25	166	15	BI-N B6B210	A	24362210
770	820	25	166	15	BI-N B6B210	A	24362209
770	820	25	185	15	BI-N B6B210	A	24375371
770	820	25	190	15	BI-N B6B210	B	49058031
770	820	25	200	15	BI-N B6A151	B	24256829
770	830	30	230	15	BI-N B6B210	A	24353514
780	820	20	222	12,5	BI-N B6A151	A	24174805

Further dimensions are available on request.



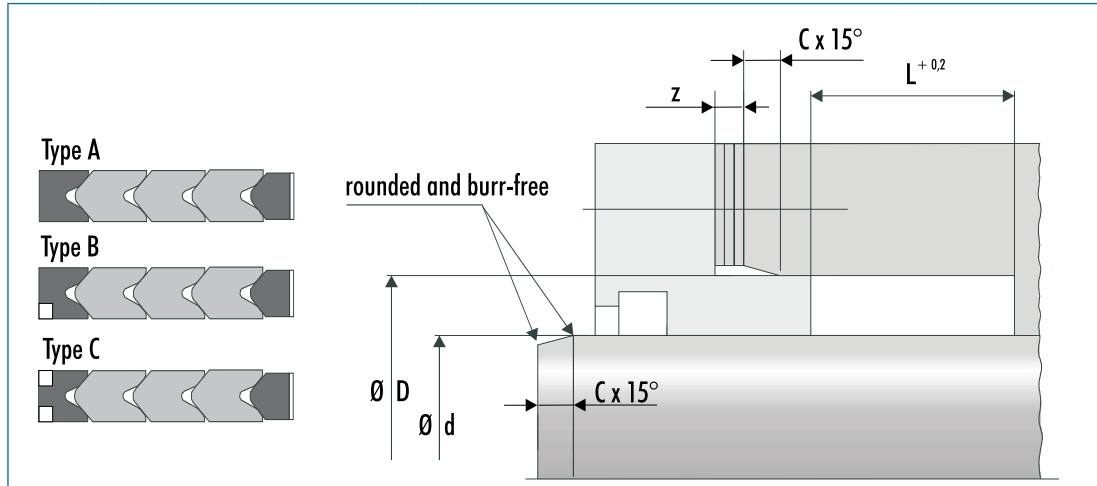
d	D	Profile	L	C	Material	Type	Article No.
780	830	25	166	15	BI-N B6A151	A	24369144
780	830	25	190	15	BI-N B6B210	A	24226117
780	830	25	200	15	BI-N B6B210	A	24148684
780	830	25	230	15	BI-N B6B210	A	24342184
790	830	20	190	12,5	BI-N B6B210	A	24302398
790	850	30	180	15	BI-N B6A151	A	24342143
790	850	30	220	15	BI-N B6A151	A	532413
800	840	20	143	12,5	BI-N B6B210	A	24377819
800	840	20	158	12,5	BI-N B6A151	A	49012794
800	840	20	170	12,5	BI-N B6B210	A	24227463
800	840	20	190	12,5	BI-N B6B210	A	49044932
800	850	25	150	15	BI-N B6A151	A	24378368
800	850	25	160	15	BI-N B6B210	A	49060272
800	850	25	166	15	BI-N B6B210	A	24343112
800	850	25	185	15	BI-N B6A151	A	24348887
800	850	25	190	15	BI-N B6A151	A	24259890
800	850	25	190	15	BI-N B6B210	A	24141357
800	850	25	200	15	BI-N B6A151	A	24095200
800	850	25	200	15	BI-N B6B210	A	24097696
800	850	25	230	15	BI-N B6B210	A	24194356
800	850	25	235	15	BI-N B6B210	A	24243659
800	860	30	190	15	BI-N B6B210	A	24288741
810	860	25	160	15	BI-N B6B210	A	24237993
810	860	25	190	15	BI-N B6B210	A	49056953
810	870	30	205	15	BI-N B6B210	A	24350234
820	870	25	185	15	BI-N B6B210	A	24333901

Further dimensions are available on request.



d	D	Profile	L	C	Material	Type	Article No.
820	870	25	195	15	BI-N B6B210	A	24214211
820	870	25	200	15	BI-N B6B210	A	24350822
820	880	30	230	15	BI-N B6B210	A	24234377
830	880	25	190	15	BI-N B6A151	A	24344986
830	880	25	200	15	BI-N B6A151	A	24095640
830	880	25	200	15	BI-N B6B210	A	24261254
830	890	30	190	15	BI-N B6B210	A	24359689
840	890	25	235	15	BI-N B6B210	A	24084158
840	894	27	150	15	BI-N B6A151	A	527151
850	880	15	123	10	BI-N B5B210	A	24148882
850	900	25	190	15	BI-N B6B210	A	24230005
850	900	25	195	15	BI-N B6B210	A	24094778
850	900	25	200	15	BI-N B6B210	A	24097188
850	900	25	230	15	BI-N B6B210	A	24079681
850	900	25	280	15	BI-N B6B210	A	24370883
860	910	25	195	15	BI-N B6B210	A	24339538
860	910	25	200	15	BI-N B6A151	A	24100649
860	910	25	200	15	BI-N B6B210	A	24378230
860	910	25	240	15	BI-N B6B210	A	24217402
860	920	30	110	15	BI-N B6B210	A	24257996
870	920	25	160	15	BI-N B6A151	A	24173923
870	920	25	200	15	BI-N B6A151	A	24360862
870	930	30	230	15	BI-N B6B210	A	24353733
880	930	25	195	15	BI-N B6B210	A	24240904
890	940	25	190	15	BI-N B6B210	A	49002831
890	940	25	195	15	BI-N B6B210	A	49039193
890	940	25	240	15	BI-N B6A151	A	24288233
900	950	25	120	15	BI-N B6B210	A	525296
900	950	25	166	15	BI-N B6B210	A	24343614
900	950	25	190	15	BI-N B6B210	A	24220749
900	950	25	195	15	BI-N B6B210	A	24096024
900	950	25	200	15	BI-N B6A151	A	24082187
900	950	25	200	15	BI-N B6B210	A	24145145
900	960	30	190	15	BI-N B6A151	A	24370250
910	960	25	155	15	BI-N B6A151	A	24372400
910	960	25	176	15	BI-N B6A151	A	24234729
910	960	25	185	15	BI-N B6A151	A	24290872
910	960	25	200	15	BI-N B6A151	A	24260892

Further dimensions are available on request.



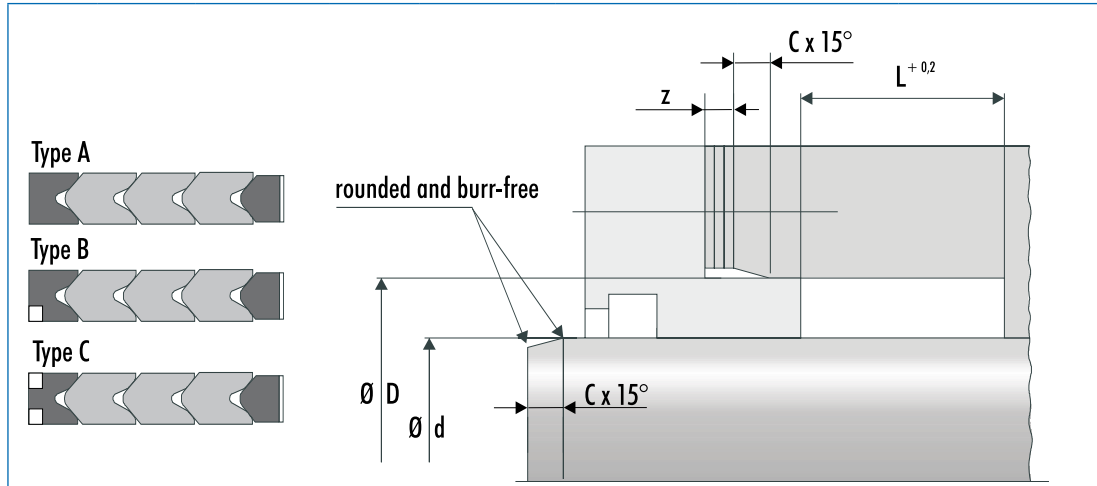
d	D	Profile	L	C	Material	Type	Article No.
910	970	30	110	15	BI-N B6B210	A	24258160
910	970	30	98,4	15	BI-N B6B210	A	24336503
910	970	30	190	15	BI-N B6B210	A	24258159
920	965	22,5	200	12,5	BI-N B6B210	A	24133244
920	970	25	240	15	BI-N B6A151	B	531995
920	970	25	192,5	15	BI-N B6B210	A	24078995
920	970	25	147	15	BI-N B6B210	A	24263048
920	970	25	190	15	BI-N B6B210	A	24195149
920	970	25	200	15	BI-N B6A151	A	24179853
920	970	25	235	15	BI-N B6A151	A	24067553
920	970	25	235	15	BI-N B6B210	A	24116351
920	970	25	240	15	BI-N B6B210	A	24147566
920	980	30	100	15	BI-N B6B210	A	24267778
925	980	27,5	176	15	BI-N B6A151	C	49008831
930	980	25	195	15	BI-N B6A151	A	24329098
930	980	25	185	15	BI-N B6A151	A	24342147
930	980	25	200	15	BI-N B6A151	B	49008633
930	984	27	205,7	15	BI-N B6B210	A	24353065
940	990	25	167,5	15	BI-N B6B210	A	24377648
940	990	25	190	15	BI-N B6B210	A	24343341
950	1000	25	190	15	BI-N B6A151	B	24220704
950	1000	25	195	15	BI-N B6B210	A	24262712
950	1000	25	198	15	BI-N B6B210	A	24308212
950	1000	25	200	15	BI-N B6A151	A	24076810
950	1000	25	200	15	BI-N B6B210	A	24089122
950	1000	25	230	15	BI-N B6B210	A	24188679

Further dimensions are available on request.



d	D	Profile	L	C	Material	Type	Article No.
950	1010	30	190	15	BI-N B6B210	A	24220472
960	1010	25	190	15	BI-N B6B210	A	49059734
960	1010	25	230	15	BI-N B6B210	A	24192900
960	1020	30	230	15	BI-N B6B210	A	24335109
970	1010	20	190	12,5	BI-N B6A151	A	24369150
970	1015	22,5	200	12,5	BI-N B6A151	A	530045
970	1020	25	150	15	BI-N B6B210	A	24369275
970	1020	25	160	15	BI-N B6A151	A	49023317
970	1020	25	200	15	BI-N B6B210	A	24241332
970	1020	25	230	15	BI-N B6B210	A	24102886
970	1020	25	240	15	BI-N B6A151	A	24080866
970	1020	25	240	15	BI-N B6B210	A	24350502
980	1030	25	190	15	BI-N B6B210	A	24295156
980	1030	25	198	15	BI-N B6A151	A	24174648
980	1030	25	200	15	BI-N B6B210	A	24257977
980	1030	25	230	15	BI-N B6B210	A	24246817
1000	1040	20	158	12,5	BI-N B6B210	A	24147569
1000	1040	20	162	12,5	BI-N B6B210	A	24338835
1000	1050	25	200	15	BI-N B6B210	B	49016314
1000	1050	25	155	15	BI-N B6B210	A	24239958
1000	1050	25	190	15	BI-N B6B210	A	24129229
1000	1050	25	195	15	BI-N B6A151	A	24072129
1000	1050	25	195	15	BI-N B6B210	A	49018275
1000	1050	25	200	15	BI-N B6A151	A	24116320
1000	1050	25	200	15	BI-N B6B210	A	24182397
1000	1050	25	200	15	BI-N B6B210	A	24086138
1000	1050	25	232	15	BI-N B6B210	B	24196695
1000	1060	30	190	15	BI-N B6A151	A	49054448
1000	1060	30	230	15	BI-N B6B210	A	24379483
1005	1060	27,5	240	15	BI-N B6A151	C	24379297
1010	1060	25	200	15	BI-N B6A151	A	24100515
1010	1060	25	240	15	BI-N B6A151	A	24296535
1010	1060	25	240	15	BI-N B6A151	B	24348850
1010	1070	30	230	15	BI-N B6B210	A	49059756
1010	1070	30	190	15	BI-N B6B210	A	24292054
1020	1060	20	158	12,5	BI-N B6A151	A	24366888
1020	1070	25	190	15	BI-N B6B210	A	24308168
1020	1070	25	200	15	BI-N B6B210	A	49017186

Further dimensions are available on request.



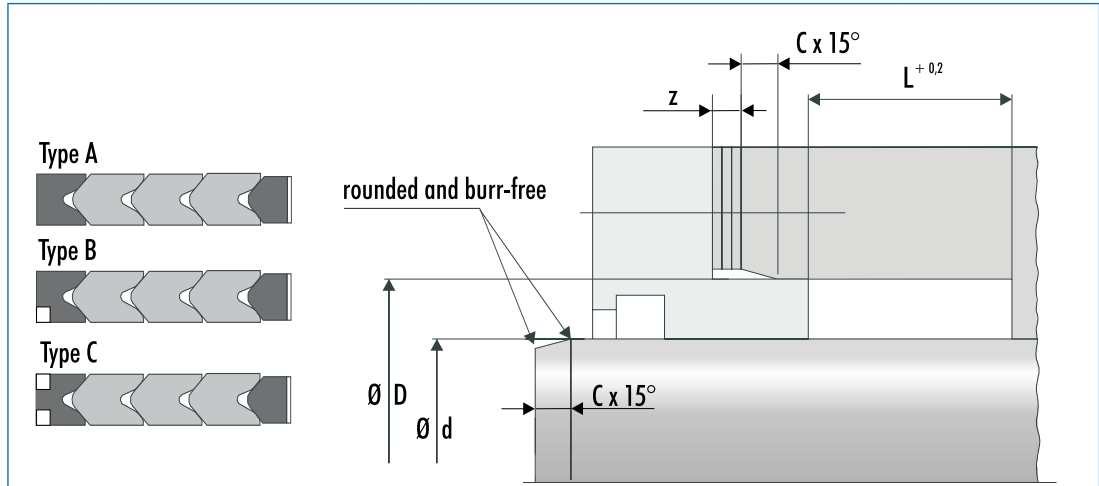
d	D	Profile	L	C	Material	Type	Article No.
1030	1080	25	200	15	BI-N B6B210	A	24096562
1030	1090	30	190	15	BI-N B6A151	A	24377601
1040	1090	25	150	15	BI-N B6B210	A	527294
1040	1090	25	230	15	BI-N B6B210	A	24290119
1040	1100	30	230	15	BI-N B6B210	A	24128707
1050	1100	25	120	15	BI-N B6B210	A	24366991
1050	1100	25	140	15	BI-N B6B210	A	49014003
1050	1100	25	150	15	BI-N B6B210	A	24298367
1050	1100	25	200	15	BI-N B6A151	A	24073067
1050	1100	25	240	15	BI-N B6B210	A	24224913
1050	1110	30	190	15	BI-N B6A151	A	24178267
1050	1110	30	230	15	BI-N B6B210	A	24119152
1060	1110	25	190	15	BI-N B6B210	A	24380800
1060	1110	25	200	15	BI-N B6B210	A	24106993
1060	1110	25	240	15	BI-N B6B210	A	24259444
1060	1120	30	230	15	BI-N B6B210	A	24355929
1065	1125	30	255	15	BI-N B6B210	C	24343940
1070	1120	25	198	15	BI-N B6B210	A	24144487
1070	1120	25	200	15	BI-N B6B210	A	24247168
1070	1120	25	240	15	BI-N B6B210	A	527844
1080	1130	25	232	15	BI-N B6B210	A	24181601
1080	1150	35	275	15	BI-N B6A151	A	49010259
1090	1140	25	200	15	BI-N B6B210	A	24267966
1090	1140	25	200	15	BI-N B6A151	B	49039516
1090	1150	30	150	15	BI-N B6B210	A	24293366
1090	1150	30	230	15	BI-N B6B210	A	24237917

Further dimensions are available on request.



d	D	Profile	L	C	Material	Type	Article No.
1100	1150	25	200	15	BI-N B6B210	A	531956
1100	1150	25	166	15	BI-N B6A151	A	24231177
1100	1150	25	190	15	BI-N B6B210	A	24258316
1100	1150	25	192	15	BI-N B6B210	A	24334775
1100	1150	25	240	15	BI-N B6B210	A	24375373
1100	1155	27,5	202	15	BI-N B6B210	A	24302975
1100	1160	30	120	15	BI-N B6B210	A	24342314
1100	1160	30	150	15	BI-N B6B210	A	24308567
1100	1160	30	230	15	BI-N B4B210	A	24335697
1110	1160	25	232	15	BI-N B6B210	A	24381003
1120	1175	27,5	202	15	BI-N B6A151	A	24298900
1130	1180	25	200	15	BI-N B6A151	A	24114963
1130	1180	25	200	15	BI-N B6B210	A	24240334
1130	1180	25	230	15	BI-N B6A151	A	24131469
1130	1180	25	240	15	BI-N B6B210	A	24261525
1130	1190	30	230	15	BI-N B6A151	A	24345073
1140	1195	27,5	170	15	BI-N B6B210	A	24342446
1140	1200	30	190	15	BI-N B6A151	A	24330168
1140	1200	30	230	15	BI-N B6A151	A	24242440
1150	1200	25	150	15	BI-N B6B210	A	49039806
1150	1200	25	190	15	BI-N B6B210	A	49019334
1150	1200	25	200	15	BI-N B6A151	A	24331570
1150	1200	25	200	15	BI-N B6B210	A	24259601
1150	1210	30	230	15	BI-N B6A151	A	24334683
1160	1220	30	190	15	BI-N B6B210	A	49002402
1160	1220	30	230	15	BI-N B6B210	A	24145531
1170	1220	25	120	15	BI-N B6B210	A	24237180
1170	1220	25	200	15	BI-N B6B210	A	24107499
1170	1230	30	210	15	BI-N B6B210	A	24334130
1180	1235	27,5	138	15	BI-N B6B210	A	24349940
1180	1235	27,5	170	15	BI-N B6B210	A	24334091
1180	1240	30	175	15	BI-N B6B210	A	24346057
1200	1250	25	190	15	BI-N B6A151	A	24267770
1200	1250	25	200	15	BI-N B6B210	A	24075198
1200	1250	25	190	15	BI-N B6B210	A	24085683
1200	1260	30	150	15	BI-N B6B210	A	527490
1200	1260	30	230	15	BI-N B6A151	A	24137108
1210	1260	25	134	15	BI-N B6B210	A	24249176

Further dimensions are available on request.



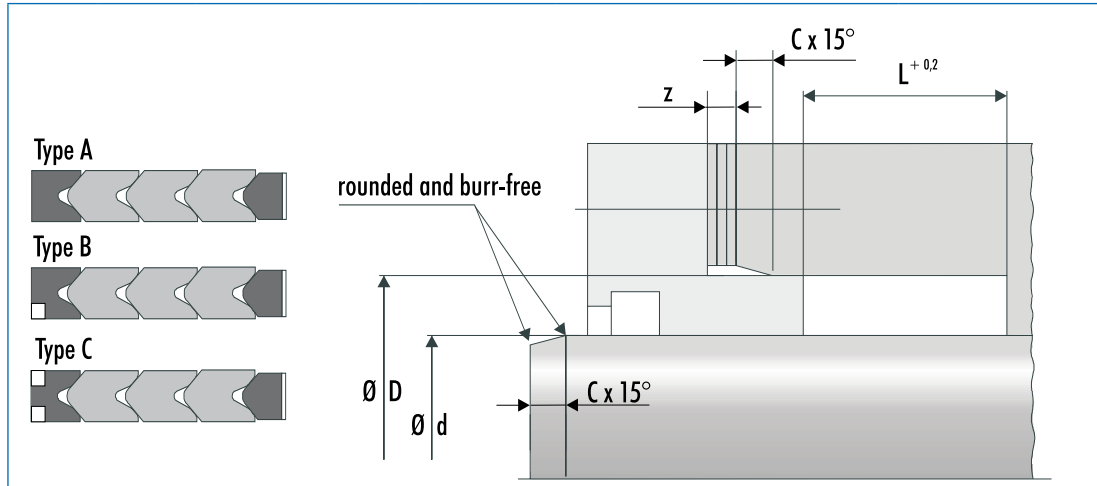
d	D	Profile	L	C	Material	Type	Article No.
1220	1260	20	190	12,5	BI-N B6B210	A	24239738
1220	1270	25	240	15	BI-N B6B210	A	49023097
1220	1280	30	230	15	BI-N B6B210	A	24267791
1230	1280	25	230	15	BI-N B6B210	A	530996
1230	1280	25	166	15	BI-N B6B210	A	24348179
1230	1280	25	176	15	BI-N B6B210	A	24344206
1230	1280	25	192	15	BI-N B6B210	A	24236024
1230	1290	30	190	15	BI-N B6A151	A	24374033
1230	1290	30	190	15	BI-N B6B210	A	24349950
1230	1290	30	230	15	BI-N B6B210	A	24312116
1235	1285	25	200	15	BI-N B6B210	A	24263220
1240	1290	25	240	15	BI-N B6B210	A	532513
1240	1290	25	200	15	BI-N B6A151	A	24178335
1240	1300	30	230	15	BI-N B6B210	A	24137932
1240	1300	30	250	15	BI-N B6B210	A	24183326
1250	1300	25	150	15	BI-N B6B210	A	527800
1250	1300	25	200	15	BI-N B6B210	A	24173519
1250	1300	25	240	15	BI-N B6B210	A	49067340
1260	1300	20	110	12,5	BI-N B5B210	A	24212921
1260	1310	25	200	15	BI-N B6B210	A	24095757
1270	1320	25	200	15	BI-N B6B210	A	24257632
1270	1320	25	230	15	BI-N B6B210	A	24093634
1270	1330	30	230	15	BI-N B6B210	A	24334560
1290	1340	25	200	15	BI-N B6B210	A	49005615
1300	1350	25	190	15	BI-N B6B210	A	49001278
1300	1350	25	200	15	BI-N B6B210	A	24199574

Further dimensions are available on request.



d	D	Profile	L	C	Material	Type	Article No.
1300	1360	30	135	15	BI-N B6B210	C	24302209
1300	1360	30	240	15	BI-N B6A151	A	24261978
1320	1370	25	200	15	BI-N B6B210	A	24360154
1320	1370	25	240	15	BI-N B6B210	A	525603
1340	1400	30	140	15	BI-N B6B210	A	24104682
1350	1400	25	152	15	BI-N B6B210	A	24369103
1350	1400	25	200	15	BI-N B6B210	A	24198469
1350	1400	25	230	15	BI-N B6B210	A	24378450
1350	1400	25	240	15	BI-N B6B210	A	24315732
1360	1410	25	200	15	BI-N B6A151	A	24378377
1360	1410	25	200	15	BI-N B6B210	A	24356885
1360	1420	30	195	15	BI-N B6B210	C	49012018
1370	1430	30	180	15	BI-N B6A151	A	24180183
1380	1430	25	166	15	BI-N B6B210	A	24314231
1380	1430	25	166	15	BI-N B6B210	A	49041214
1380	1430	25	190	15	BI-N B6A151	A	24348888
1380	1430	25	200	15	BI-N B6A151	A	24340271
1380	1430	25	200	15	BI-N B6B210	A	24142545
1380	1430	25	230	15	BI-N B6A151	A	24173720
1380	1430	25	230	15	BI-N B6B210	A	24177187
1380	1434	27	190	15	BI-N B6A151	A	24116610
1380	1440	30	190	15	BI-N B6B210	A	531928
1400	1450	25	166	15	BI-N B6A151	A	49060297
1400	1450	25	200	15	BI-N B6A151	A	24250631
1400	1460	30	190	15	BI-N B6B210	A	24085195
1400	1460	30	230	15	BI-N B6B210	A	49034937
1420	1470	25	200	15	BI-N B6A151	A	24081831
1420	1470	25	240	15	BI-N B6B210	A	24375863
1430	1490	30	250	15	BI-N B6B210	A	528516
1447	1497	25	150	15	BI-N B6B210	B	24307585
1450	1500	25	200	15	BI-N B6B210	A	49002455
1450	1500	25	190	15	BI-N B6B210	B	24334552
1450	1510	30	210	15	BI-N B6B210	A	24234563
1450	1510	30	230	15	BI-N B6B210	A	24302543
1460	1510	25	200	15	BI-N B6A151	A	24087347
1460	1510	25	200	15	BI-N B6B210	A	532968
1460	1510	25	240	15	BI-N B6B210	A	49058397
1460	1520	30	230	15	BI-N B6B210	A	530835

Further dimensions are available on request.



d	D	Profile	L	C	Material	Type	Article No.
1470	1520	25	230	15	BI-N B6A151	A	24299585
1480	1530	25	200	15	BI-N B6B210	A	24370971
1480	1540	30	190	15	BI-N B6A151	A	49054444
1490	1560	35	184	15	BI-N B6A151	A	525042
1500	1550	25	200	15	BI-N B6B210	A	24194257
1500	1560	30	210	15	BI-N B6A151	A	24362972
1500	1560	30	210	15	BI-N B6B210	A	49023307
1520	1570	25	200	15	BI-N B6A151	A	24180710
1520	1570	25	200	15	BI-N B6A151	A	24142729
1520	1570	25	200	15	BI-N B6B210	A	24092672
1550	1600	25	200	15	BI-N B6A151	A	24137633
1550	1600	25	200	15	BI-N B6B210	A	24290204
1550	1600	25	240	15	BI-N B6B210	A	24302319
1560	1620	30	255	15	BI-N B6A151	A	531076
1600	1650	25	200	15	BI-N B6A151	A	24374580
1600	1650	25	240	15	BI-N B6B210	A	24300926
1600	1660	30	195	15	BI-N B6B210	A	49009927
1600	1660	30	235	15	BI-N B6B210	A	49066637
1630	1680	25	200	15	BI-N B6A151	A	24197262
1630	1684	27	213,8	15	BI-N B6A151	A	24328710
1660	1720	30	210	15	BI-N B6B210	A	24302204
1670	1730	30	210	15	BI-N B6A151	A	24263417
1670	1730	30	210	15	BI-N B6A151	C	24181640
1700	1750	25	134	15	BI-N B6B210	A	49019308
1700	1760	30	122	15	BI-N B6B210	A	24182238
1700	1760	30	255	15	BI-N B6B210	A	24370764

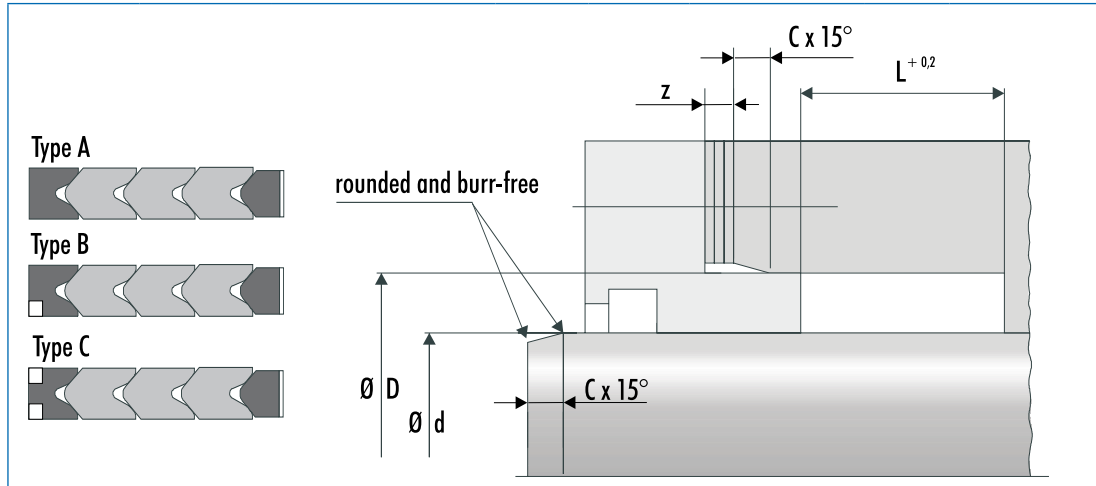
Further dimensions are available on request.



d	D	Profile	L	C	Material	Type	Article No.
1740	1800	30	110	15	BI-N B6A151	A	24187767
1740	1800	30	230	15	BI-N B6B210	A	49019486
1750	1800	25	240	15	BI-N B6B210	A	24332511
1800	1850	25	200	15	BI-N B6B210	A	24148688
1800	1860	30	195	15	BI-N B6B210	C	49011985
1800	1860	30	180	15	BI-N B6B210	C	24191677
1800	1860	30	255	15	BI-N B6B210	A	49062783
1840	1900	30	230	15	BI-N B6B210	A	24379771
1850	1910	30	255	15	BI-N B6B210	A	24332316
1960	2020	30	250	15	BI-N B6A151	A	24259162
1960	2020	30	250	15	BI-N B6B210	A	527794
2000	2060	30	190	15	BI-N B6B210	A	24082656
2000	2060	30	230	15	BI-N B6B210	A	24294539
2160	2220	30	270	15	BI-N B6B210	A	49024792
2450	2510	30	190	15	BI-N B6B210	A	24378196

Further dimensions are available on request.

Merkel V-Packings-Sets with Inch Dimensions.



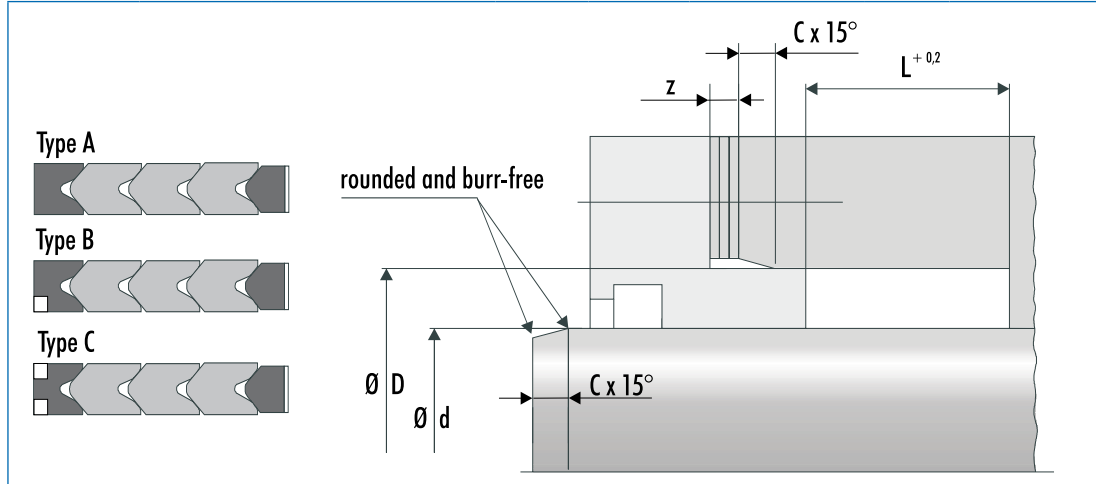
d	D	Profile	L	z	C	Material	Type	Article No.
25,591	27,591	1,000	9,055	0,787	0,591	BI-N B6A151	A	24258953
25,752	27,752	1,000	7,992	0,787	0,591	BI-N B6B210	A	24145955
26,252	28,252	1,000	6,929	0,787	0,591	BI-N B6B210	A	24267914
27,000	28,500	0,750	5,004	0,591	0,492	BI-N B6B210	A	24369184
27,252	28,752	0,750	6,098	0,591	0,492	BI-N B6B210	A	24095826
28,000	29,500	0,750	3,909	0,591	0,492	BI-N B6B210	A	24248872
28,000	29,500	0,750	6,098	0,591	0,492	BI-N B6B210	A	24144242
28,000	30,000	1,000	8,504	0,787	0,591	BI-N B6B210	A	24258984
28,000	30,000	1,000	8,819	0,787	0,591	BI-N B6B210	A	24289652
28,406	30,906	1,250	7,500	1,181	0,591	BI-N B6A151	A	24263500
28,701	30,764	1,031	6,685	0,827	0,591	BI-N B6B210	A	24257902
28,760	31,260	1,250	7,500	1,181	0,591	BI-N B6A151	A	524598
29,000	31,000	1,000	7,874	0,787	0,591	BI-N B6B210	A	533195
29,000	31,000	1,000	9,055	0,787	0,591	BI-N B6A151	A	24109290
29,059	31,185	1,063	6,028	0,906	0,591	BI-N B6B210	A	24178499
29,437	31,248	0,906	4,547	0,709	0,591	BI-N B6A151	A	24238851
29,803	31,803	1,000	6,535	0,787	0,591	BI-N B6B210	A	24376197
29,937	32,189	1,126	8,248	1,181	0,591	BI-N B6A151	A	24293109
30,677	32,677	1,000	7,480	0,787	0,591	BI-N B6B210	A	24145736
30,819	33,071	1,126	10,000	1,181	0,591	BI-N B6A151	A	24220320
31,000	33,000	1,000	7,480	0,787	0,591	BI-N B6A151	A	24296452
31,000	33,000	1,000	8,937	0,787	0,591	BI-N B6A151	A	24181133
31,000	33,126	1,063	7,087	0,906	0,591	BI-N B6A151	A	24196140
31,331	33,583	1,126	8,484	1,181	0,591	BI-N B6B210	A	24372361
31,437	33,500	1,031	6,685	0,827	0,591	BI-N B6B210	A	24264681

Further dimensions are available on request.



d	D	Profile	L	z	C	Material	Type	Article No.
31,500	33,500	1,000	7,480	0,787	0,591	BI-N B6B210	A	24175548
31,626	33,752	1,063	5,579	0,906	0,591	BI-N B6B210	A	24355848
31,752	33,752	1,000	6,535	0,787	0,591	BI-N B6B210	A	24342631
31,752	34,004	1,126	8,307	1,181	0,591	BI-N B6B210	A	24240835
31,850	33,602	0,875	6,709	0,669	0,492	BI-N B6A151	A	24262606
31,850	34,102	1,126	8,248	1,181	0,591	BI-N B6B210	A	24358439
32,000	33,500	0,750	4,157	0,591	0,492	BI-N B6B210	A	24263405
32,000	33,752	0,875	4,287	0,669	0,492	BI-N B6B210	A	24186967
32,000	33,752	0,875	6,709	0,669	0,492	BI-N B6B210	A	24264682
32,000	33,752	0,875	5,583	0,669	0,492	BI-N B6B210	A	24174905
32,000	34,000	1,000	8,189	0,787	0,591	BI-N B6B210	A	24134805
32,000	34,000	1,000	9,055	0,787	0,591	BI-N B6B210	A	24191478
32,000	34,000	1,000	9,449	0,787	0,591	BI-N B6B210	A	24179576
32,252	33,752	0,750	5,004	0,591	0,492	BI-N B6B210	A	24296251
32,500	34,500	1,000	6,102	0,787	0,591	BI-N B6B210	A	24343186
33,000	35,000	1,000	9,449	0,787	0,591	BI-N B6B210	A	49009310
33,346	35,409	1,031	7,996	0,827	0,591	BI-N B6B210	A	24377381
34,000	36,000	1,000	5,276	0,787	0,591	BI-N B6B210	A	24332067
34,000	36,000	1,000	6,535	0,787	0,591	BI-N B6B210	A	24241027
34,752	36,752	1,000	9,134	0,787	0,591	BI-N B6A151	A	24299504
34,752	36,752	1,000	9,449	0,787	0,591	BI-N B6A151	A	24299896
34,850	36,976	1,063	9,055	0,906	0,591	BI-N B6B210	A	24368685
35,000	37,000	1,000	9,449	0,787	0,591	BI-N B6A151	A	24083454
35,000	37,126	1,063	9,055	0,906	0,591	BI-N B6A151	A	24372317
35,181	37,181	1,000	5,079	0,787	0,591	BI-N B6B210	A	24375627
35,433	37,433	1,000	7,795	0,787	0,591	BI-N B6B210	A	49013116
35,787	38,287	1,250	7,500	1,181	0,591	BI-N B6B210	A	24208983
35,937	38,189	1,126	7,693	1,181	0,591	BI-N B6B210	A	24247269
36,000	38,000	1,000	9,567	0,787	0,591	BI-N B6B210	A	24149505
36,000	38,000	1,000	9,055	0,787	0,591	BI-N B6A151	A	24187112
36,780	38,780	1,000	6,102	0,787	0,591	BI-N B6B210	A	24377231
36,929	39,000	1,031	5,055	0,827	0,591	BI-N B6B210	A	24343720
37,000	39,000	1,000	4,843	0,787	0,591	BI-N B6B210	A	24302350
37,496	39,748	1,126	8,307	1,181	0,591	BI-N B6A151	A	24288048
37,874	40,000	1,063	8,059	0,906	0,591	BI-N B6A151	A	24250673
38,000	40,000	1,000	7,874	0,787	0,591	BI-N B6A151	A	24236771
38,287	40,539	1,126	10,000	1,181	0,591	BI-N B6B210	A	24328803

Further dimensions are available on request.



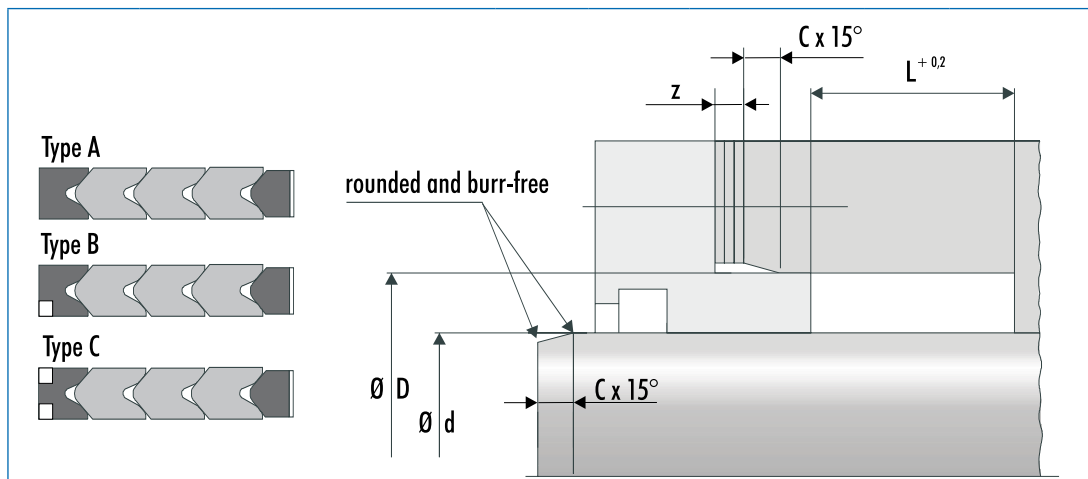
d	D	Profile	L	z	C	Material	Type	Article No.
38,626	41,126	1,250	10,008	1,181	0,591	BI-N B6B210	A	24366792
38,937	41,189	1,126	10,000	1,181	0,591	BI-N B6B210	A	24264136
39,339	41,339	1,000	7,874	0,787	0,591	B6B210	A	24379738
39,500	42,000	1,250	7,500	1,181	0,591	BI-N B6A151	A	24113960
39,500	42,000	1,250	8,004	1,181	0,591	BI-N B6B210	A	24359050
39,752	42,004	1,126	9,004	1,181	0,591	BI-N B6A151	A	24328458
40,000	42,126	1,063	6,535	0,906	0,591	BI-N B6B210	A	24181632
40,000	42,126	1,063	8,374	0,906	0,591	BI-N B6A151	A	24339138
40,551	43,051	1,250	6,000	1,181	0,591	BI-N B6B210	A	24377755
40,787	43,287	1,250	9,000	1,181	0,591	BI-N B6A151	A	24348986
40,929	43,429	1,250	9,000	1,181	0,591	BI-N B6B210	A	24314891
41,000	43,000	1,000	4,843	0,787	0,591	BI-N B6B210	A	24215952
41,307	43,307	1,000	5,512	0,787	0,591	BI-N B6B210	A	49014400
41,374	43,374	1,000	7,480	0,787	0,591	BI-N B6B210	A	24260146
41,500	43,500	1,000	7,874	0,787	0,591	BI-N B6B210	A	24232239
41,500	43,752	1,125	8,248	1,181	0,591	BI-N B6A151	A	24112812
41,732	44,232	1,250	9,000	1,181	0,591	BI-N B6B210	A	49045377
41,929	44,429	1,250	10,008	1,181	0,591	BI-N B6B210	A	24330853
42,000	44,000	1,000	5,276	0,787	0,591	BI-N B6A151	A	24097943
42,000	44,000	1,000	7,795	0,787	0,591	BI-N B6B210	A	24257816
42,000	44,000	1,000	8,937	0,787	0,591	BI-N B6A151	A	24306150
42,000	44,000	1,000	9,055	0,787	0,591	BI-N B6B210	A	24234460
42,130	44,630	1,250	10,008	1,181	0,591	BI-N B6B210	A	24362012
42,374	44,500	1,063	9,055	0,906	0,591	BI-N B6A151	A	24079273
42,374	44,626	1,126	9,004	1,181	0,591	BI-N B6A151	A	24362584

Further dimensions are available on request.



d	D	Profile	L	z	C	Material	Type	Article No.
42,752	44,752	1,000	7,480	0,787	0,591	BI-N B6B210	A	531515
42,752	44,752	1,000	7,677	0,787	0,591	BI-N B6B210	A	24297883
42,752	44,752	1,000	9,055	0,787	0,591	BI-N B6B210	A	49007297
43,500	45,748	1,126	10,811	1,181	0,591	BI-N B6B210	A	24142573
44,000	46,000	1,000	5,276	0,787	0,591	BI-N B6B210	A	24101361
44,000	46,000	0,965	4,724	0,787	0,591	BI-N B6B210	A	24341362
44,000	46,000	1,000	6,535	0,787	0,591	BI-N B6B210	A	24376196
44,000	46,252	1,125	9,004	1,181	0,591	BI-N B6A151	A	24140474
44,291	46,543	1,126	8,248	1,181	0,591	BI-N B6B210	A	24293644
44,291	46,543	1,126	10,000	1,181	0,591	BI-N B6B210	A	24293513
44,409	46,472	1,031	7,996	0,827	0,591	BI-N B6A151	A	49004452
45,000	47,000	1,000	7,874	0,787	0,591	BI-N B6B210	A	24136697
45,500	47,500	1,000	4,843	0,787	0,591	BI-N B6B210	A	24350823
45,787	48,039	1,126	7,252	1,181	0,591	BI-N B6B210	A	24237989
45,787	48,039	1,126	9,004	1,181	0,591	BI-N B6B210	A	24337806
46,000	48,000	1,000	7,874	0,787	0,591	BI-N B6B210	A	24343297
46,000	48,000	1,000	8,110	0,787	0,591	BI-N B6B210	A	24234270
46,000	48,000	1,000	9,449	0,787	0,591	BI-N B6B210	A	24377841
46,000	48,252	1,126	9,004	1,181	0,591	BI-N B6B210	A	24332345
46,000	48,252	1,126	10,000	1,181	0,591	BI-N B6A151	A	49003223
46,000	48,252	1,125	10,756	1,181	0,591	BI-N B6A151	A	24097438
46,500	48,500	1,000	9,449	0,787	0,591	BI-N B6B210	A	49012040
47,500	50,000	1,250	8,256	1,181	0,591	BI-N B6A151	A	24350653
47,996	50,059	1,031	6,248	0,827	0,591	BI-N B6A151	A	24329263
48,000	50,000	1,000	4,843	0,787	0,591	BI-N B6B210	A	24170559
48,000	50,000	1,000	7,874	0,787	0,591	BI-N B6A151	A	24175602
48,000	50,063	1,031	6,685	0,827	0,591	BI-N B6A151	A	24119656
48,000	50,252	1,126	9,004	1,181	0,591	BI-N B6A151	A	24288745
48,437	50,689	1,126	8,311	1,181	0,591	BI-N B6A151	A	24291581
48,500	50,500	1,000	7,559	0,787	0,591	BI-N B6A151	A	24137869
49,252	51,504	1,126	10,000	1,181	0,591	BI-N B6B210	A	24232553
49,874	52,126	1,126	8,248	1,181	0,591	BI-N B6B210	A	24257818
50,000	52,000	1,000	5,276	0,787	0,591	BI-N B6B210	A	24173272
50,736	52,862	1,063	6,535	0,906	0,591	BI-N B6B210	A	24267362
50,752	52,752	1,000	6,535	0,787	0,591	BI-N B6B210	A	49010415
51,000	53,000	1,000	5,866	0,787	0,591	BI-N B6B210	A	24258445
51,181	53,433	1,126	6,496	1,181	0,591	BI-N B6B210	A	24248356

Further dimensions are available on request.



d	D	Profile	L	z	C	Material	Type	Article No.
51,181	53,433	1,126	8,248	1,181	0,591	BI-N B6B210	A	24293514
52,000	54,063	1,031	6,685	0,827	0,591	BI-N B6A151	A	24342431
53,134	55,134	1,000	8,504	0,787	0,591	BI-N B6A151	A	24089993
54,000	56,000	1,000	9,449	0,787	0,591	BI-N B6B210	A	24242040
54,331	56,331	1,000	6,299	0,787	0,591	BI-N B6B210	A	24196667
54,500	56,500	1,000	7,480	0,787	0,591	BI-N B6B210	A	24349941
54,752	57,000	1,126	10,535	1,181	0,591	BI-N B6A151	A	24333024
55,000	57,500	1,250	8,256	1,181	0,591	BI-N B6B210	A	24237013
55,906	58,406	1,250	6,000	1,181	0,591	BI-N B6B210	A	24262564
57,028	59,528	1,250	8,256	1,181	0,591	BI-N B6A151	A	24359266
57,248	59,500	1,126	10,000	1,181	0,591	BI-N B6B210	A	24262791
58,000	60,000	1,000	5,866	0,787	0,591	BI-N B6A151	A	24179947
59,500	61,752	1,126	10,000	1,181	0,591	BI-N B6A151	A	24334902
59,500	61,752	1,126	10,756	1,181	0,591	BI-N B6A151	A	24349946
59,937	62,437	1,250	10,000	1,181	0,591	BI-N B6A151	A	24088873
59,937	62,437	1,250	10,752	1,181	0,591	BI-N B6A151	A	24289148
59,937	62,437	1,250	10,752	1,181	0,591	BI-N B6A151	A	24289148
60,000	62,063	1,031	6,685	0,827	0,591	BI-N B6A151	A	24102377
60,000	62,252	1,125	9,004	1,181	0,591	BI-N B6A151	A	24084799
64,173	66,236	1,031	7,996	0,827	0,591	BI-N B6A151	A	24103722
65,004	66,972	1,000	4,331	0,787	0,591	BI-N B6B210	A	24227891
65,004	67,004	1,000	4,882	0,787	0,591	BI-N B6B210	A	24143498
65,004	67,004	1,000	4,449	0,787	0,591	BI-N B6B210	A	530694
65,039	67,291	1,126	10,000	1,181	0,591	BI-N B6B210	A	49012090
65,500	67,752	1,126	8,248	1,181	0,591	BI-N B6A151	A	24241328

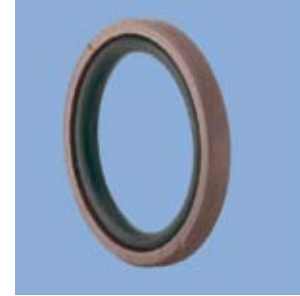
Further dimensions are available on request.



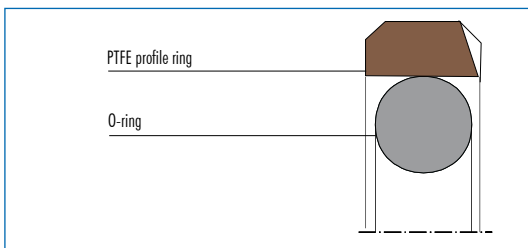
d	D	Profile	L	z	C	Material	Type	Article No.
66,500	68,500	1,000	8,504	0,787	0,591	BI-N B6A151	A	24084005
67,000	69,252	1,126	9,004	1,181	0,591	BI-N B6B210	A	24346859
68,000	70,000	1,000	5,276	0,787	0,591	BI-N B6A151	A	24094521
68,000	70,252	1,125	10,756	1,181	0,591	BI-N B6B210	A	24182245
68,500	71,252	1,376	10,000	1,457	0,591	BI-N B6B210	A	24374417
71,551	74,051	1,250	8,256	1,181	0,591	BI-N B6A151	A	24231956
72,000	74,252	1,125	9,004	1,181	0,591	BI-N B6A151	A	24126941
72,000	74,252	1,126	10,756	1,181	0,591	BI-N B6A151	A	528524
76,969	79,469	1,250	10,008	1,181	0,591	BI-N B6B210	A	531255

Further dimensions are available on request.





Merkel Omegat OMK-MR



Product description

Two-piece seal set for sealing pistons, consisting of a PTFE profile ring and an O-ring as the preloading element.

Product advantages

- enhanced operating reliability with tough operating parameters
- no „blow by“ with fast load changes, due to pressure activation grooves
- very good pressure resistance capability and hardness
- good thermal conductivity
- high resistance to abrasion
- low friction, stick-slip-free

Material

PTFE profile ring

Material	Designation	Color
PTFE-bronze	PTFE B602	brown
PTFE-carbon-fiber compound	PTFE C104	light grey

Other material combinations are available on request.

Material

O-ring

Material	Designation
Nitrile rubber	NBR

Other material combinations are available on request.

Application

The OMK-MR is used for pistons with pressure from both sides.

Operating conditions

Material	PTFE B602/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-
Water	-
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Operating conditions

Material	PTFE GM201/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90%, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

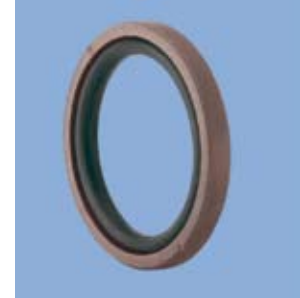
The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
	Ra	> 0,05 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces.



Gap dimension

The dimension d_2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion. (See also Merkel Technical Manual).

The maximum permissible extrusion gap with a one-sided position of the piston is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material.

Profile dimension		Max. permissible gap dimension			
L	Profile	16 MPa	26 MPa	32 MPa	40 MPa
2,2	2,45	0,35	0,3	–	–
3,2	3,75	0,4	0,35	–	–
4,2	5,5	0,5	0,4	0,3	–
6,3	7,75	0,55	0,45	0,4	0,35
8,1	10,5	0,6	0,5	0,45	0,45
8,1	12,25	0,7	0,6	0,55	0,5

At an operating temperature of above 90°C, and simultaneous exposure to an operating pressure of more than 26 MPa, we recommend the use of the material compound PTFE B602 and PTFE C104.

Tolerances

Diameter d	Tolerance
< 500	h8
> 500	h7

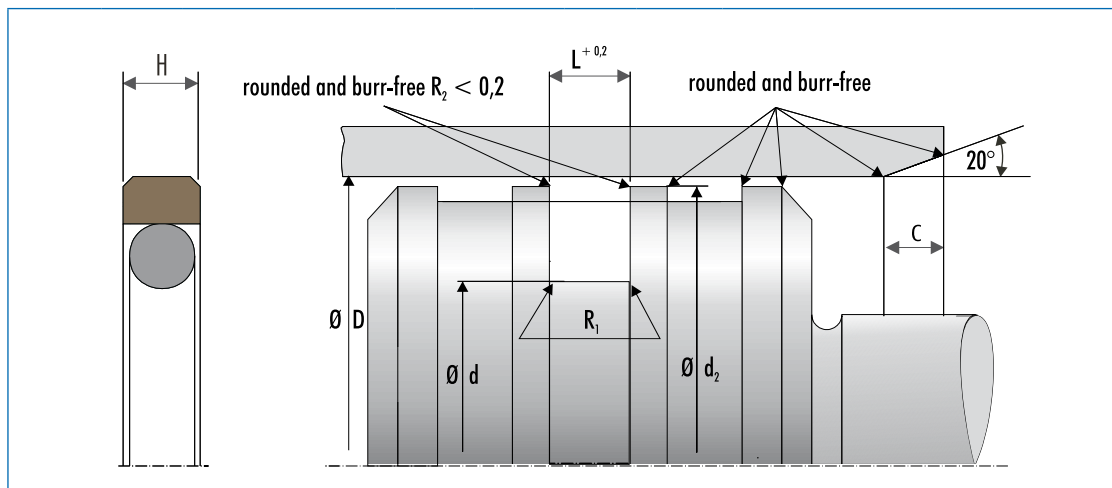
The tolerance for the diameters D and d_2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

Design notes

Please note our general design remarks in the *Merkel Technical Manual*.

Installation & assembly

Please note our general remarks on hydraulic seal assembly in the *Merkel Technical Manual*.



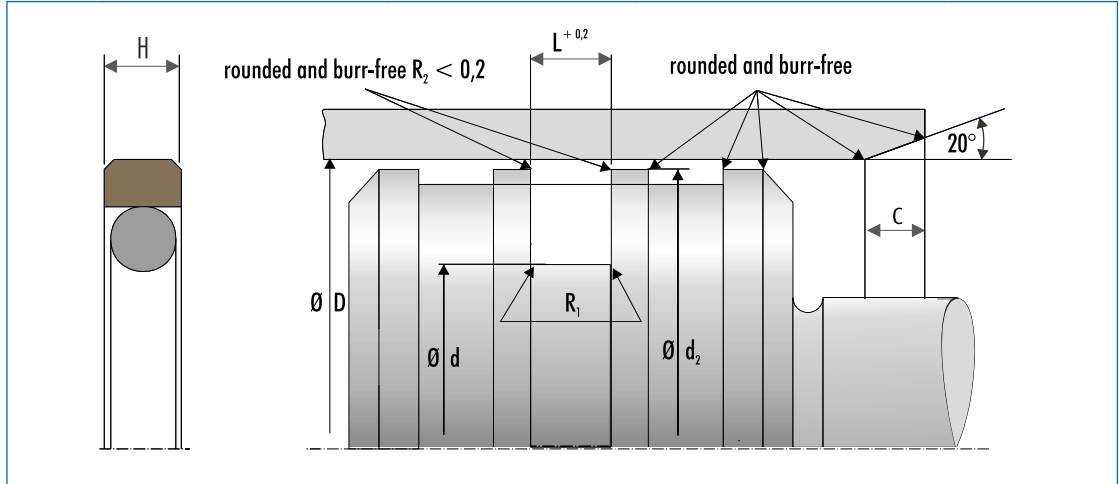
Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	60	49	4	4,2	5,5	6	0,8	PTFE C104 / NBR	49020100
	60	49	4	4,2	5,5	6	0,8	PTFE GM201 / NBR	24131859
	60	49	4	4,2	5,5	6	0,8	PTFE GM201 / NBR	24290302
	60	49	4	4,2	5,5	6	0,8	PTFE B602 / NBR	24178470
ISO	63	52	4	4,2	5,5	6	0,8	PTFE B602 / NBR	24178471
ISO	63	52	4	4,2	5,5	6	0,8	PTFE C104 / NBR	49056626
ISO	63	52	4	4,2	5,5	6	0,8	PTFE GM201 / NBR	24123140
	65	54	4	4,2	5,5	6	0,8	PTFE B602 / NBR	24191950
	65	54	4	4,2	5,5	6	0,8	PTFE GM201 / NBR	24104068
	70	54,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49030513
	70	54,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24258071
	70	54,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24131887
	70	54,5	6,3	6,3	7,75	8	1,2	PTFE B602 / NBR	24213778
	70	59	4	4,2	5,5	6	0,8	PTFE GM201 / NBR	24131860
	70	59	4	4,2	5,5	6	0,8	PTFE C104 / NBR	49021488
	70	59	4	4,2	5,5	6	0,8	PTFE B602 / NBR	24213776
	72	56,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24261989
	75	59,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24213782
	75	59,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49059301
	75	59,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24213523
	75	64	4	4,2	5,5	6	0,8	PTFE B602 / NBR	24213780
	75	64	4	4,2	5,5	6	0,8	PTFE GM201 / NBR	24145486
	80	59	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131888
	80	59	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213784
	80	64,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49018495

Other material combinations and further dimensions are available on request.



Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	80	64,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24178473
	80	64,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24101263
	85	64	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24213524
	85	64	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213786
	85	69,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24213788
	85	69,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24223623
	85	69,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49054674
	90	69	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131889
	90	69	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213790
	90	74,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24131861
	90	74,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24178474
	90	74,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49018496
	95	74	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24075603
	95	74	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213792
	95	79,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24199482
	95	79,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49000291
	95	79,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24213794
	100	79	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213796
	100	79	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24077512
ISO	100	84,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24178475
	100	84,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49002075
ISO	100	84,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24107904
ISO	100	89	4	4,2	5,5	6	0,8	PTFE B602 / NBR	24259017
ISO	100	89	4	4,2	5,5	6	0,8	PTFE GM201 / NBR	24328829
	105	89,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24187281
	105	89,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24213798
	105	89,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49018497
	110	89	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24077514
	110	89	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213802
	110	94,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24178476
	110	94,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24131862
	110	94,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49020706
	115	94	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131890
	115	94	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24193795
	115	99,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24178477
	115	99,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24131863
	120	99	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213807
	120	99	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24199999

Other material combinations and further dimensions are available on request.



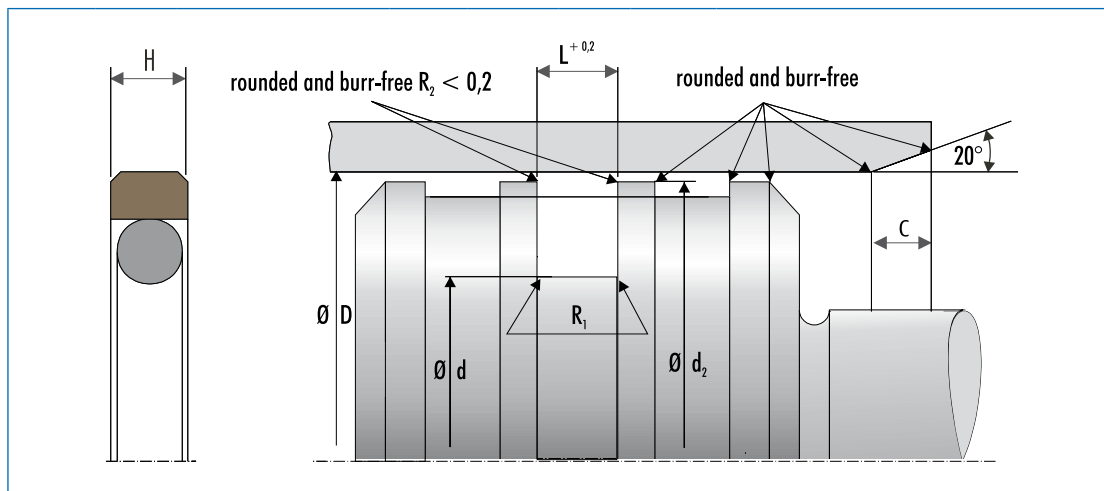
Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	120	104,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49018498
	120	104,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24213805
	120	104,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24186464
ISO	125	104	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24093346
ISO	125	104	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213809
ISO	125	109,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24178478
ISO	125	109,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49000292
ISO	125	109,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24109478
	130	109	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213811
	130	109	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24077517
	130	114,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24213813
	130	114,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49041763
	130	114,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24145852
	135	114	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24235337
	140	119	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24178479
	140	119	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49000293
	140	119	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24075607
	145	124	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24236854
	145	124	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	49058935
	150	129	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24178480
	150	129	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49018499
	150	129	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24075609
	150	134,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	49015512
	155	134	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24377858
	155	134	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49062453

Other material combinations and further dimensions are available on request.



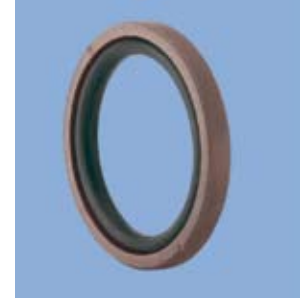
Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	155	134	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24361559
ISO	160	139	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49018500
ISO	160	139	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24075673
ISO	160	139	8,1	8,1	10,5	10,5	2	PTFE B602 / NBR	24213816
	165	144	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24287221
	165	144	8,1	8,1	10,5	10,5	2	PTFE GM201 / NBR	24355435
	170	149	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131864
	170	149	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49059334
	170	149	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24179245
	175	154	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24246987
	175	154	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49012838
	175	159,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24361027
	180	159	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131865
	180	159	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49000295
	180	159	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24179246
	185	164	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	49041837
	185	164	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24231189
	190	169	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24179247
	190	169	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131866
	195	174	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24355438
	195	174	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24146929
ISO	200	179	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131867
ISO	200	179	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24179248
	205	184	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24259749
	210	189	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24138658
	210	189	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24236852
	210	189	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49036993
	215	194	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24233505
	215	194	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49000267
	215	194	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24380695
	220	199	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24179249
	220	199	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49045372
	220	199	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131868
	225	204	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24288833
	225	204	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24137322
	230	209	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49000268
	230	209	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24275475
	230	209	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24145853

Other material combinations and further dimensions are available on request.



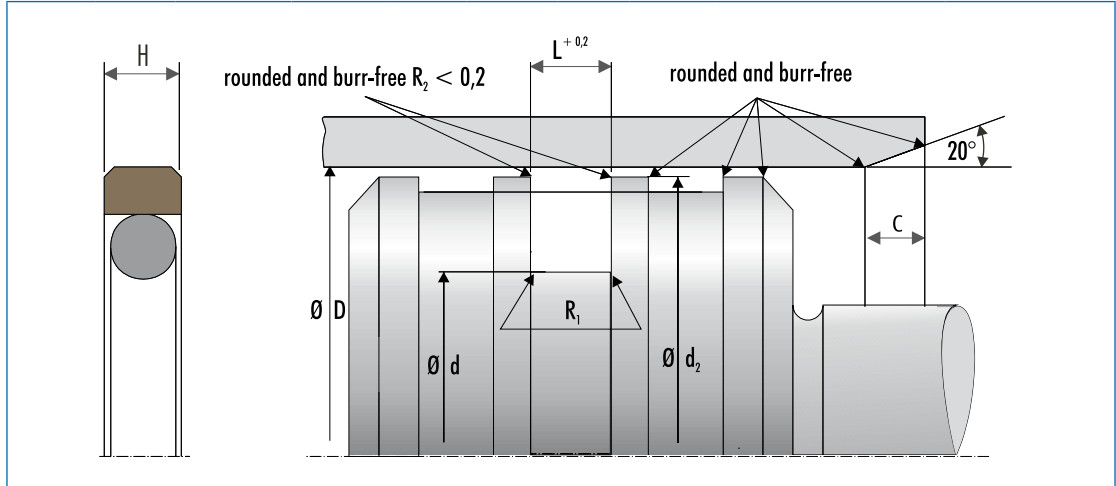
Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	235	214	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24315953
	235	214	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	49036333
	240	219	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24191703
	240	219	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49054781
	240	219	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24107902
	245	224	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24287245
ISO	250	229	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24179250
ISO	250	229	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49000269
ISO	250	229	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131869
	260	239	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24192188
	260	239	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49058145
	260	239	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24223625
	270	249	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24121481
	270	249	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24191949
	280	259	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49035216
	280	259	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24120265
	280	259	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24179251
	290	269	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24275526
	290	269	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24275640
	300	279	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49009207
	300	279	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24179922
	300	279	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24213824
	310	289	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24251064
	310	289	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	533523
	310	289	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24248946

Other material combinations and further dimensions are available on request.



Housing	D	d	H	L	Profile	C	R1	Material	Article No.
ISO	320	299	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24179252
ISO	320	299	7,7	8,1	10,5	10,5	2	PTFE GM201 / NBR	24131870
	330	305,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275529
	330	305,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24105259
	340	315,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24213827
	340	315,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24213529
	350	325,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275527
	350	325,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24199746
	360	335,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24118300
	360	335,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24179253
	370	345,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24251062
	370	345,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275649
	380	355,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275530
	380	355,5	7,7	8,1	12,25	14	2	PTFE GM201 / NBR	24194142
	390	365,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275528
	390	365,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24145902
ISO	400	375,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24179254
ISO	400	375,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24123281
	410	385,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24145195
	410	385,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275480
	420	395,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24234537
	420	395,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24240756
	430	405,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24274578
	430	405,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275683
	440	415,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275478
	440	415,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24194521
	450	425,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24269426
	450	425,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275678
	460	435,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24174791
	460	435,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24259026
	460	435,5	7,7	8,1	12,25	12	2	PTFE C104 / NBR	49044247
	470	445,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275477
	470	445,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275646
	480	455,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24194143
	480	455,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275483
	490	465,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275479
	490	465,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275481
	500	475,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24268696

Other material combinations and further dimensions are available on request.



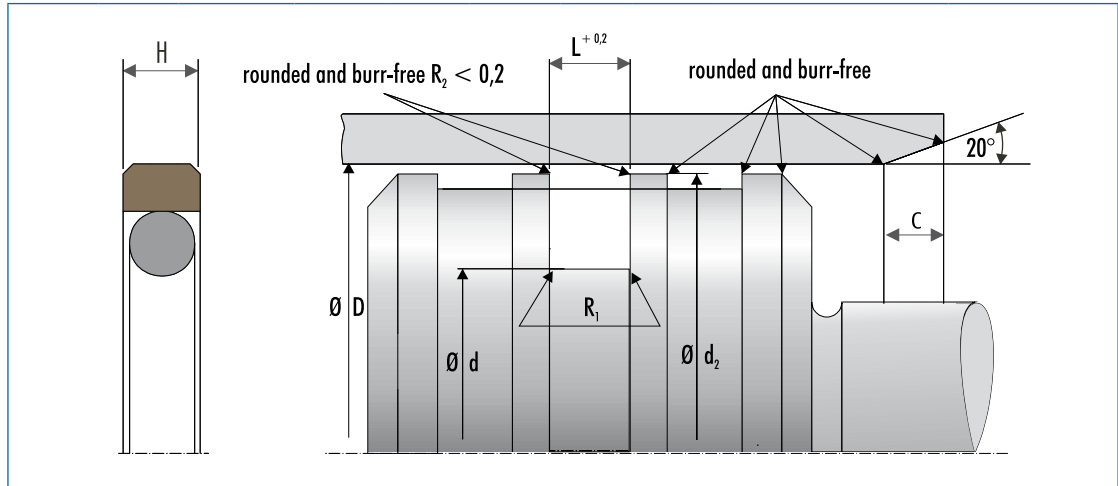
Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	500	475,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24268694
	510	485,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275482
	510	485,5	7,7	8,1	12,25	12	2	PTFE C104 / NBR	49022888
	510	485,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275681
	520	495,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275655
	520	495,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24269669
	530	505,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275489
	530	505,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275659
	540	515,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275492
	540	515,5	7,7	8,1	12,25	12	2	PTFE C104 / NBR	49023947
	540	515,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275684
	550	525,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275494
	550	525,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275665
	560	535,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275490
	560	535,5	7,7	8,1	12,25	12	2	PTFE C104 / NBR	49008962
	560	535,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275667
	570	545,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275486
	570	545,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275476
	580	555,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275493
	580	555,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275661
	590	565,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275666
	590	565,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275497
	600	575,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24145899
	600	575,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24191702
	610	585,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24234535

Other material combinations and further dimensions are available on request.



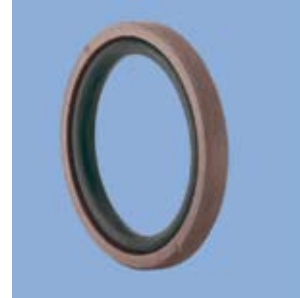
Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	610	585,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24233565
	620	595,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275487
	620	595,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275675
	630	605,5	7,7	8,1	12,25	12	2	PTFE C104 / NBR	49023948
	630	605,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275647
	630	605,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275498
	640	615,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24243559
	640	615,5	7,7	8,1	12,25	12	2	PTFE C104 / NBR	49008963
	640	615,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275668
	650	625,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24268700
	650	625,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24268698
	660	635,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24275495
	660	635,5	7,7	8,1	12,25	12	2	PTFE C104 / NBR	49058938
	660	635,5	7,7	8,1	12,25	12	2	PTFE GM201 / NBR	24275637
	670	642	9	9,5	14	13	2	PTFE B602 / NBR	24275502
	670	642	9	9,5	14	13	2	PTFE GM201 / NBR	24275660
	680	652	9	9,5	14	13	2	PTFE B602 / NBR	24275499
	680	652	9	9,5	14	13	2	PTFE C104 / NBR	49023949
	680	652	9	9,5	14	13	2	PTFE GM201 / NBR	24275682
	690	662	9	9,5	14	13	2	PTFE B602 / NBR	24275501
	690	662	9	9,5	14	13	2	PTFE GM201 / NBR	24275676
	700	672	9	9,5	14	13	2	PTFE GM201 / NBR	24268834
	700	672	9	9,5	14	13	2	PTFE B602 / NBR	24268832
	710	682	9	9,5	14	13	2	PTFE B602 / NBR	24275488
	710	682	9	9,5	14	13	2	PTFE GM201 / NBR	24275674
	720	692	9	9,5	14	13	2	PTFE GM201 / NBR	24275650
	720	692	9	9,5	14	13	2	PTFE B602 / NBR	24275500
	730	702	9	9,5	14	13	2	PTFE B602 / NBR	24269480
	730	702	9	9,5	14	13	2	PTFE GM201 / NBR	24275671
	740	712	9	9,5	14	13	2	PTFE C104 / NBR	49023950
	740	712	9	9,5	14	13	2	PTFE GM201 / NBR	24275664
	740	712	9	9,5	14	13	2	PTFE B602 / NBR	24275510
	750	722	9	9,5	14	13	2	PTFE B602 / NBR	24275514
	750	722	9	9,5	14	13	2	PTFE GM201 / NBR	24275663
	760	732	9	9,5	14	13	2	PTFE B602 / NBR	24275508
	760	732	9	9,5	14	13	2	PTFE GM201 / NBR	24275679
	770	742	9	9,5	14	13	2	PTFE GM201 / NBR	24275644
	770	742	9	9,5	14	13	2	PTFE B602 / NBR	24275503

Other material combinations and further dimensions are available on request.



Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	780	752	9	9,5	14	13	2	PTFE B602 / NBR	24275512
	780	752	9	9,5	14	13	2	PTFE GM201 / NBR	24275662
	790	762	9	9,5	14	13	2	PTFE B602 / NBR	24275517
	790	762	9	9,5	14	13	2	PTFE GM201 / NBR	24275658
	800	772	9	9,5	14	13	2	PTFE B602 / NBR	24275523
	800	772	9	9,5	14	13	2	PTFE GM201 / NBR	24275645
	805	777	9	9,5	14	13	2	PTFE B602 / NBR	24344664
	810	782	9	9,5	14	13	2	PTFE GM201 / NBR	24275670
	810	782	9	9,5	14	13	2	PTFE B602 / NBR	24275513
	820	792	9	9,5	14	13	2	PTFE B602 / NBR	24275504
	820	792	9	9,5	14	13	2	PTFE GM201 / NBR	24275685
	830	802	9	9,5	14	13	2	PTFE GM201 / NBR	24275673
	830	802	9	9,5	14	13	2	PTFE B602 / NBR	24275518
	830	802	9	9,5	14	13	2	PTFE C104 / NBR	49023951
	840	812	9	9,5	14	13	2	PTFE GM201 / NBR	24275687
	840	812	9	9,5	14	13	2	PTFE B602 / NBR	24275511
	850	822	9	9,5	14	13	2	PTFE B602 / NBR	24275507
	850	822	9	9,5	14	13	2	PTFE GM201 / NBR	24275652
	860	832	9	9,5	14	13	2	PTFE GM201 / NBR	24275648
	860	832	9	9,5	14	13	2	PTFE B602 / NBR	24275515
	870	842	9	9,5	14	13	2	PTFE B602 / NBR	24275522
	870	842	9	9,5	14	13	2	PTFE GM201 / NBR	24275651
	880	852	9	9,5	14	13	2	PTFE B602 / NBR	24275519
	880	852	9	9,5	14	13	2	PTFE GM201 / NBR	24275657
	890	862	9	9,5	14	13	2	PTFE GM201 / NBR	24275669

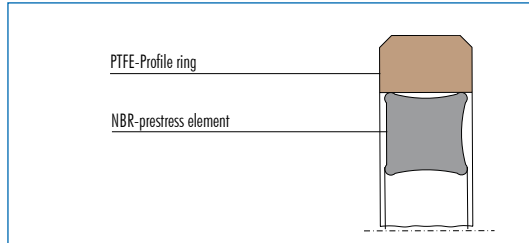
Other material combinations and further dimensions are available on request.



Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	890	862	9	9,5	14	13	2	PTFE B602 / NBR	24275509
	900	872	9	9,5	14	13	2	PTFE B602 / NBR	24275521
	900	872	9	9,5	14	13	2	PTFE GM201 / NBR	24275677
	910	882	9	9,5	14	13	2	PTFE B602 / NBR	24275516
	910	882	9	9,5	14	13	2	PTFE GM201 / NBR	24275672
	920	892	9	9,5	14	13	2	PTFE B602 / NBR	24269457
	920	892	9	9,5	14	13	2	PTFE GM201 / NBR	24275680
	930	902	9	9,5	14	13	2	PTFE GM201 / NBR	24275653
	930	902	9	9,5	14	13	2	PTFE B602 / NBR	24275520
	940	912	9	9,5	14	13	2	PTFE GM201 / NBR	24275686
	940	912	9	9,5	14	13	2	PTFE B602 / NBR	24275524
	950	922	9	9,5	14	13	2	PTFE B602 / NBR	24275525
	950	922	9	9,5	14	13	2	PTFE GM201 / NBR	24275638
	970	942	9	9,5	14	13	2	PTFE B602 / NBR	531898
	1100	1072	9	9,5	14	13	2	PTFE GM201 / NBR	24345602

Other material combinations and further dimensions are available on request.

Merkel Omegat OMK-QR



Product description

Two-piece seal set for sealing pistons, consisting of a PTFE Profile ring and a NBR Profile ring as the preloading element.

Product advantages

- enhanced operating reliability with tough operating parameters
- no „blow by“ with fast load changes, due to pressure activation grooves
- very good pressure resistance capability and hardness
- good thermal conductivity
- high resistance to abrasion
- low friction, stick-slip-free

Material

PTFE Profile ring

Material	Designation	Color
PTFE-bronze	PTFE B602	brown
PTFE-carbon-fiber compound	PTFE C104	dark grey

Prestress element

Material	Designation	Color
Nitrile rubber	NBR	black

Other material combinations are available on request.

Application

The Omegat OMK-QR is used for pistons with pressure from both sides and heavy duty applications. Especially designed for large dimensions.

Operating conditions

Material	PTFE B602/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-
Water	-
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

Material	PTFE C104/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$



Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces.

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness. See also *Merkel Technical Manual*.

Gap dimension

The dimension d2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion. (See also *Merkel Technical Manual*).

The maximum permissible extrusion gap with a one-sided position of the piston is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material.

Profile dimension		Max. permissible gap dimension			
L	Profile	16 MPa	26 MPa	32 MPa	40 MPa
2,2	2,45	0,35	0,3	–	–
3,2	3,75	0,4	0,35	–	–
4,2	5,5	0,5	0,4	0,3	–
6,3	7,75	0,55	0,45	0,4	0,35
8,1	10,5	0,6	0,5	0,45	0,45
8,1	12,25	0,7	0,6	0,55	0,5
9,5	14,0	0,75	0,65	0,6	0,55

At an operating temperature of above 90°C, and simultaneous exposure to an operating pressure of more than 26 MPa, we recommend the use of the material compound PTFE B602 and PTFE C104.

Tolerances

Diameter d	Tolerance
< 500	h8
> 500	h7

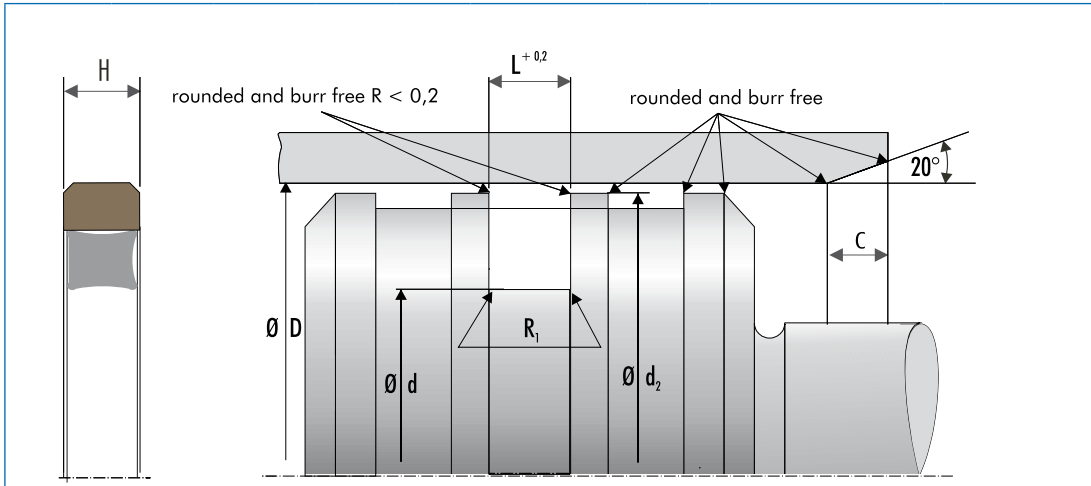
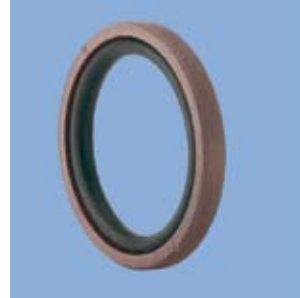
The tolerance for the diameters D and d2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or f7 and f8 are usually chosen.

Design notes

Please note our general design remarks in the *Merkel Technical Manual*.

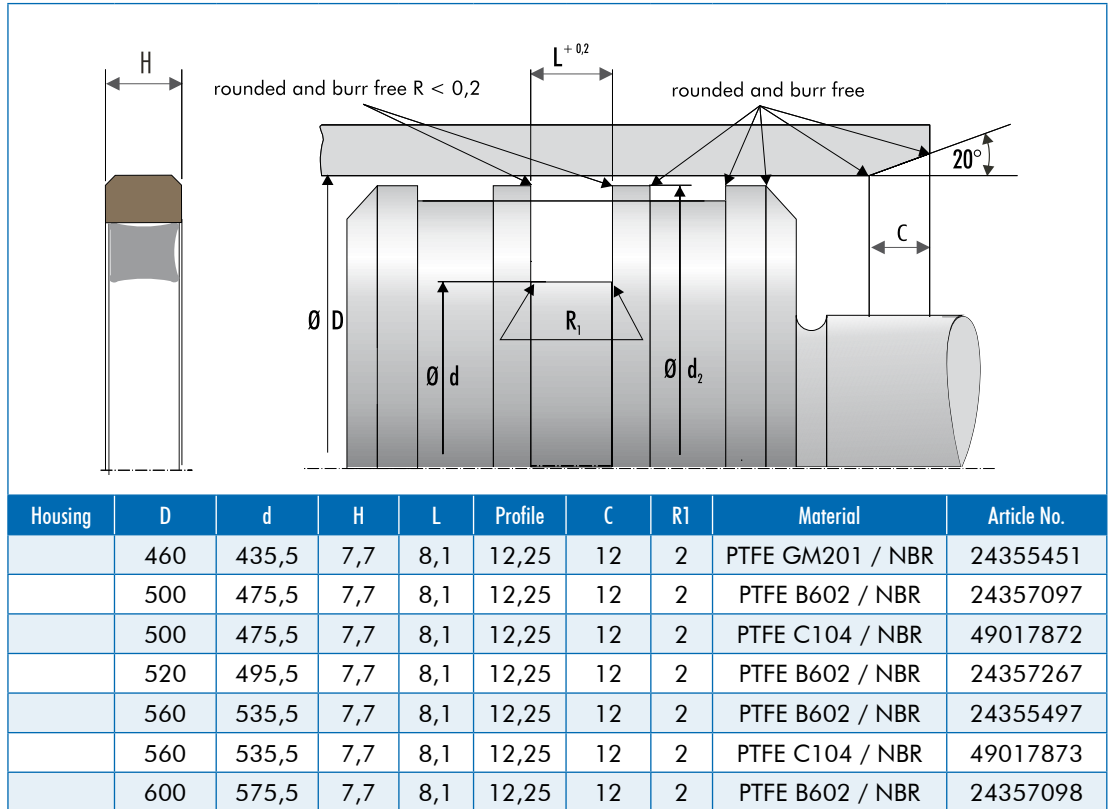
Installation & assembly

Please note our general remarks on hydraulic seal assembly in the *Merkel Technical Manual*.

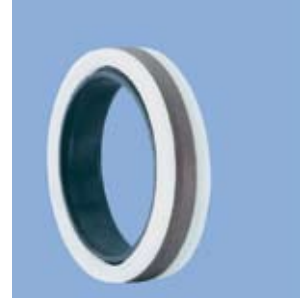


Housing	D	d	H	L	Profile	C	R1	Material	Article No.
	90	74,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24355426
	110	94,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24357144
	115	99,5	5,9	6,3	7,75	8	1,2	PTFE GM201 / NBR	24355428
ISO	125	109,5	5,9	6,3	7,75	8	1,2	PTFE B602 / NBR	24367048
ISO	125	109,5	5,9	6,3	7,75	8	1,2	PTFE C104 / NBR	49017860
	140	119	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24355432
	140	119	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49017861
	145	124	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24355433
ISO	160	139	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24357096
ISO	160	139	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49017862
	180	159	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24357571
	180	159	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49017863
	220	199	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49063568
	300	279	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24355445
	300	279	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49035976
	315	294	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49017868
ISO	320	299	7,7	8,1	10,5	10,5	2	PTFE B602 / NBR	24355446
	320	299	7,7	8,1	10,5	10,5	2	PTFE C104 / NBR	49025366
	360	335,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24355448
	380	355,5	8,1	8,1	12,25	12	2	PTFE B602 / NBR	24367049
	400	375,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24355495
	400	375,5	7,7	8,1	12,25	12	2	PTFE C104 / NBR	49017870
	420	395,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24355450
	440	415,5	7,7	8,1	12,25	12	2	PTFE B602 / NBR	24360949
	450	425,5	7,7	8,1	12,25	12	2	PTFE C104 / NBR	49017871

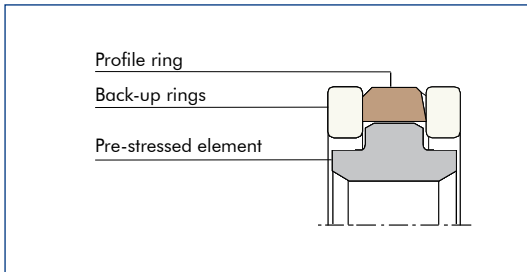
Other material combinations and further dimensions are available on request.



Other material combinations and further dimensions are available on request.



Merkel Compact Seal L 27



Product description

Four-piece piston seal set made of an elastomer pre-stressed element, two active back-up rings and one PTFE/bronze Profile ring.

Product advantages

- bridges large radial gaps
- very good resistance to extrusion, also at pressure peaks
- high resistance to abrasion
- high pressure force due to elastomer Profile ring
- low friction, stick-slip-free

Material

Profile ring

Material	Designation	Color
PTFE-Bronze-Compound	PTFE B602	brown

Pre-stressed element

Material	Designation	Color
Nitrile rubber	NBR	black

Back-up ring

Material	Designation	Color
Polyacetal	POM	white

Application

Compact seal for sealing pistons which can be pressurised on both sides. The activated back-up rings offer a high degree of protection against extrusion, also with breathing gaps.

Operating conditions

Material	NBR/PTFE/POM
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-
Water	-
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +50 °C
Mineral greases	-30 ... +100 °C
Pressure	50 MPa
Running speed	1,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

The long-time behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface.

A precise description and assessment of the surface is thus indispensable.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface.

See also *Merkel Technical Manual*.

Surface finish of the sliding surface

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension d2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion. (See also *Merkel Technical Manual*).

The maximum permissible extrusion gap with a one-sided position of the piston is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material

Profile dimension		Max. permissible gap dimension			
Diameter D	Profile	16 MPa	26 MPa	32 MPa	40 MPa
... 70	6,0	0,8	0,7	0,5	0,4
>70 ... 110	8,5	1,2	1,0	0,65	0,5
>110 ... 200	10,0	1,2	1,0	0,65	0,5
>200 ... 350	12,5	1,8	1,4	0,9	0,7

Tolerances

Diameter	Tolerance
d	h9

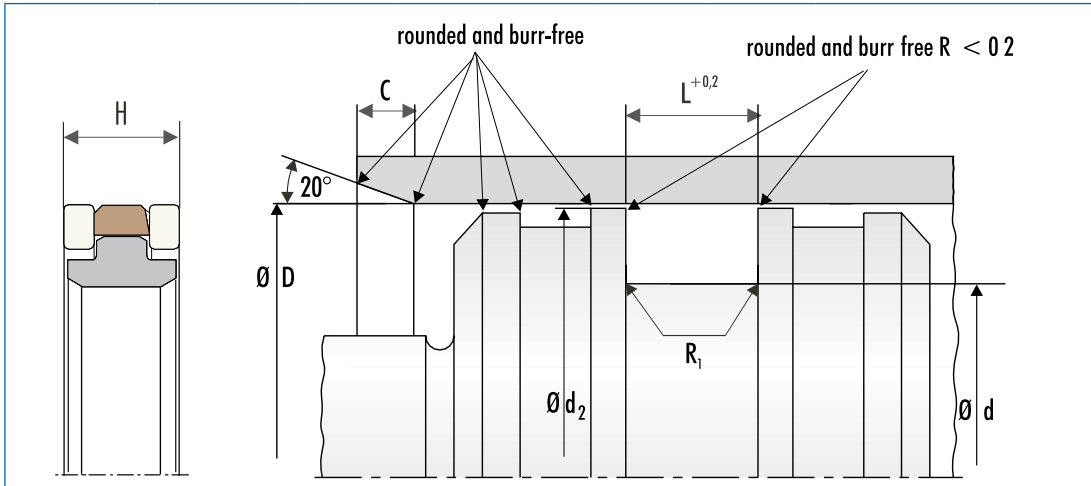
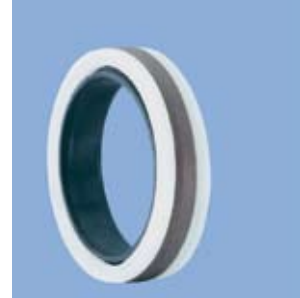
The tolerance for the diameters D and d2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or f7 and f8 are usually chosen.

Design notes

Please note our general design remarks in the *Merkel Technical Manual*.

Installation & assembly

Please note our general remarks on hydraulic seal assembly in the *Merkel Technical Manual*.

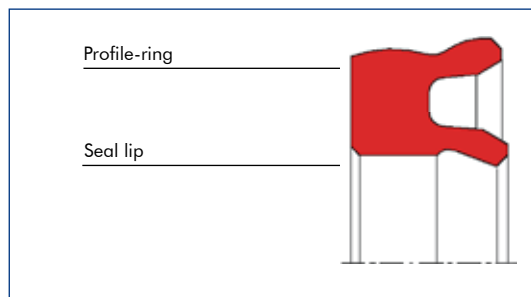


D	d	H	L	Profile	C	R1	Article No.
200	175	18,4	19	12,5	10,5	0,5	24361320
210	185	18,4	19	12,5	10,5	0,5	24380842
220	195	18,4	19	12,5	10,5	0,5	24380754
240	215	18,4	19	12,5	10,5	0,5	49008490
250	225	18,4	19	12,5	10,5	0,5	24370692
280	255	18,4	19	12,5	10,5	0,5	24370693
300	275	18,4	19	12,5	10,5	0,5	24370694
320	295	18,4	19	12,5	10,5	0,5	24370695
360	335	23	25	12,5	10,5	0,5	24378044
400	370	23	25	15	12	0,5	528316
800	770	23	25	15	12	0,5	49045830
950	920	23	25	15	12	0,5	49066255

Further dimensions are available on request.



Merkel Piston Seal TMP 21



Product description

Single-acting polyurethane U-ring

Product advantages

Owing to new production technology special sizes can also be manufactured quickly and flexibly. The U-rings are designed for pressure on one side.

- High degree of tightness
- Large dimension range
- Suitable for dry air
- No moulding tools

Applications

Piston seal which is mainly used in pneumatic cylinders in heavy-duty mechanical engineering.

Material

For diameter <500 mm

Material	Designation	Color
Polyurethane	93 AU V167	red

For diameter >500 mm

Material	Designation	Color
Polyurethane	93 AU V168	red

Operating conditions

Material	93 AU V167/93 AU V168
Pneumatic: air dry or oiled	-10 ... +80 °C
Pressure	2 MPa
Running speed	1,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content Mr > 50 % to max. 90 %, with cut depth c = Rz/2 and reference line Cref = 0 %. Abrasive surfaces, scores, scratches and blowholes are to be avoided.

Toleranzen

If the housing is designed according to our recommendations (see Merkel Technical Manual), the following tolerances can be chosen.

Diameter	Tolerance
D	H8
d_2	h9

Diameter d	Tolerance
<250	h11
>250	h10

Design notes

Please read our general design notes in the *Merkel Technical Manual*.

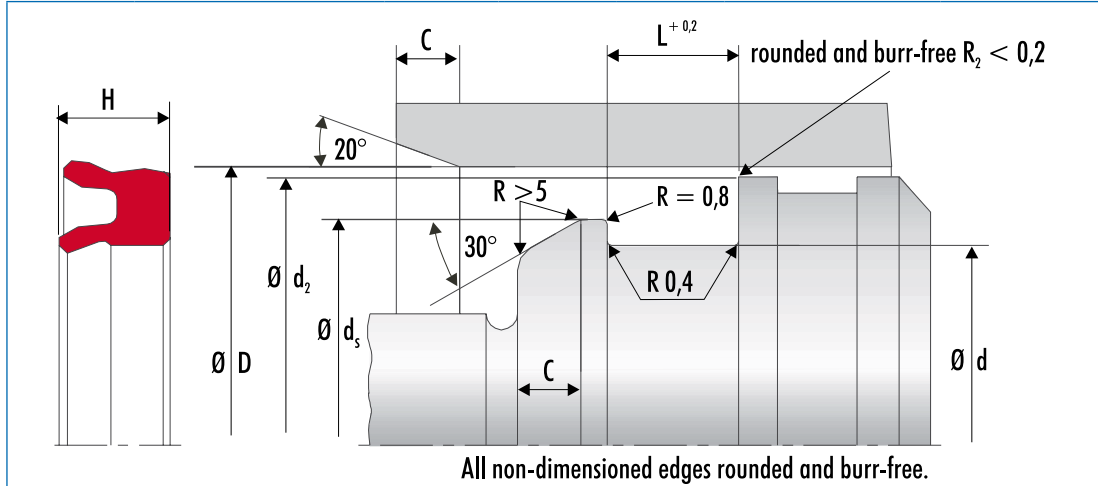
Housing recommendations for new design

d	D	d_s	L	C
>70 ... 220	D - 20	d+6,5	16	8,5
>125 ... 345	D - 25	d+8,5	20	10
>180 ... 660	D - 30	d+10	24	11,5
>440 ... 840	D - 40	d+13,5	32	12,5
>850 ... 1250	D - 50	d+16,5	40	16
>1060 ... 2000	D - 60	d+20	48	18

Installation & assembly

The piston seals can be mounted over the metallic support collar by hand or using an aid (mallet, slightly oil or grease seal). Please contact our application consultants about different housings, e.g. in old plants.

To achieve optimum running-in and operation behaviour, the U-rings should be oiled or greased slightly prior to use (initial lubrication).



D	d	H	L	Profile	C	Material	Article No.
120	100	14,6	16	10	8,5	93 AU V167	24378157
130	105	17,3	19	12,5	10	93 AU V167	531427
140	110	17,3	19	15	11,5	93 AU V167	24377186
140	115	17,3	19	12,5	10	93 AU V167	24370314
155	135	14,6	16	10	8,5	93 AU V167	24371114
160	130	17,3	19	15	11,5	93 AU V167	24370316
180	150	17,3	19	15	11,5	93 AU V167	24370318
190	160	20,9	23	15	11,5	93 AU V167	24370319
200	170	20,9	23	15	11,5	93 AU V167	24370320
220	190	20,9	23	15	11,5	93 AU V167	24368204
230	200	20,9	23	15	11,5	93 AU V167	24368205
235	205	17,3	19	15	11,5	93 AU V167	524744
240	210	20,9	23	15	11,5	93 AU V167	24368206
250	220	20,9	23	15	11,5	93 AU V167	24368207
250	225	18,2	20	12,5	10	93 AU V167	24377713
270	240	20,9	23	15	11,5	93 AU V167	24368317
280	250	20,9	23	15	11,5	93 AU V167	24368209
300	270	20,9	23	15	11,5	93 AU V167	24372471
310	280	20,9	23	15	11,5	93 AU V167	24368210
320	290	22,8	25	15	11,5	93 AU V167	24372339
350	320	20,9	23	15	11,5	93 AU V167	24368212
355	325	23,7	26	15	11,5	93 AU V167	49001230
360	330	20,9	23	15	11,5	93 AU V167	24377184
370	330	26,8	29,5	20	12,5	93 AU V167	24374210
380	350	23,7	26	15	11,5	93 AU V167	24368213
420	390	23,7	26	15	11,5	93 AU V167	24372719
430	400	23,7	26	15	11,5	93 AU V167	24368215
450	420	22	24,2	15	11,5	93 AU V167	24369192

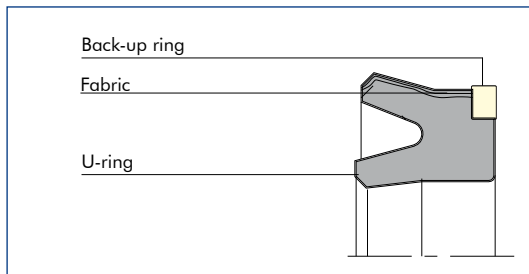
Further dimensions are available on request.



D	d	H	L	Profile	C	Material	Article No.
450	420	23,7	26	15	11,5	93 AU V167	24368216
480	450	23,7	26	15	11,5	93 AU V167	24370400
500	470	23,7	26	15	11,5	93 AU V167	24368217
500	470	25	27,5	15	11,5	93 AU V167	24370361
530	500	23,7	26	15	11,5	93 AU V167	24368219
550	520	23,7	26	15	11,5	93 AU V168	24380029
560	530	23,7	26	15	11,5	93 AU V168	24368220
580	540	20	22	20	12,5	93 AU V168	528819
600	560	24,9	26,5	20	12,5	93 AU V168	24368221
610	570	24,9	26,5	20	12,5	93 AU V168	49001223
630	600	23,7	26	15	11,5	93 AU V168	24367303
650	620	22,8	25	15	11,5	93 AU V168	532611
660	620	24,9	26,5	20	12,5	93 AU V168	49001224
660	630	22,8	25	15	11,5	93 AU V168	24378990
700	660	24,9	26,5	20	12,5	93 AU V168	49001225
705	660	31,9	35	22,5	16	93 AU V168	24370890
710	670	24,9	26,5	20	12,5	93 AU V168	24368222
750	710	24,9	26,5	20	12,5	93 AU V168	24368223
780	750	22,8	25	15	11,5	93 AU V168	24370360
800	750	32	34	25	16	93 AU V168	24368224
820	780	30,9	34	20	12,5	93 AU V168	49001226
840	790	32	34	25	16	93 AU V168	49005726
850	800	32	34	25	16	93 AU V168	24368225
900	850	32	34	25	16	93 AU V168	24368226
950	900	32	34	25	16	93 AU V168	24368227
980	920	39,5	42	30	18	93 AU V168	49001227
1000	950	32	34	25	16	93 AU V168	24368228
1020	980	20	22	20	12,5	93 AU V168	24369479
1040	990	25	27,5	25	16	93 AU V168	24368626
1060	1000	40	42,5	30	18	93 AU V168	24368050
1060	1010	34,6	38	25	16	93 AU V168	24368595
1120	1060	40	42,5	20	18	93 AU V168	24368229
1150	1080	38,7	42,5	35	20	93 AU V168	49005698
1180	1120	40	42,5	30	18	93 AU V168	24367969
1240	1180	40	42,5	30	18	93 AU V168	24367640
1250	1180	42,3	45	35	20	93 AU V168	24368230
1270	1230	20	22	20	12,5	93 AU V168	528838
1320	1250	38,2	42	35	20	93 AU V168	24369407
1320	1250	42,3	45	35	20	93 AU V168	24368231
1400	1320	48,2	53	40	22	93 AU V168	24370891

Further dimensions are available on request.

Merkel U-ring Seal Set 0215



Product description

Two-piece seal set comprising an elastomer U-ring with a fabric reinforcement on the running surface to right over the sealing edge and an active back-up ring.

Product advantages

- low friction due to fabric reinforcement
- large dimension range
- resistant to extrusion owing to activated back-up ring

Applications

Single-acting piston seal for use in hydraulics or pneumatics.

Material

Profile ring

Material	Description	Color
Nitrile rubber	NBR	black
Cotton fabric	BI-NBR	black

Back-up ring

Material	Description	Color
D < 300 mm Polyacetal	POM	white
D > 300 mm Polyamide	PA	white

Other materials like PTFE/bronze back-up ring on request.

Operating conditions

Material	NBR/BI-NBR/POM or PA
Hydraulic oils HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rapeseed oil)	-30 ... +80 °C
HEES (synthetic esters)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure Hydraulic	25 or 40* MPa
Pressure Pneumatic	5 MPa
Sliding speed v in m/s	1,5 m/s

*max. pressure depends on the Profile

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	< 2,5 μm
Groove base	< 1,6 μm	< 6,3 μm
Groove sides	< 3,0 μm	< 15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$



Design notes

Please note our general design remarks in the *Merkel Technical Manual*

Gap dimension

The dimension d_2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance and the deflection of the guide under load.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Back-up ring height h	Max. permissible gap dimension			
	16 MPa	26 MPa	32 MPa	40 MPa
1,5	0,5	0,5	0,4	0,3
2,5	0,8	0,7	0,6	0,4
3,0	0,8	0,7	0,6	0,4
3,5	1,2	1,0	0,65	0,5
4,0	1,2	1,0	0,65	0,5
5,0	1,8	1,4	0,9	0,7
6,0	1,8	1,4	0,9	0,7
8,0	2,0	1,6	1,1	0,9

The largest gap width occurring in operation on the non-pressurised side of the seal is crucial for the functioning of the seal. See *Merkel Technical Manual*.

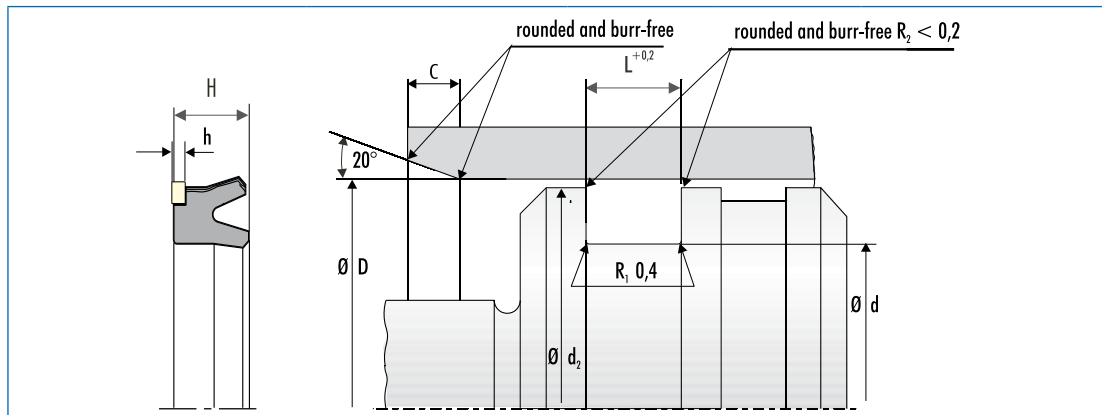
Tolerance

Diameter	Tolerance
D	H8
d_2	h10

The tolerance for the diameter d_2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

Installation & assembly

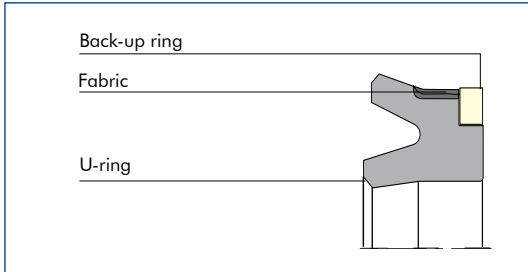
Careful assembly is a precondition for the perfect functioning of the seal. See *Merkel Technical Manual*.



D	d	H	L	Profile	h	Article No.
80	65	11,8	13	7,5	2,5	24142953
100	85	11,8	13	7,5	2,5	24140707
125	105	15	16	10	2,5	24142955
160	140	15	16	10	2,5	24142958
200	170	22	23	15	3,5	24295125
200	175	18,8	20	12,5	2,5	24142961
250	220	22	23	15	3,5	24299010
250	225	18,8	20	12,5	2,5	24142964
310	280	22	22,3	15	4	24240365
320	290	23,5	25	15	2,5	24142967
330	300	22	0	15	4	24238760
340	310	22	23	15	3,5	24301449
350	320	22	23	15	4	24334236
350	320	22	23	15	4	24265069
360	330	25	26	15	3,5	24308767
370	330	28	29,5	20	5	24297841
380	350	25	0	15	4	24240361
400	360	30,5	32	20	2,5	24142970
400	370	25	0	15	4	24241348
420	390	25	0	15	4	24238275
430	400	25	26	15	4	24292148
450	410	30	0	20	6	24245119
490	450	34	35,5	20	5	24297820
500	470	25	26	15	4	24292218
630	600	25	26	15	5	24294143
750	710	25	26,5	20	5	24294439
800	750	32	33,5	25	8	24265071
850	800	32	34	25	5	24294586
900	850	32	34	25	5	24294442

Further dimensions are available on request.

Merkel U-ring Seal Set 0217



Product description

Two-piece seal set comprising an elastomer U-Ring with a fabric reinforcement on the running surface and an active back-up ring.

Product advantages

- low friction due to fabric reinforcement
- large dimension range
- resistant to extrusion owing to activated back-up ring

Applications

Single-acting piston seal for use in hydraulics or pneumatics.

Material

Profile ring

Material	Description	Color
Nitrile rubber	NBR	black
Cotton fabric	BI-NBR	black

Back-up ring

Material	Description	Color
D < 300 mm Polyacetal	POM	white
D > 300 mm Polyamide	PA	white

Other materials like PTFE/bronze back-up ring on request.

Operating conditions

Material	NBR/BI-NBR/POM or PA
Hydraulic oils HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rapeseed oil)	-30 ... +80 °C
HEES (synthetic esters)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure Hydraulic	25 or 40* MPa
Pressure Pneumatic	5 MPa
Sliding speed v in m/s	1,5 m/s

*max. pressure depends on the Profile

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	< 2,5 μm
Groove base	< 1,6 μm	< 6,3 μm
Groove sides	< 3,0 μm	< 15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

Design notes

Please note our general design remarks in the *Merkel Technical Manual*

Gap dimension

The dimension d_2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance and the deflection of the guide under load.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Back-up ring height h	Max. permissible gap dimension			
	16 MPa	26 MPa	32 MPa	40 MPa
1,5	0,5	0,5	0,4	0,3
2,5	0,8	0,7	0,6	0,4
3,0	0,8	0,7	0,6	0,4
3,5	1,2	1,0	0,65	0,5
4,0	1,2	1,0	0,65	0,5
5,0	1,8	1,4	0,9	0,7
6,0	1,8	1,4	0,9	0,7
8,0	2,0	1,6	1,1	0,9

The largest gap width occurring in operation on the non-pressurised side of the seal is crucial for the functioning of the seal. See *Merkel Technical Manual*.

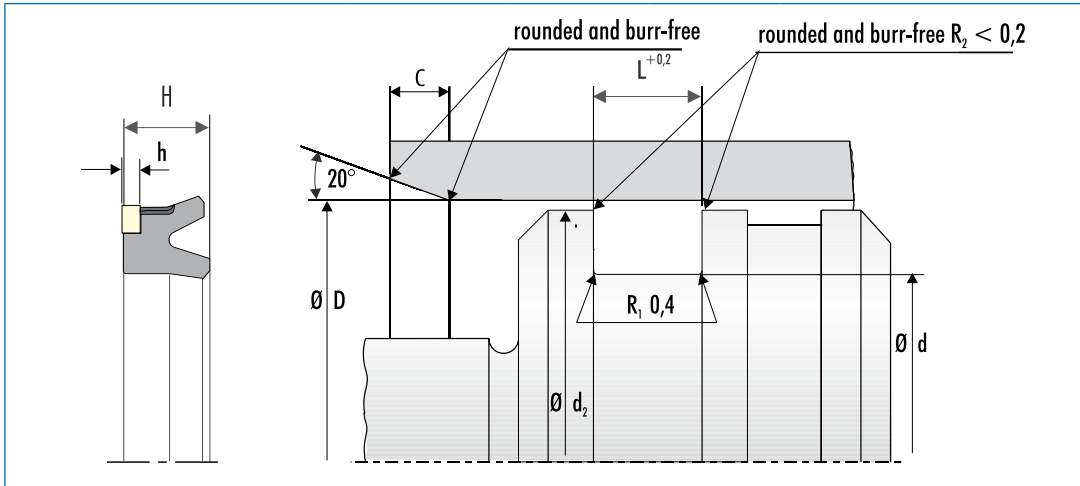
Tolerance

Diameter	Tolerance
D	H8
d_2	h10

The tolerance for the diameter d_2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

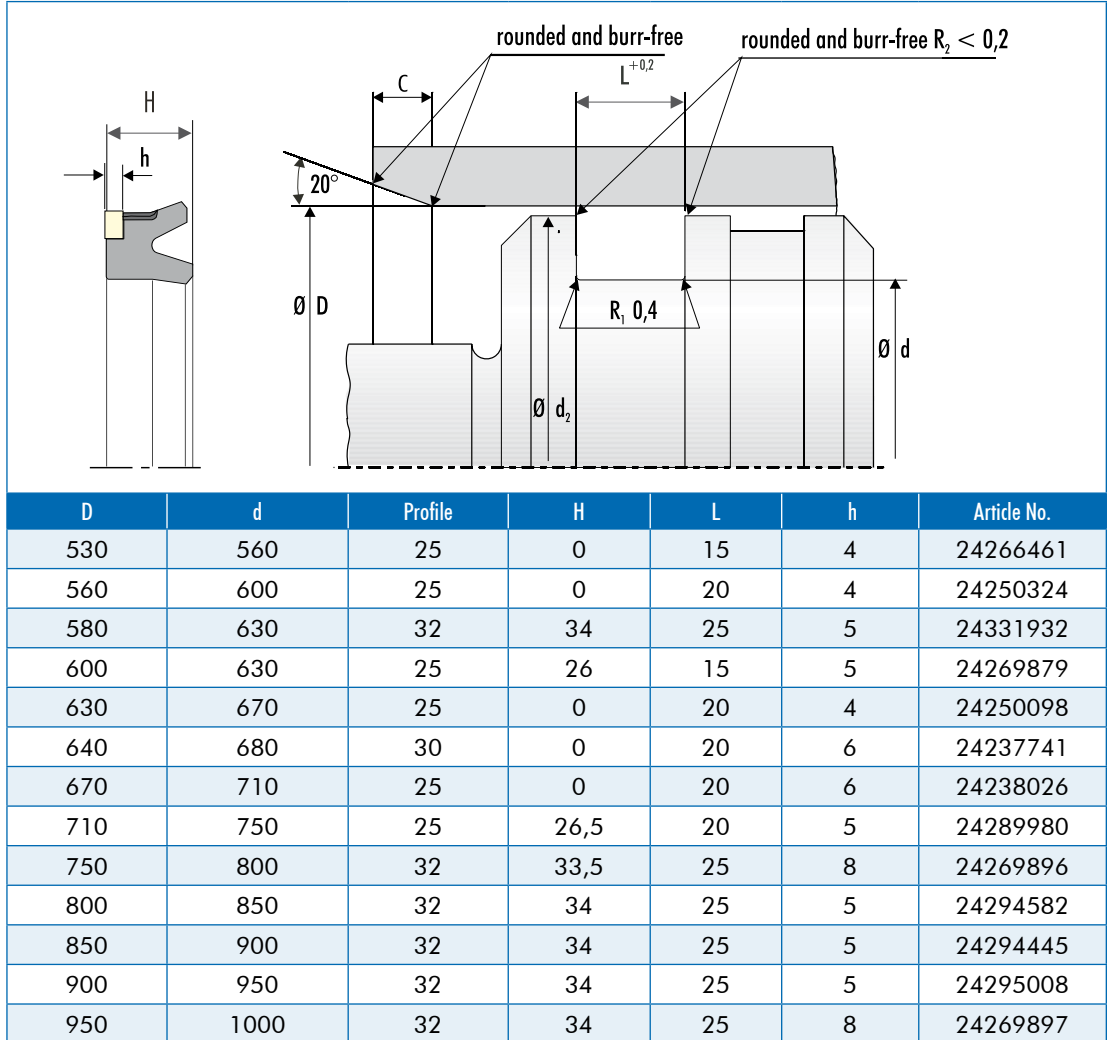
Installation & assembly

Careful assembly is a precondition for the perfect functioning of the seal. See *Merkel Technical Manual*.



D	d	Profile	H	L	h	Article No.
170	200	22	23	15	3,5	24291117
205	235	18	19	15	3,5	24298553
210	240	22	0	15	4	24265118
220	250	22	23	15	3,5	24291116
225	250	18,8	20	12,5	2,5	24245127
240	270	22	0	15	4	24245131
270	300	22	23	15	3,5	24292037
270	310	20	0	20	4	24245125
280	310	22	0	15	4	24245128
290	320	23,5	25	15	2,5	24245126
300	330	22	0	15	4	24245134
310	340	22	23	15	3,5	24301448
320	350	22	23	15	4	24269895
330	360	25	26	15	3,5	24290774
350	380	25	0	15	4	24245490
360	400	30,5	32	20	2,5	24245491
370	400	25	0	15	4	24238271
390	420	25	0	15	4	24245492
400	430	25	26	15	4	24292147
410	450	30	0	20	6	24245493
420	450	25	0	15	4	24240357
440	470	25	0	15	4	24266416
450	480	25	0	15	4	24250323
460	500	23,9	25,4	20	5	24351681
470	500	25	26	15	4	24269878
500	530	25	0	15	4	24245121

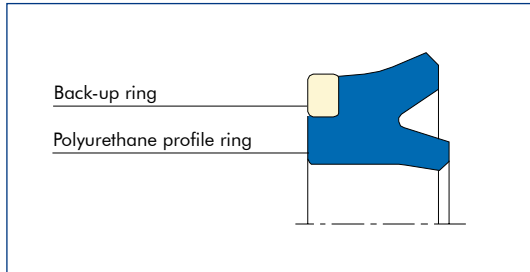
Further dimensions are available on request.



Further dimensions are available on request.



Merkel Nutringdichtsatz Typ 0504



Product description

Two-piece Merkel seal set with asymmetrical profile, used as piston seal.

Product advantages

- Functional safety in case of radial shaft misalignment by using large profile overlap.
- Operational safety due to robust polyurethane Profile ring.
- High sealing function due to distinctive sealing edge (high line load).
- Safety against metallic contact due to large extrusion gaps by using back-up ring for high extrusion resistance.
- Easy and secure mounting.

Application

- Single seal for working pressures up to 50 MPa.
- Suitable for large extrusion gaps.
- Nominal diameter up to 2000 mm.

Material

Profile ring

Material	Designation	Color
Polyurethane	95 AU V142	dark blue

or

Material	Designation	Color
Polyurethane	94 AU 925	light blue

Back-up ring

Material	Designation	Color
Polyamide	PA	white

or

Material	Designation	Color
Polyoxymethylen	POM	white

The material is determined by the nominal diameter and the production process involved.

Operating conditions

Material	95 AU V142 94 AU 926
Hydraulic oils, HL, HLP	-30 ... +110 °C
HFA fluids	+5 ... +50 °C
HFB fluids	+5 ... +50 °C
HFC fluids	-30 ... +40 °C
HFD fluids	-
Water	+5 ... +40 °C
HETG (rape-seed oil)	-30 ... +60 °C
HEES (synth. ester)	-30 ... +60 °C
HEPG (glycol)	-30 ... +40 °C
Mineral greases	-30 ... +110 °C
Pressure	50 MPa
Running speed	0,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Gap dimension

The dimension D2 is determined by factoring in the maximum permissible extrusion gap, the tolerances, the guide clearance, the deflection of the guide under load, and the pipe expansion See also *Merkel Technical Manual*.

The maximum permissible extrusion gap with a one-sided position of the piston rod is significantly determined by the maximum operating pressure and the temperature-dependent dimensional stability of the seal material. See also *Merkel Technical Manual*.

Profile dimension	Max. permissible gap dimension				
	16 MPa	26 MPa	32 MPa	40 MPa	50 MPa
Profile					
10,0 ... < 15,0	0,7	0,7	0,7	0,6	0,5
15,0 ... 30,0	1,1	1,1	1,0	0,9	0,7

Tolerances

If the installation space is designed according to our housing recommendations (p. v. design notes), the following tolerances can be chosen:

Diameter	Tolerance
D	H8
d2	h9

Diameter D	Tolerance
≤ 250	h11
> 250	h10

Diameter D	Tolerance
≤ 500	h8
> 500	-0,1

If other housing dimensions are used, please contact our technical service.



Design notes

The U-Ring seal set Type 0504 is a single acting seal. We do not recommend a back-to-back arrangement, since there is the risk of pressure build-up between the seals during operation.

Housing recommendation

D	d	ds	L	C
> 70 ... 220	D - 20	d + 6,5	16	8,5
> 125 ... 345	D - 25	d + 8,5	20	10
> 180 ... 660	D - 30	d + 10	24	11,5
> 440 ... 840	D - 40	d + 13,5	32	12,5
> 840 ... 1250	D - 50	d + 16,5	40	16
> 1060 ... 2000	D - 60	d + 20	48	18

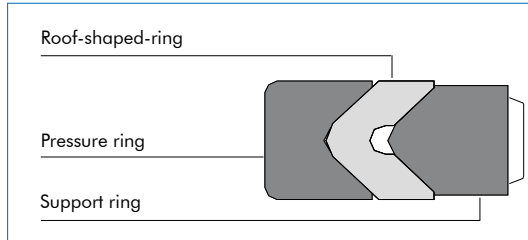
Please note our general design remarks in the *Merkel Technical Manual*.

Installation & assembly

Dependent on the diameter ordered, the back-ring is delivered with a certain over-length and has to be cut to size just before mounting on site.

Reliable seal function is dependent on correct installation. See also *Merkel Technical Manual*.

Merkel Roof-Shaped Seal Set EK/EKV



Product description

Multi-part piston seal set comprising one thrust ring, one or two roof-shaped seals and one support ring.

Product advantages

- Field-proven under ultra-tough conditions long useful lifetime
- Can be optimally matched to the application concerned
- Functions for a certain period even on poor surfaces
- Not susceptible to soiling
- The leakage or friction behavior may alter, depending on the application or design concerned.

Application

Seal set for tough applications, predominantly for spares supply at old installations. EK/EKV Roof-Shaped Seal Sets can be used for one-sided applications or back-to-back for pistons.

Material

Pressure ring

Type	Material	Designation
EK	Cotton fabric/NBR	BI-NBR
EKV	Cotton fabric/FKM	BI-FKM

Roof-shaped-ring

Type	Material	Designation
EK	Cotton fabric/NBR	BI-NBR
EKV	Cotton fabric/FKM	BI-FKM

Type	Material	Designation
EK	NBR	85 NBR
EKV	FKM	85 FKM

Support ring

Type	Material	Designation
EK	Cotton fabric/NBR or POM	BI-NBR or POM
EKV	Cotton fabric/FKM	BI-FKM

Operating conditions

Material	BI-NBR/85 NBR
Hydraulic oils HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rapeseed oil)	-30 ... +80 °C
HEES (synthetic ester)	-30 ... +80 °C
HEPG (glykol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Sliding speed	0,5 m/s

Material	BI-FKM/85 FKM
Hydraulic oils HL, HLP	-15 ... +140 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	+5 ... +60 °C
HFD fluids	-15 ... +140 °C
Water	+5 ... +80 °C
HETG (rapeseed oil)	-15 ... +80 °C
HEES (synthetic ester)	-15 ... +100 °C
HEPG (glykol)	-15 ... +80 °C
Mineral greases	-15 ... +140 °C
Pressure	40 MPa
Sliding speed	0,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content Mr > 50 % to max. 90 %, with cut depth c = Rz/2 and reference line Cref = 0 %



The long-time behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface.

A precise description and assessment of the surface is thus indispensable.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, the hitherto merely general description of the material content is significantly improved, not least in regard to the abrasiveness of the surface.

See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces.

See also *Merkel Technical Manual*.

Design notes

Nominal- \emptyset D	d
≤ 80	H9/f8
>80 ... 120	H8/f8
> 120 ... 500	H8/f7
> 500 ... 630	H8/f7
> 630 ... 800	H8/f7
> 800 ... 1000	H8/f7
> 1000 ... 1250	H8/f7

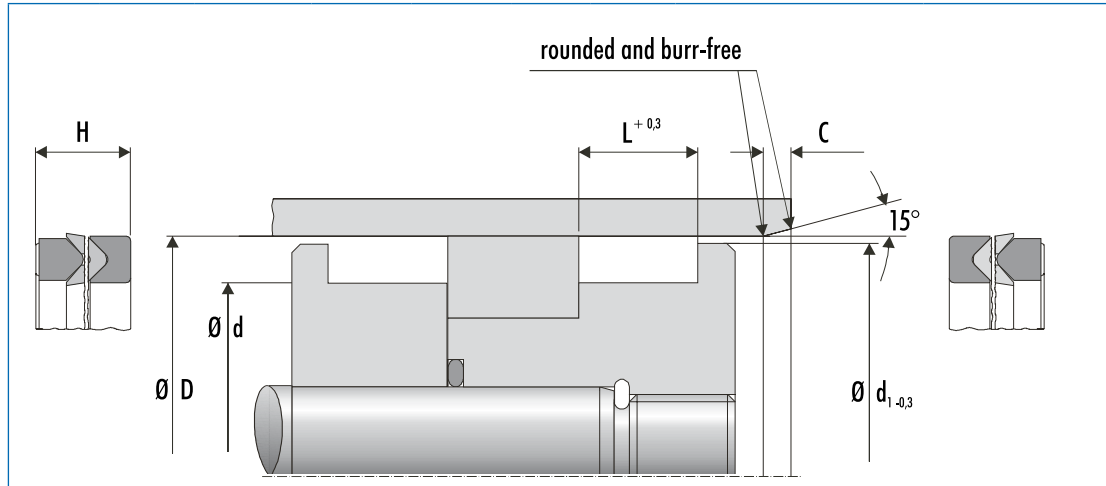
Please note our general design remarks in the *Merkel Technical Manual*.

Tolerances

Diameter D	Tolerance	d_1
< 500	H11	-0,3
> 500	H10	-0,3

Installation & assembly

Careful fitting is a prerequisite for the correct function of the seal. See also *Merkel Technical Manual*.



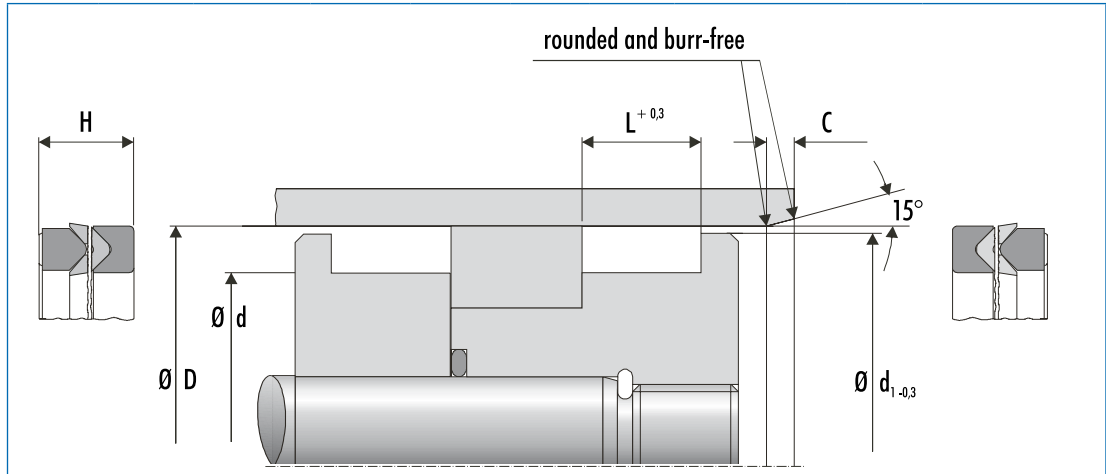
D	d	d1	L	H	Profile	C	Material	Type	Article No.
40	25	39	11,5	11	7,5	5	BI-NBR	EK	24070153
40	25	39	11,5	11	7,5	5	BI-FKM	EKV	24101339
45	30	44	11,5	11	7,5	5	BI-NBR	EK	24070155
45	30	44	11,5	11	7,5	5	BI-FKM	EKV	24148048
50	35	49	11,5	11	7,5	5	BI-NBR	EK	24070156
50	35	49	11,5	11	7,5	5	BI-FKM	EKV	24139300
55	40	54	11,5	11	7,5	5	BI-NBR	EK	24070157
55	40	54	11,5	11	7,5	5	BI-FKM	EKV	24148049
56	41	55	11,5	11	7,5	5	BI-NBR	EK	24070158
56	41	55	11,5	11	7,5	5	BI-FKM	EKV	24148050
60	45	59	11,5	11	7,5	5	BI-NBR	EK	24070159
60	45	59	11,5	11	7,5	5	BI-FKM	EKV	24139297
63	48	62	12,5	12	7,5	5	BI-NBR	EK	24076835
63	48	62	13	12,5	7,5	5	BI-NBR	EK	24070160
63	48	62	13	12,5	7,5	5	BI-FKM	EKV	24139361
65	50	64	13	12,5	7,5	5	BI-NBR	EK	24138932
70	50	69	15,2	14,6	10	6	BI-NBR	EK	24070161
70	50	69	15,2	14,6	10	6	BI-FKM	EKV	24139314
80	60	79	15,2	14,6	10	6	BI-NBR	EK	24070162
80	65	79	12,5	12	7,5	5	BI-FKM	EKV	24248122
90	70	89	21,2	20,6	10	6	BI-NBR	EK	24070163
90	70	89	21,2	20,6	10	6	BI-FKM	EKV	24148051
100	80	99	21,2	20,6	10	6	BI-NBR	EK	24070164
100	80	99	21,2	20,6	10	6	BI-FKM	EKV	24139296
100	85	99	12,5	12	7,5	6	BI-NBR	EK	24073568
110	90	109	21,2	20	10	6	BI-NBR	EK	24070165

Further dimensions are available on request.



D	d	d1	L	H	Profile	C	Material	Type	Article No.
110	90	109	21,2	20,6	10	6	BI-FKM	EKV	24144307
115	95	114	21,2	20,6	10	6	BI-NBR	EK	24070166
115	95	114	21,2	20,6	10	6	BI-FKM	EKV	24148052
120	95	119	25,3	24,5	12,5	7,5	BI-NBR	EK	24071344
125	100	124	25,8	25	12,5	7,5	BI-NBR	EK	24070167
125	100	124	25,8	25	12,5	7,5	BI-FKM	EKV	24099512
140	115	139	25,8	25	12,5	7,5	BI-NBR	EK	24070168
140	115	139	25,8	25	12,5	7,5	BI-FKM	EKV	24139362
150	120	148,5	29	28	15	7,5	BI-NBR	EK	24070169
150	120	148,5	29	28	15	7,5	BI-FKM	EKV	24144511
160	130	158,5	29	28	15	7,5	BI-NBR	EK	24070170
160	130	158,5	29	28	15	7,5	BI-FKM	EKV	24099516
180	150	178,5	31,5	30,5	15	7,5	BI-NBR	EK	24070171
180	150	178,5	31,5	30,5	15	7,5	BI-FKM	EKV	24139365
200	170	198,5	33,5	32,5	15	7,5	BI-NBR	EK	24266531
200	170	198,5	33,5	32,5	15	7,5	BI-FKM	EKV	24139359
200	170	198,5	38,7	37,5	15	7,5	BI-NBR	EK	24079621
220	190	218,5	33,5	32,5	15	7,5	BI-NBR	EK	24085858
220	190	218,5	38,7	37,5	15	7,5	BI-NBR	EK	24199656
225	195	223,5	33,5	32,5	15	7,5	BI-NBR	EK	24266533
225	195	223,5	33,5	32,5	15	7,5	BI-FKM	EKV	24148053
225	195	223,5	38,7	37,5	15	7,5	BI-NBR	EK	24075180
240	210	238,5	33,5	32,5	15	7,5	BI-NBR	EK	24121200
240	210	238,5	38,7	37,5	15	7,5	BI-NBR	EK	24102695
250	220	248,5	25	24	15	7,5	BI-NBR	EK	24248388
250	220	248,5	33,5	32,5	15	7,5	BI-NBR	EK	24149616
250	220	248,5	33,5	32,5	15	7,5	BI-FKM	EKV	24139363
250	220	248,5	38,7	37,5	15	7,5	BI-NBR	EK	24220077
260	230	258,5	33,5	32,5	15	7,5	BI-NBR	EK	24266547
260	230	258,5	38,7	37,5	15	7,5	BI-NBR	EK	24266548
280	250	278,5	33,5	32,5	15	7,5	BI-NBR	EK	24266549
280	250	278,5	33,5	30	15	7,5	BI-FKM	EKV	24182616
280	250	278,5	38,7	37,5	15	7,5	BI-NBR	EK	24063522
300	270	298,5	33,5	32,5	15	7,5	BI-NBR	EK	24266550
300	270	298,5	33,5	32,5	15	7,5	BI-FKM	EKV	24148055
300	270	298,5	38,7	37,5	15	7,5	BI-NBR	EK	24063954
310	280	308,5	33,5	32,5	15	7,5	BI-NBR	EK	24266551
310	280	308,5	38,7	37,5	15	7,5	BI-NBR	EK	24106772

Further dimensions are available on request.



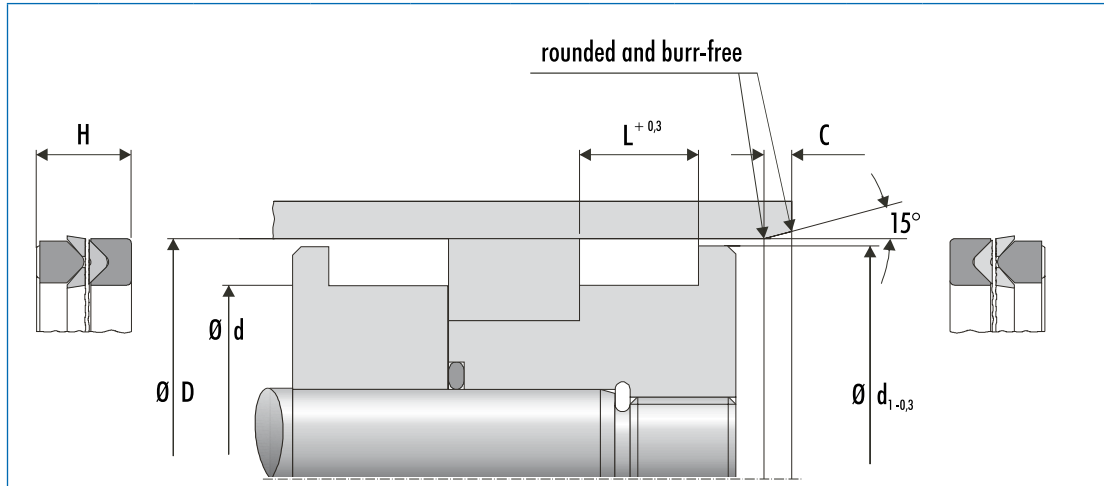
D	d	d1	L	H	Profile	C	Material	Type	Article No.
320	280	318	41,5	40	20	7,5	BI-NBR	EK	24068630
320	280	318	51,8	50	20	7,5	BI-NBR	EK	24072341
320	290	318,5	33,5	32,5	15	7,5	BI-NBR	EK	24266552
320	290	318,5	38,7	37,5	15	7,5	BI-NBR	EK	24220080
340	300	338	41,5	40	20	10	BI-NBR	EK	24089867
340	300	338	51,8	50	20	10	BI-NBR	EK	24067213
340	310	338,5	33,5	32,5	15	7,5	BI-NBR	EK	24266553
340	310	338,5	38,7	37,5	15	7,5	BI-NBR	EK	24067366
350	310	348	41,5	40	20	10	BI-NBR	EK	24266554
350	310	348	51,8	50	20	10	BI-NBR	EK	24266555
360	320	358	41,5	40	20	10	BI-NBR	EK	24073186
360	320	358	51,8	50	20	10	BI-NBR	EK	24068309
380	340	378	41,5	40	20	10	BI-NBR	EK	24063739
380	340	378	51,8	50	20	10	BI-NBR	EK	24063609
390	350	388	41,5	40	20	10	BI-NBR	EK	24096917
390	350	388	51,8	50	20	10	BI-NBR	EK	24091905
400	360	398	41,5	40	20	10	BI-NBR	EK	24061431
400	360	398	51,8	50	20	10	BI-NBR	EK	24062353
410	370	407,5	41,5	40	20	10	BI-NBR	EK	24076734
410	370	407,5	51,8	50	20	10	BI-NBR	EK	24134434
420	380	417,5	41,5	40	20	10	BI-NBR	EK	24078766
420	380	417,5	51,8	50	20	10	BI-NBR	EK	24179322
440	400	437,5	41,5	40	20	10	BI-NBR	EK	24088254
440	400	437,5	51,8	50	20	10	BI-NBR	EK	24220081
450	410	447,5	41,5	40	20	10	BI-NBR	EK	24108468
450	410	447,5	51,8	50	20	10	BI-NBR	EK	24220082
460	420	457,5	41,5	40	20	10	BI-NBR	EK	24113757

Further dimensions are available on request.



D	d	d1	L	H	Profile	C	Material	Type	Article No.
460	420	457,5	51,8	50	20	10	BI-NBR	EK	24080149
480	440	477,5	41,5	40	20	10	BI-NBR	EK	24073599
480	440	477,5	51,8	50	20	10	BI-NBR	EK	24083862
490	450	487,5	41,5	40	20	10	BI-NBR	EK	24082627
490	450	487,5	51,8	50	20	10	BI-NBR	EK	24083228
500	460	497,5	41,5	40	20	10	BI-NBR	EK	24220083
500	460	497,5	51,8	50	20	10	BI-NBR	EK	24220084
510	470	507,5	41,5	40	20	10	BI-NBR	EK	24091197
510	470	507,5	51,8	50	20	10	BI-NBR	EK	24097617
520	480	517,5	41,5	40	20	10	BI-NBR	EK	24087936
520	480	517,5	51,8	50	20	10	BI-NBR	EK	24069860
540	500	537,5	41,5	40	20	10	BI-NBR	EK	24085075
540	500	537,5	64,5	50	20	10	BI-NBR	EK	24082317
550	510	547,5	41,5	40	20	10	BI-NBR	EK	24343760
550	510	547,5	51,8	50	20	10	BI-NBR	EK	24343761
560	510	557,5	51,8	50	25	12,5	BI-NBR	EK	24083477
560	510	557,5	64,5	62,5	25	12,5	BI-NBR	EK	24082090
570	530	567,5	41,5	40	20	10	BI-NBR	EK	24287015
570	530	567,5	51,8	50	20	10	BI-NBR	EK	24214286
580	530	577,5	51,8	50	25	12,5	BI-NBR	EK	24113726
580	530	577,5	64,5	62,5	25	12,5	BI-NBR	EK	24091357
580	540	577,5	41,5	40	20	10	BI-NBR	EK	24220085
580	540	577,5	51,8	50	20	10	BI-NBR	EK	24220086
590	550	587,5	51,8	50	20	10	BI-NBR	EK	24087597
600	560	597,5	41,5	40	20	10	BI-NBR	EK	24067724
600	560	597,5	51,8	50	20	10	BI-NBR	EK	24077886
610	560	607,5	51,8	50	25	12,5	BI-NBR	EK	24220087
610	560	607,5	64,5	62,5	25	12,5	BI-NBR	EK	24099113
620	580	617,5	41,5	40	20	10	BI-NBR	EK	24090558
620	580	617,5	51,8	50	20	10	BI-NBR	EK	24170779
630	580	627,5	51,8	50	25	12,5	BI-NBR	EK	24141229
630	580	627,5	64,5	62,5	25	12,5	BI-NBR	EK	24094418
630	590	627,5	41,5	40	20	10	BI-NBR	EK	24068741
630	590	627,5	51,8	50	20	10	BI-NBR	EK	24083633
640	600	637,5	51,8	50	20	10	BI-NBR	EK	24247385
650	600	647,5	51,8	50	25	12,5	BI-NBR	EK	24073080
650	600	647,5	64,5	62,5	25	12,5	BI-NBR	EK	24082118
670	630	667,5	41,5	40	20	10	BI-NBR	EK	24074848
670	630	667,5	51,8	50	20	10	BI-NBR	EK	24074849
720	670	717,5	51,8	50	25	12,5	BI-NBR	EK	24181627

Further dimensions are available on request.



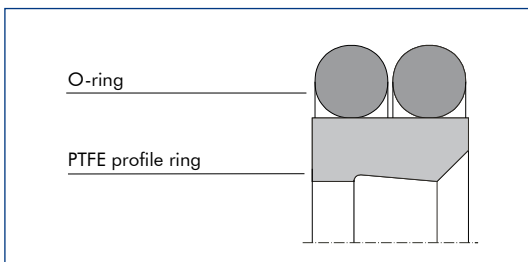
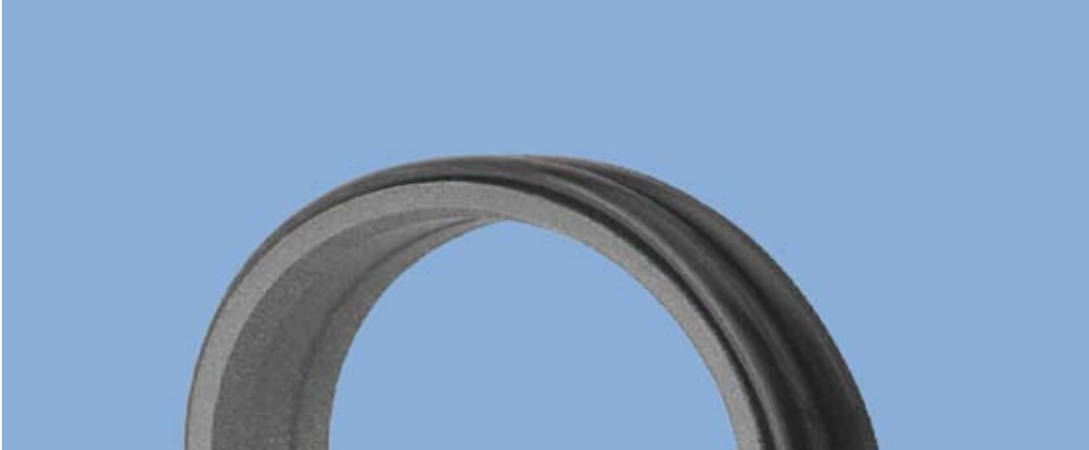
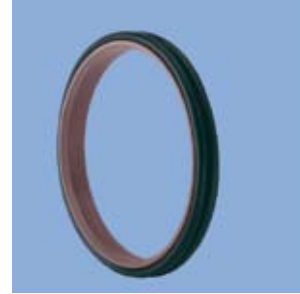
D	d	d1	L	H	Profile	C	Material	Type	Article No.
720	670	717,5	64,5	62,5	25	12,5	BI-NBR	EK	24077483
730	690	727,5	51,8	50	20	10	BI-NBR	EK	24292823
740	700	737,5	41,5	40	20	10	BI-NBR	EK	24142521
740	700	737,5	51,8	50	20	10	BI-NBR	EK	24137458
750	710	747,5	41,5	40	20	10	BI-NBR	EK	24105848
750	710	747,5	51,8	50	20	10	BI-NBR	EK	24080694
760	710	757,5	64,5	62,5	25	12,5	BI-NBR	EK	24339524
790	750	787,5	41,5	40	20	10	BI-NBR	EK	24220088
790	750	787,5	51,8	50	20	10	BI-NBR	EK	24149095
800	750	797,5	51,8	50	25	12,5	BI-NBR	EK	24068701
800	750	797,5	64,5	62,5	25	12,5	BI-NBR	EK	24068702
840	800	837,5	41,5	40	20	10	BI-NBR	EK	24220089
840	800	837,5	51,8	50	20	10	BI-NBR	EK	24220090
850	800	847,5	51,8	50	25	12,5	BI-NBR	EK	24101686
850	800	847,5	64,5	62,5	25	12,5	BI-NBR	EK	24085823
860	810	857,5	64,5	62,5	25	12,5	BI-NBR	EK	24249193
870	820	867,5	51,8	50	25	12,5	BI-NBR	EK	24097782
870	820	867,5	64,5	62,5	25	12,5	BI-NBR	EK	24137668
890	850	887,5	41,5	40	20	10	BI-NBR	EK	24143588
890	850	887,5	51,8	50	20	10	BI-NBR	EK	24218572
900	850	897,5	51,8	50	25	12,5	BI-NBR	EK	24181084
900	850	897,5	64,5	62,5	25	12,5	BI-NBR	EK	24128505
950	900	947,5	64,5	62,5	25	12,5	BI-NBR	EK	24081584
1000	950	997,5	51,8	50	25	12,5	BI-NBR	EK	24068742
1000	950	997,5	64,5	62,5	25	12,5	BI-NBR	EK	24068704
1050	1000	1047,5	51,8	50	25	12,5	BI-NBR	EK	24311917
1050	1000	1047,5	64,5	62,5	25	12,5	BI-NBR	EK	24069614
1100	1050	1097,5	64,5	62,5	25	12,5	BI-NBR	EK	24133469

Further dimensions are available on request.





Merkel Double Wiper PT 1



Product description

Double wiper, consisting of a PTFE profile ring with one sealing and one wiping edge, plus two O-rings as preloading elements.

Product advantages

- enhanced functional reliability of the sealing system, thanks to additional sealing edge
- high operating reliability, thanks to sturdy profile ring made of PTFE compound (can briefly withstand the full operating pressure)
- very good wiping capability for dirt adhering, thanks to dimensionally stable wiping edge
- excellent control and positioning characteristics thanks to favorable frictional behavior (stick-slip-free)

Material

PTFE profile ring

Material	Designation	Color
PTFE-glass-fiber-MoS2 compound	PTFE GM201	light grey

O-ring

Material	Designation
Nitrile rubber	NBR

Applications

Double wiper for improving overall sealing capabilities. The PT 1 is preferably used in conjunction with our rod seals OMS-MR PR or T 20.

Operating conditions

Material	PTFE GM 201/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	+30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Running speed	5 m/s

Operating conditions

Material	PTFE B206/FKM
Hydraulic oils, HL, HLP	-10 ... +200 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-10 ... +200 °C
Water	-
HETG (rape-seed oil)	-10 ... +80 °C
HEES (synth. ester)	-10 ... +100 °C
HEPG (glycol)	-10 ... +80 °C
Mineral greases	-10 ... +200 °C
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness. See also *Merkel Technical Manual*.

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
R_a	> 0,05 μm	< 0,30 μm
R_{max}	< 2,5 μm	
R_{pkx}	< 0,5 μm	
R_{pk}	< 0,5 μm	
R_k	>0,25 μm	<0,7 μm
R_{vk}	>0,2 μm	<0,65 μm
R_{vkx}	>0,2 μm	<2,0 μm

Tolerances

Diameter	Tolerance
D	H9
D1	H10

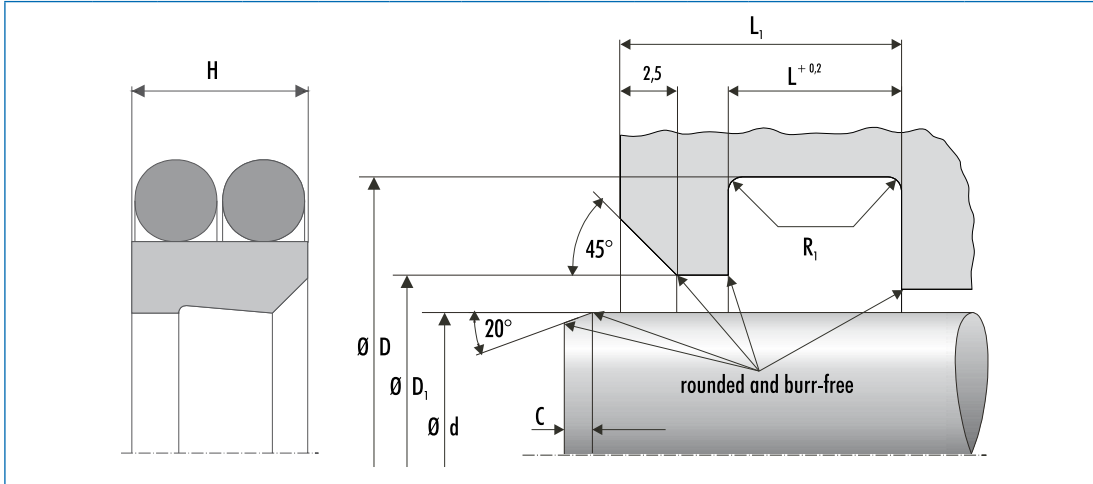
The tolerance for the diameter d is specified in connection with the gap dimension calculation for the primary seal. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 are usually chosen.

Design notes

We recommend a pressure-relief bore. In the case of upstream seals with a good return capability, a pressure-relief feature is not necessary.

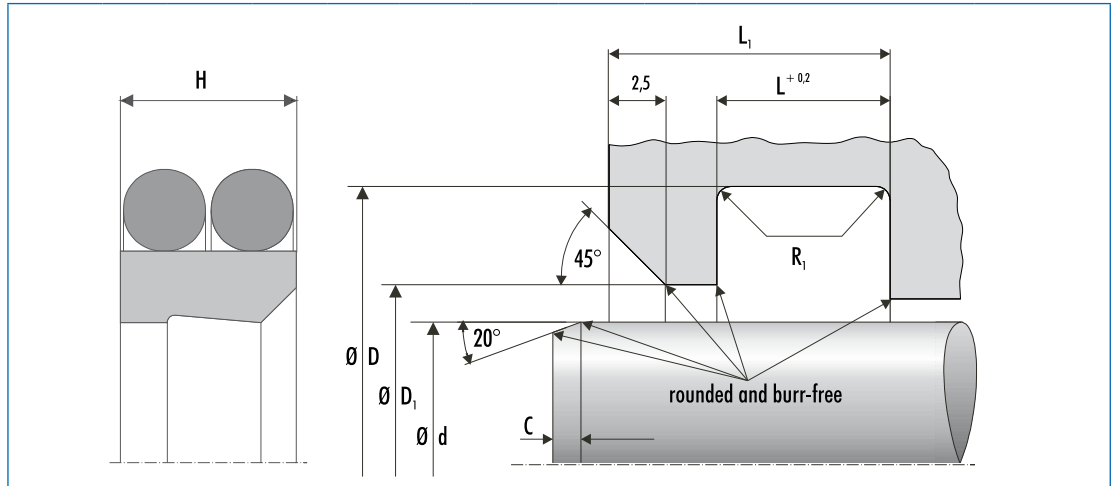
Installation & assembly

Reliable seal function is dependent on correct installation. See also *Merkel Technical Manual*



Housing	d	D	H	L	L1	D1	Profile	C	R1	Material	Article No.
	60	68,8	6	6,3	10,3	61,5	4,4	4	1,2	PTFE GM201/NBR	531996
	65	73,8	6	6,3	10,3	66,5	4,4	4	1,2	PTFE GM201/NBR	24380154
ISO	70	82,2	7,7	8,1	12,1	72	6,1	4	2	PTFE GM201/NBR	24371776
	75	87,2	7,7	8,1	12,1	77	6,1	4	2	PTFE GM201/NBR	49018473
	80	92,2	7,7	8,1	12,1	82	6,1	4	2	PTFE GM201/NBR	49016404
	85	97,2	7,7	8,1	12,1	87	6,1	4	2	PTFE GM201/NBR	24380155
	90	102,2	7,7	8,1	12,1	92	6,1	4	2	PTFE GM201/NBR	49039519
	95	107,2	7,7	8,1	12,1	97	6,1	4	2	PTFE GM201/NBR	24379210
ISO	100	112,2	7,7	8,1	12,1	102	6,1	4	2	PTFE GM201/NBR	24380032
	105	117,2	7,7	8,1	12,1	107	6,1	6	2	PTFE GM201/NBR	24380095
ISO	110	122,2	7,7	8,1	12,1	112	6,1	4	2	PTFE GM201/NBR	24380092
	115	127,2	7,7	8,1	12,1	117	6,1	4	2	PTFE GM201/NBR	49040461
	120	132,2	7,7	8,1	12,1	122	6,1	4	2	PTFE GM201/NBR	49012837
ISO	125	137,2	7,7	8,1	12,1	127	6,1	6	2	PTFE GM201/NBR	24380156
	130	142,2	7,7	8,1	12,1	132	6,1	6	2	PTFE GM201/NBR	49023823
	140	156	11	11,5	15,5	142	8	6	2	PTFE GM201/NBR	49004558
	145	161	11	11,5	15,5	147	8	6	2	PTFE GM201/NBR	24380702
	150	166	11	11,5	15,5	152	8	6	2	PTFE GM201/NBR	49005139
	155	171	11	11,5	15,5	157	8	6	2	PTFE GM201/NBR	24380703
	160	176	11	11,5	15,5	162	8	6	2	PTFE GM201/NBR	49015836
	165	181	11	11,5	15,5	167	8	6	2	PTFE GM201/NBR	49036298
	170	186	11	11,5	15,5	172	8	6	2	PTFE GM201/NBR	24380704
	175	191	11	11,5	15,5	177	8	6	2	PTFE GM201/NBR	24362382
	180	196	11	11,5	15,5	182	8	6	2	PTFE GM201/NBR	531957
	195	211	11	11,5	15,5	197	8	6	2	PTFE GM201/NBR	49023874

Further dimensions are available on request.



Housing	d	D	H	L	L1	D1	Profile	C	R1	Material	Article No.
	200	216	11	11,5	15,5	202	8	6	2	PTFE GM201/NBR	24342233
	210	226	11	11,5	15,5	212	8	6	2	PTFE GM201/NBR	24380705
	215	231	11	11,5	15,5	217	8	8	2	PTFE GM201/NBR	49023875
	220	236	11	11,5	15,5	222	8	8	2	PTFE GM201/NBR	49002400
	230	246	11	11,5	15,5	232	8	8	2	PTFE GM201/NBR	49004618
	240	256	11	11,5	15,5	242	8	8	2	PTFE GM201/NBR	533355
	250	266	11	11,5	15,5	252	8	8	2	PTFE GM201/NBR	49009052
	260	276	9	9,5	13,5	262	8	8	2	PTFE GM201/NBR	24375451
	260	276	11	11,5	15,5	262	8	8	2	PTFE GM201/NBR	49059024
	280	296	11	11,5	15,5	282	8	8	2	PTFE GM201/NBR	49004005
	300	316	11	11,5	15,5	302	8	8	2	PTFE GM201/NBR	49043075
	310	326	11	11,5	15,5	312	8	8	2	PTFE GM201/NBR	49009461
	320	336	11	11,5	15,5	322	8	8	2	PTFE GM201/NBR	49010398
	330	346	11	11,5	15,5	332	8	8	2	PTFE GM201/NBR	49004619
	340	356	11	11,5	15,5	342	8	8	2	PTFE GM201/NBR	49068487
	360	376	11	11,5	15,5	362	8	8	2	PTFE GM201/NBR	49009462
	370	386	11	11,5	15,5	372	8	8	2	PTFE GM201/NBR	49023877
	380	396	11	11,5	15,5	382	8	8	2	PTFE GM201/NBR	49019716
	400	424	14,8	15,5	19,5	402,5	12	8	2	PTFE GM201/NBR	49012517
	410	434	14,8	15,5	19,5	412,5	12	8	2	PTFE GM201/NBR	49019717
	420	444	14,8	15,5	19,5	422,5	12	8	2	PTFE GM201/NBR	49008822
	430	454	14,8	15,5	19,5	433	12	8	2	PTFE GM201/NBR	49068502
	450	474	14,8	15,5	19,5	453	12	8	2	PTFE GM201/NBR	49063692
	480	504	14,8	15,5	19,5	483	12	8	2	PTFE GM201/NBR	49054685
	510	534	14,8	15,5	19,5	512,5	12	8	2	PTFE GM201/NBR	49006826

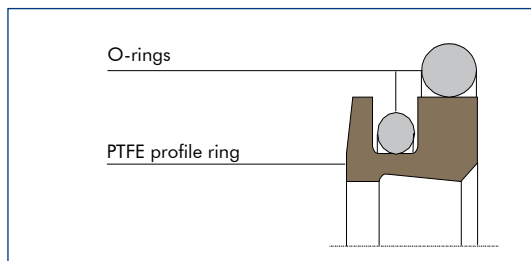
Further dimensions are available on request.



Housing	d	D	H	L	L1	D1	Profile	C	R1	Material	Article No.
	520	544	14,8	15,5	19,5	522,5	12	8	2	PTFE GM201/NBR	49008973
	570	594	14,8	15,5	19,5	572,5	12	8	2	PTFE GM201/NBR	49009444
	620	644	14,8	15,5	19,5	622,5	12	8	2	PTFE GM201/NBR	49027854
	640	664	14,8	15,5	19,5	642,5	12	8	2	PTFE GM201/NBR	532207
	720	747,3	17,2	18	22	723	13,65	11	2	PTFE GM201/NBR	49054677

Further dimensions are available on request.

Merkel Double Wiper PT 2



Product description

Double wiper PT 2, consisting of one profile ring with one sealing edge and one wiper edge, plus two O-rings as prestress elements

Product advantages

- The wipers additional static sealing zone (dirt deflector) flush-fits with the housing and leaves no space for any dirt clusters.
- Outstanding ability to wipe-off sticky dirt by inherently stable wiper edge.
- Improved functional reliability of the complete sealing system due to the wipers' additional sealing edge.
- Stick-slip free operation by customised choice of materials (friction coefficient)

Material

PTFE Profile ring

Material	Designation	Color
PTFE bronze compound	PTFE B602	brown
PTFE-glass-fibre-MoS2 compound	PTFE GM201	light grey

O-rings

Material	Designation
Nitrile rubber	NBR

Application

- Upwards motion of cylinder rods
- Dirt sticking to cylinder rods
- Improvement of the system leakage behaviour

Operating conditions

Material	PTFE B602/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-
Water	-
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Running speed	5 m/s

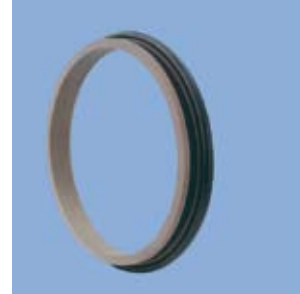
Material	PTFE GM201/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	+30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$



The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Tolerances

Diameter	Tolerance
D	H8
D1	H8

The tolerance for the diameter D is specified in connection with the gap dimension calculation for the primary seal. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields H7 and H8 are usually chosen.

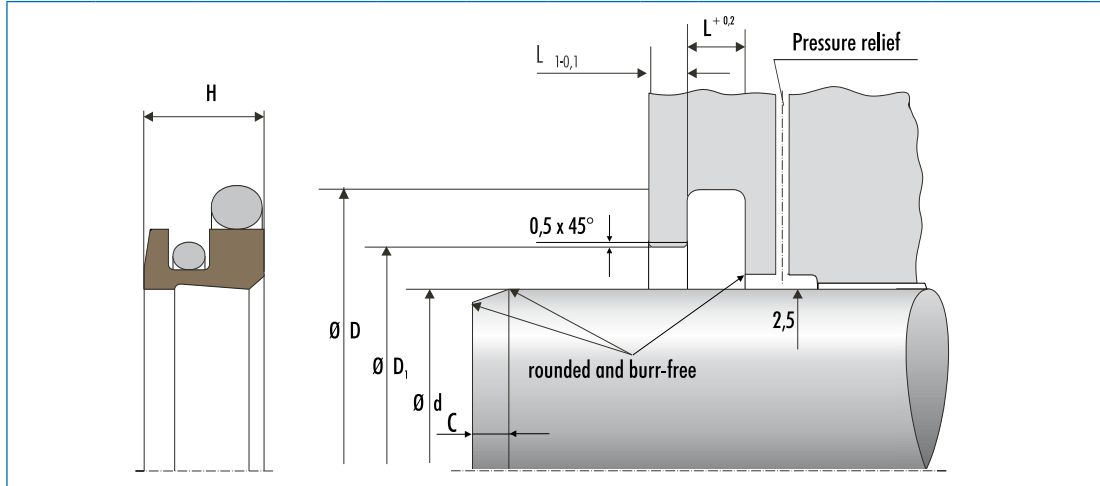
Design notes

- In the space between the seal and the double wiper PT 2 a pressure relief bore must be integrated.
- PT 2 double wiper with a diameter $d < 100$ mm can not be mounted in pierced grooves. For the basic diameter range $50 \text{ mm} > d < 100 \text{ mm}$ a special version of the PT 2 wiper with 3 O-rings can be ordered. Basic diameters of the PT 2 wiper with $d < 50$ mm are presently not available. In this case, please ask for support.

Please note our general design remarks in the *Merkel Technical Manual*.

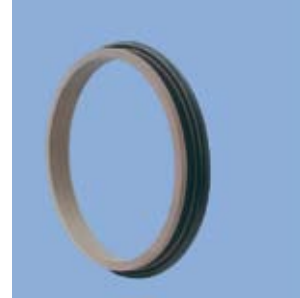
Installation & assembly

For the mounting within the basic diameter range $100 \text{ mm} > d < 150 \text{ mm}$ we recommend the use of a mounting tool. See also *Merkel Technical Manual*
See also *Merkel Technical Manual*.



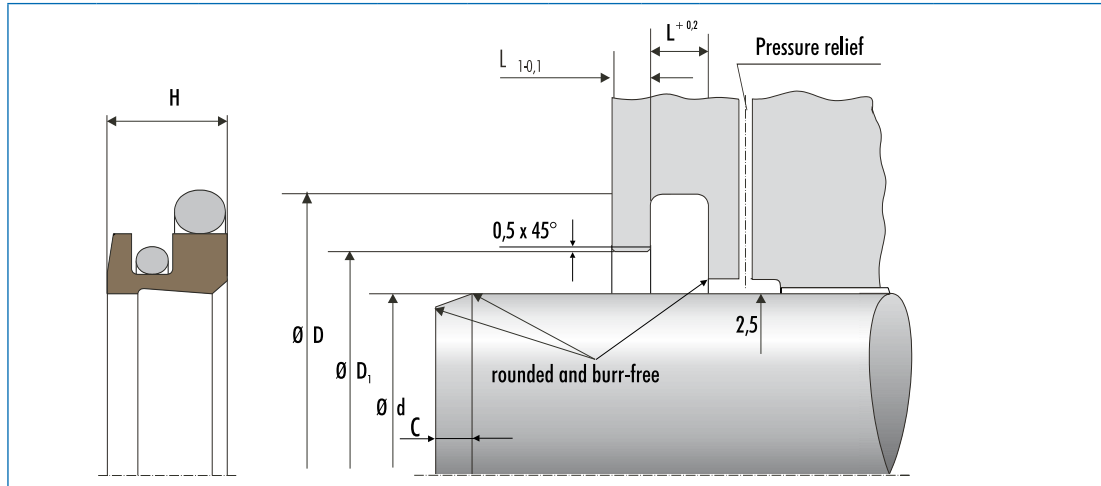
d	D	D ₁	H	L	L ₁	Profile	R ₁	Material	Article No.
100	122,2	110,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24359838
100	122,2	110,7	13,5	6,3	4,2	11,1	1,2	PTFE GM201 / NBR	49058566
105	127,2	115,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	529068
110	132,2	120,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24361474
120	142,2	130,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24357224
120	142,2	130,7	13,5	6,3	4,2	11,1	1,2	PTFE GM201 / NBR	49058565
125	147,2	135,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24373115
130	152,2	140,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24361475
140	162,2	150,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24344542
140	162,2	150,7	13,5	6,3	4,2	11,1	1,2	PTFE GM201 / NBR	49058446
145	167,2	155,7	13,5	6,3	4,2	11,1	1,2	PTFE GM201 / NBR	526113
150	172,2	160,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24360778
155	177,2	165,7	13,5	6,3	4,2	11,1	1,2	PTFE GM201 / NBR	49008292
160	182,2	170,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24347042
170	192,2	180,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24344540
170	192,2	180,7	13,5	6,3	4,2	11,1	1,2	PTFE GM201 / NBR	49005697
180	202,2	190,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24350643
180	202,2	190,7	13,5	6,3	4,2	11,1	1,2	PTFE GM201 / NBR	49066050
185	207,2	195,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	49054646
190	212,2	200,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24368087
200	222,2	210,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24353154
210	232,2	220,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24375895
210	232,2	220,7	13,5	6,3	4,2	11,1	1,2	PTFE GM201 / NBR	532233
220	242,2	230,7	13,5	6,3	4,2	11,1	1,2	PTFE B602 / NBR	24353169
230	254,2	240,7	13,5	6,3	4,2	12,1	1,2	PTFE B602 / NBR	24355054
235	259,2	245,7	13,5	6,3	4,2	12,1	1,2	PTFE B602 / NBR	527661

Further dimensions are available on request.



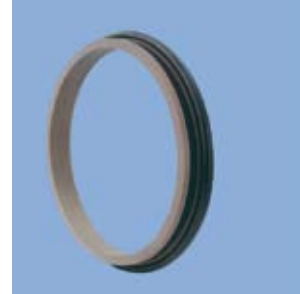
d	D	D _i	H	L	L _i	Profile	R _i	Material	Article No.
240	264,2	250,7	13,5	6,3	4,2	12,1	1,2	PTFE B602 / NBR	24356322
250	274,2	260,7	13,5	6,3	4,2	12,1	1,2	PTFE B602 / NBR	24371138
250	274,2	260,7	13,5	6,3	4,2	12,1	1,2	PTFE GM201 / NBR	49018494
260	284,2	270,7	13,5	6,3	4,2	12,1	1,2	PTFE B602 / NBR	24352166
280	304,2	290,7	13,5	6,3	4,2	12,1	1,2	PTFE B602 / NBR	24360995
290	314,2	300,7	13,5	6,3	4,2	12,1	1,2	PTFE B602 / NBR	49026457
300	333	310,7	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24348115
320	353	335,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	524609
320	353	335,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	49055889
330	363	345,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	49057704
340	373	355,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	526102
350	383	365,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24337999
350	383	365,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	49027133
360	393	375,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24331443
370	403	385,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24344424
380	413	395,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24346896
380	413	395,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	49023284
385	418	400,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24353627
400	433	415,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24353007
400	433	415,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	24368670
420	453	435,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24331444
420	453	435,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	49027134
430	463	445,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24354755
430	463	445,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	49058864
440	473	455,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24363240
440	473	455,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	24368671
450	483	465,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24358970
450	483	465,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	49027135
460	493	475,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	24368672
470	503	485,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	49033427
480	513	495,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24338000
480	513	495,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	49027136
485	518	500,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24352066
500	533	515,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24360955
500	533	515,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	24368675
510	543	525,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24372692
520	553	535,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24370787
530	563	545,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24363241

Further dimensions are available on request.



d	D	D ₁	H	L	L ₁	Profile	R ₁	Material	Article No.
530	563	545,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	24368676
550	583	555,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24362840
560	593	575,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24339610
560	593	575,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	24368677
580	613	595,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	49015712
600	633	615,1	18,4	8,1	6,3	16,5	1,2	PTFE B602 / NBR	24331445
600	633	615,1	18,4	8,1	6,3	16,5	1,2	PTFE GM201 / NBR	24368678
620	656,5	635,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	49014759
630	666,5	645,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24349708
630	666,5	645,1	19,8	9,5	6,3	18,25	2	PTFE GM201 / NBR	524893
640	676,5	655,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24348256
660	696,5	675,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24349836
670	706,5	685,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24346164
700	736,5	715,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	49035756
720	756,5	735,1	19,8	9,5	6,3	18,25	2	PTFE GM201 / NBR	49058672
730	766,5	745,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	531292
730	766,5	745,1	19,8	9,5	6,3	18,25	2	PTFE GM201 / NBR	49015690
740	776,5	755,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24344400
750	786,5	765,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24367379
790	826,5	805,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24368078
790	826,5	805,1	19,8	9,5	6,3	18,25	2	PTFE GM201 / NBR	49015689
795	831,5	810,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24344331
800	836,5	815,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24341037
820	856,5	835,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24349213
830	866,5	845,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24344384
850	886,5	865,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24314623

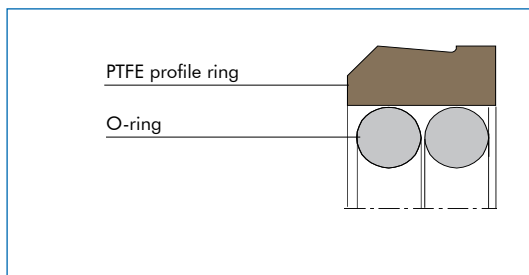
Further dimensions are available on request.



d	D	D _i	H	L	L _i	Profile	R _i	Material	Article No.
850	886,5	865,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24314623
860	896,5	875,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24374444
890	926,5	905,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24343530
900	936,5	915,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24374392
920	956,5	935,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	49060913
950	986,5	965,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24356339
970	1006,5	985,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24359661
1000	1036,5	1015,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	49060888
1020	1043	1035,1	19,8	9,5	6,3	11,5	2	PTFE B602 / NBR	49064560
1050	1086,5	1065,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	530269
1070	1106,5	1085,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	49056413
1100	1136,5	1115,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24374393
1130	1166,5	1145,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	530018
1160	1196,5	1175,1	19,8	9,5	6,3	18,25	2	PTFE B602 / NBR	24371028

Further dimensions are available on request.

Merkel Double Wiper PT 3



Product description

Double wiper, consisting of a PTFE profile ring with one sealing and one wiping edge, plus two O-rings as preloading elements.

Product advantages

- enhanced functional reliability of the sealing system, due to additional sealing edge
- high operating reliability, due to sturdy profile ring made of PTFE compound (can briefly withstand the full operating pressure)
- very good wiping capability for dirt adhering, due to dimensionally stable wiping edge
- excellent control and positioning characteristics due to favorable frictional behavior (stick-slip-free)

Material

PTFE profile ring

Material	Designation	Color
PTFE-bronze compound	PTFE B602	brown
PTFE-glass-fiber-MoS2 compound	PTFE GM201	light grey

O-ring

Material	Designation
Nitrile rubber	NBR

Other material combinations are available on request.

Application

- Double wiper with integrated sealing function towards the outside diameter to improve the sealing functionality of the complete sealing system. PT 3 ideally used in combination with our piston seals.
- We generally recommend the use of a pressure relief bore, and it is a must, if an upstream seals is mounted with a poor ability to retract media. This pressure relief function is not vital, if an upstream seal is mounted with a sufficient ability to retract media.

Operating conditions

Material	PTFE B602/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	-
HFB fluids	-
HFC fluids	-
HFD fluids	-
Water	-
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Running speed	5 m/s

Material	PTFE GM 201/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	+30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Running speed	5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$



The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
	Ra	> 0,05µm
Rmax	< 2,5µm	
Rpkx	< 0,5µm	
Rpk	< 0,5µm	
Rk	>0,25µm	<0,7µm
Rvk	>0,2µm	<0,65µm
Rvkx	>0,2µm	<2,0µm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Tolerances

Diameter	Tolerance
d	h9
d ₁	h10

The tolerance for the diameter d is specified in connection with the gap dimension calculation for the primary seal. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 are usually chosen.

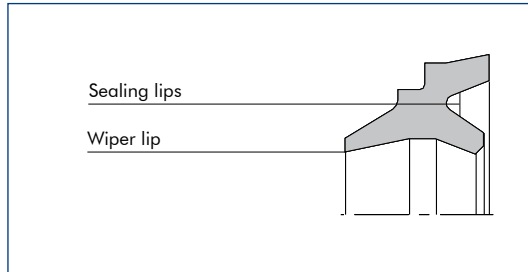
Design notes

We recommend a pressure-relief bore. In the case of upstream seals with a good return capability, a pressure-relief feature is not necessary.

Installation & assembly

Reliable seal function is dependent on correct installation. See also *Merkel Technical Manual*

Merkel Double Wiper P 8



Product description

Double-acting elastomer dirt wiper.

Product advantages

- Strong wiping action against dirt
- Very good sealing effect against residual film of oil on the extending rod
- Wear-resistant

Material

Material	Designation	Color
Nitrile rubber	NBR	black

Other materials on request.

Applications

Inwardly, the Merkel double wiper P 8 exercises the stripping function of a lip seal, and outwardly a wiper effect against dirt.

The P 8 double wiper is principally used in conjunction with our rod sealing system. In order to prevent a pressure build-up between the seal and the wiper, we definitely recommend providing a pressure relief borehole in front of the double wiper.

Operating conditions

Material	85 NBR B247
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Running speed	2 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	*	*
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

* Surface roughness of the sliding surface to suit the sealing component used.

Material content $M_r > 50\%$ to max. 90%, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$



Design notes

Please note our general design-related remarks in the *Merkel Technical Manual*.

Tolerance recommendation

Nominal- \varnothing d	D	D ₁	D ₂
16 ... 1000	H10	H11	H10

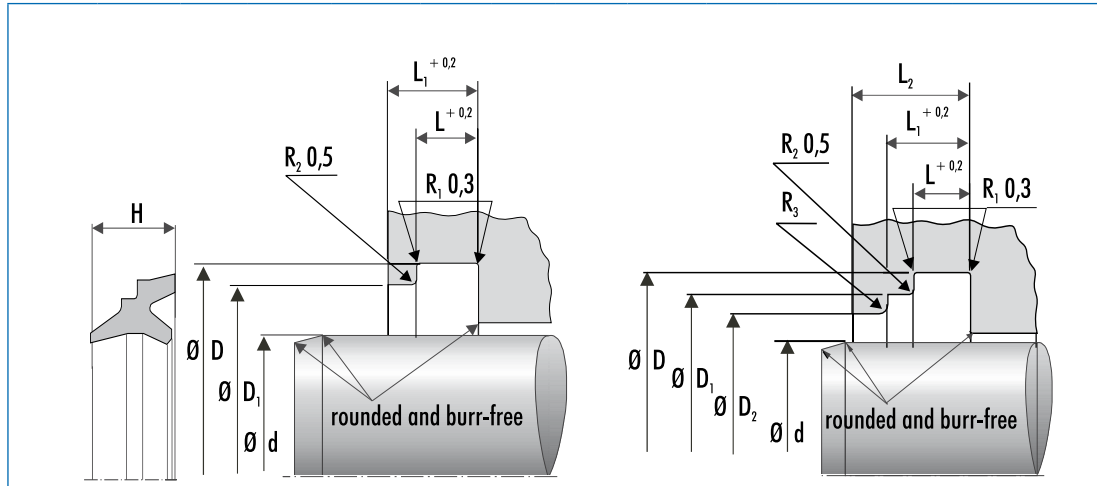
The tolerance for the diameter d is determined by the buffer seal.

Installation chamfers

Length and angle must be executed to suit the rod seal being used.

Installation & assembly

Careful installation is a prerequisite for the correct function of the wiper. Generally, wipers can be quickly and easily fitted by deforming into a kidney shape. Please note our general remarks on the installation of hydraulic seals in the *Merkel Technical Manual*, assembling hydraulic seals.



d	D	H	D1	D2	L	L1	L2	Profile	R3	Material	Article No.
60	68	8	66	63,5	4	6	8	4	0,5	90 NBR 109	24224403
63	71	8	69	66,5	4	6	8	4	0,5	90 NBR 109	24224424
65	73	8	71	68,5	4	6	8	4	0,5	90 NBR 109	24224404
70	78	8	76	73,5	4	6	8	4	0,5	90 NBR 109	24224423
75	83	8	81	78,5	4	6	8	4	0,5	90 NBR 109	24224405
80	88	8	86	83,5	4	6	8	4	0,5	90 NBR 109	24224422
85	93	8	91	88,5	4	6	8	4	0,5	90 NBR 109	24224406
90	98	8	96	93,5	4	6	8	4	0,5	90 NBR 109	24224032
100	108	8	106	103,5	4	6	8	4	0,5	90 NBR 109	24224407
105	117	11	114	110	5,5	8,2	11,2	6	1	90 NBR 109	24224420
120	132	11	129	125	5,5	8,2	11,2	6	1	90 NBR 109	24224409
130	142	11	139	135	5,5	8,2	11,2	6	1	90 NBR 109	24224410
135	147	11	144	140	5,5	8,2	11,2	6	1	90 NBR 109	24224417
140	152	11	149	145	5,5	8,2	11,2	6	1	90 NBR 109	24224411
150	162	11	159	155	5,5	8,2	11,2	6	1	90 NBR 109	24224416
160	172	11	169	165	5,5	8,2	11,2	6	1	90 NBR 109	24224412
170	182	11	179	175	5,5	8,2	11,2	6	1	90 NBR 109	24224415
190	202	11	199	195	5,5	8,2	11,2	6	1	90 NBR 109	24264583
200	212	11	209	205	5,5	8,2	11,2	6	1	90 NBR 109	24224414
210	225	13	222	217	6,5	9,5	12,5	7,5	1,5	85 NBR B247	49017591
220	235	13	232	227	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354797
235	250	13	247	243	6,5	9,5	12,5	7,5	1,5	85 NBR B247	49017612
240	255	13	252	247	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354798
260	275	13	272	267	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354799
280	295	13	292	287	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354800
300	315	13	312	307	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354801

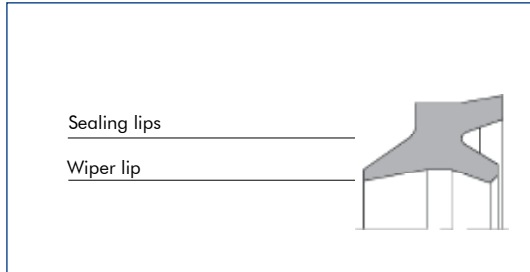
Further dimensions or other material on request.



d	D	H	D1	D2	L	L1	L2	Profile	R3	Material	Article No.
310	325	13	322	317	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24357280
320	335	13	332	327	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355390
340	355	13	352	347	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354802
350	365	13	362	357	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24367045
360	375	13	372	367	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354803
370	385	13	382	377	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24359370
380	395	13	392	387	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354804
390	405	13	402	398	6,5	9,5	12,5	7,5	1,5	85 NBR B247	49035280
400	415	13	412	407	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354805
420	435	13	432	427	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354806
440	455	13	452	447	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355392
450	465	13	462	457	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355393
460	475	13	472	467	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354807
470	485	13	482	477	6,5	9,5	12,5	7,5	1,5	85 NBR B247	49017615
480	495	13	492	487	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355394
490	505	13	502	497	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24379846
500	515	13	512	507	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354808
530	545	13	542	537	6,5	9,5	12,5	7,5	1,5	85 NBR B247	49042374
540	555	13	552	547	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355395
550	565	13	562	557	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355396
560	575	13	572	567	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354809
570	585	13	582	478	6,5	9,5	12,5	7,5	1,5	85 NBR B247	49023111
580	595	13	592	587	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24357108
590	605	13	602	597	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355397
600	615	13	612	607	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354810
630	645	13	642	637	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354811
650	665	13	662	657	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355398
670	685	13	682	677	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24359048
680	695	13	692	687	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24354812
700	715	13	712	707	6,5	9,5	12,5	7,5	1,5	85 NBR B247	49055524
710	725	13	722	717	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355399
750	765	13	762	757	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355400
800	815	13	812	807	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355401
840	855	13	852	847	6,5	9,5	12,5	7,5	1,5	85 NBR B247	527160
900	915	13	912	907	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24355402
950	965	13	962	957	6,5	9,5	12,5	7,5	1,5	85 NBR B247	527757
1000	1015	13	1012	1007	6,5	9,5	12,5	7,5	1,5	85 NBR B247	24357109

Further dimensions or other material on request.

Merkel Double Wiper P 9



Product description

Elastomer double wiper, particularly suitable for large diameters.

Product advantages

- Intermediate sizes possible without mold/tool
- High wiper effect against dirt
- Very good sealing effect against residual oil film on the exiting rod
- Wear-resistant

Material

Material	Designation	Color
Nitrile rubber	NBR	black

Applications

Inwardly, the P 9 double wiper exercises the wiper function of a lip seal, and outwardly a wiper effect against soiling. The P 9 double wiper is preferably used in conjunction with rod sealing systems. In order to avoid a pressure build-up between the seal and the wiper, a pressure-relief borehole should be provided before the wiper. The P 9 double wiper is preferably used in conjunction with our rod sealing systems.

Operating conditions

Material	NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Running speed	2 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	*	*
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

* Surface roughness of the sliding surface to suit the sealing component used.

Design notes

Please note our general design-related remarks in the *Merkel Technical Manual*.

Tolerance recommendation

Nominal- \emptyset d	D	D_1
20 ... 2900	H10	H11

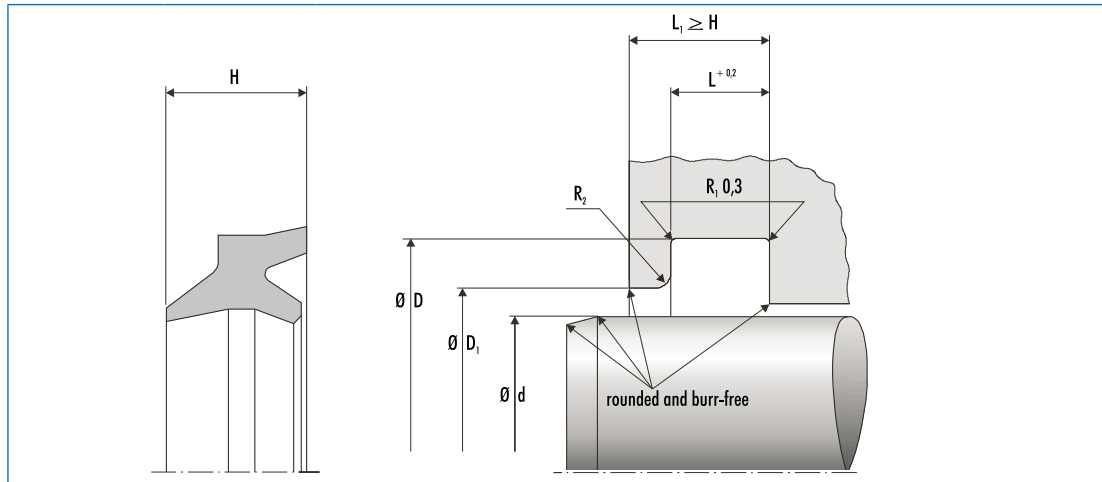
The tolerance for the diameter d is determined by the buffer seal.

Installation chamfers

Length and angle must be executed to suit the rod seal being used.

Installation & assembly

Careful installation is a prerequisite for the correct function of the wiper. Generally, wipers can be quickly and easily fitted by deforming into a kidney shape. Please note our general remarks in the *Merkel Technical Manual*.



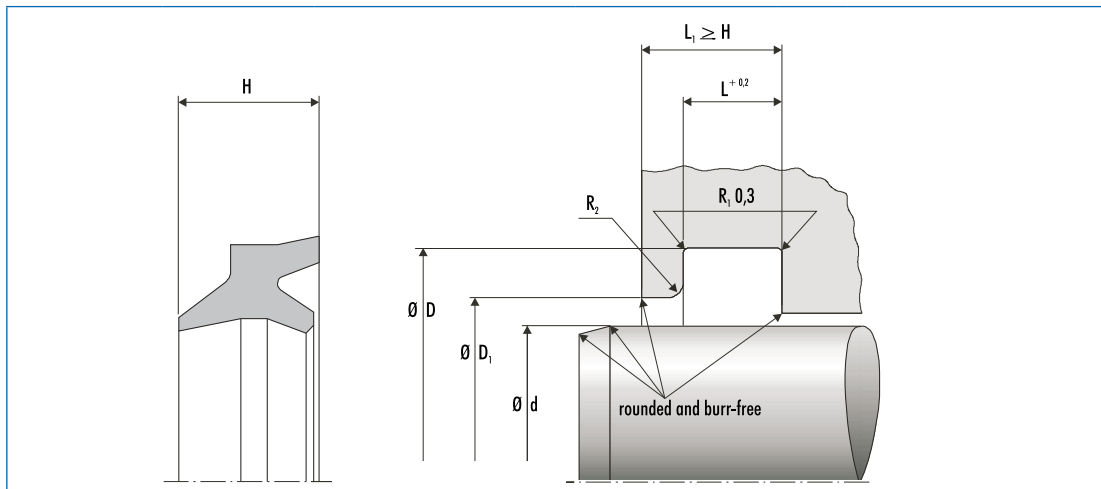
d	D	D1	H	L	Profile	R2	Article No.
200	220	210	18	10,2	10	1,5	24212749
210	230	220	18	10,2	10	1,5	24224920
220	240	230	18	10,2	10	1,5	24224959
230	250	240	18	10,2	10	1,5	24224931
240	260	250	18	10,2	10	1,5	24193882
250	275	262,6	22,5	16	12,5	2	24175461
260	285	272,6	22,5	16	12,5	2	24224921
270	295	282,6	22,5	16	12,5	2	24213404
280	305	292,6	22,5	16	12,5	2	24183892
290	315	302,6	22,5	16	12,5	2	24224938
300	325	312,6	22,5	16	12,5	2	24173146
310	340	325	27	18	15	3	24224922
320	350	335	27	18	15	3	24224937
330	360	345	27	18	15	3	24146278
340	370	355	27	18	15	3	24224930
350	380	365	27	18	15	3	24147758
360	390	375	27	18	15	3	24224923
370	400	385	27	18	15	3	24224929
380	410	395	27	18	15	3	24149422
390	420	405	27	18	15	3	24224940
400	430	415	27	18	15	3	24170712
410	440	425	27	18	15	3	24224936
420	450	435	27	18	15	3	24170651
430	460	445	27	18	15	3	24178040
440	470	455	27	18	15	3	24224924
450	480	465	27	18	15	3	24224958

Further dimensions are available on request.



d	D	D1	H	L	Profile	R2	Article No.
460	490	475	27	18	15	3	24224942
470	500	485	27	18	15	3	24224960
480	510	495	27	18	15	3	24224941
490	520	505	27	18	15	3	24224957
500	530	515	27	18	15	3	24224925
510	540	525	27	18	15	3	24224943
520	550	535	27	18	15	3	24224956
530	560	545	27	18	15	3	24224932
540	570	555	27	18	15	3	24224955
550	580	565	27	18	15	3	24224964
560	590	575	27	18	15	3	24224954
570	600	585	27	18	15	3	24224944
580	610	595	27	18	15	3	24224933
590	620	605	27	18	15	3	24224945
600	630	615	27	18	15	3	24224926
610	640	625	27	18	15	3	24262532
620	650	635	27	18	15	3	24224953
630	660	645	27	18	15	3	24222458
640	670	655	27	18	15	3	24226226
650	680	665	27	18	15	3	24224946
660	690	675	27	18	15	3	24287716
670	700	685	27	18	15	3	24224934
680	710	695	27	18	15	3	24238455
690	720	705	27	18	15	3	24221251
700	730	715	27	18	15	3	24224952
710	740	725	27	18	15	3	24216448
720	750	735	27	18	15	3	24224947
730	760	745	27	18	15	3	49018767
740	770	755	27	18	15	3	24224951
750	780	765	27	18	15	3	24233258
760	790	775	27	18	15	3	24224948
770	800	785	27	18	15	3	24353518
780	810	795	27	18	15	3	24217401
790	820	805	27	18	15	3	24302433
800	830	815	27	18	15	3	24215532
810	840	825	27	18	15	3	24264154
820	850	835	27	18	15	3	24224935
830	860	845	27	18	15	3	49003545

Further dimensions are available on request.



d	D	D1	H	L	Profile	R2	Article No.
840	870	855	27	18	15	3	24224961
850	880	865	27	18	15	3	24215590
860	890	875	27	18	15	3	24224963
870	900	885	27	18	15	3	24295918
880	910	895	27	18	15	3	24224962
890	920	905	27	18	15	3	24297999
900	930	915	27	18	15	3	24224950
920	950	935	27	18	15	3	24345992
940	970	955	17	18	15	3	24343336
950	980	965	27	18	15	3	24233241
960	990	975	27	18	15	3	24224928
980	1010	995	27	18	15	3	24293775
990	1020	1005	27	18	15	3	49007878
1000	1030	1015	27	18	15	3	24215533
1010	1040	1025	27	18	15	3	49046682
1020	1050	1035	27	18	15	3	24353379
1030	1060	1045	27	18	15	3	49038846
1040	1070	1055	27	18	15	3	24331194
1050	1080	1065	27	18	15	3	24306433
1060	1090	1075	27	18	15	3	24350174
1070	1100	1085	27	18	15	3	24228839
1100	1130	1115	27	18	15	3	24250720
1110	1140	1125	27	18	15	3	24237246
1120	1150	1135	27	18	15	3	49017722
1130	1160	1145	27	18	15	3	24378267
1140	1170	1155	27	18	15	3	49036756

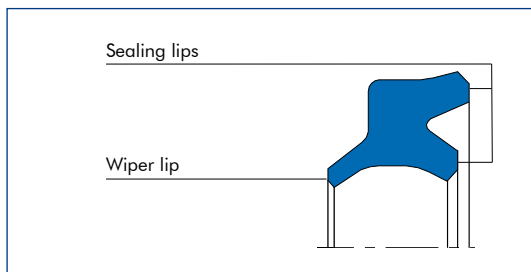
Further dimensions are available on request.



d	D	D1	H	L	Profile	R2	Article No.
1150	1180	1165	27	18	15	3	49026394
1160	1190	1175	27	18	15	3	24342178
1170	1200	1185	27	18	15	3	24341374
1190	1220	1205	27	18	15	3	24378268
1210	1240	1225	27	18	15	3	24362171
1220	1250	1235	27	18	15	3	24259753
1230	1260	1245	27	18	15	3	49056627
1250	1280	1265	27	18	15	3	24302041
1260	1290	1275	27	18	15	3	24342022
1280	1310	1295	27	18	15	3	24378269
1300	1330	1315	27	18	15	3	24292824
1340	1370	1355	27	0	15	3	531143
1350	1380	1365	27	18	15	3	24290793
1370	1400	1385	27	18	15	3	24332613
1380	1410	1395	27	18	15	3	24378270
1420	1450	1435	27	18	15	3	24362130
1450	1480	1465	27	18	15	3	24302595
1500	1530	1515	27	18	15	3	49068716
1540	1570	1555	27	18	15	3	24378271
1560	1590	1565	27	18	15	3	532782
1580	1610	1595	27	18	15	3	24336748
1600	1630	1615	27	18	15	3	49058706
1650	1680	1665	27	18	15	3	49027957
1660	1690	1675	27	18	15	3	24357172
1700	1730	1715	27	18	15	3	49019211
1750	1780	1765	27	18	15	3	24262918
1800	1830	1815	27	18	15	3	49012005
1960	1990	1975	27	18	15	3	24259169
2000	2030	2015	27	18	15	3	24294574
2450	2480	2495	27	18	15	0	24378197

Further dimensions are available on request.

Merkel Double Wiper PU 11



Product description

Lip seal with molded-on wiper lip (double-lip wiper); sealing edge of wiper lip slightly rounded

Product advantages

Double wiper for improving the overall sealing effect; dimensions for standardized installation spaces as per ISO 6195 Type C.

- Inwardly directed sealing lips provide the function of a lip seal
- Wiper lip with a slightly rounded sealing edge can be relied upon to strip off dirt, and leaves a residual film of oil on the entering rod, with concomitant benefits for the sealing effect, the lifetime and the friction behavior.

Material

Material	Designation	Color
Polyurethane	95 AU V142	blau

Applications

The P 11 double wiper is preferably used in conjunction with our OMS-MR rod seals. The PU 11 can cope with pressures of up to 1.6 MPa. If higher pressures may be encountered, we recommend a pressure-relief borehole between the seal and the wiper.

Operating conditions

Material	95 AU V142
Hydraulic oils, HL, HLP	-30 ... +110 °C
HFA fluids	+5 ... +50 °C
HFB fluids	+5 ... +50 °C
HFC fluids	-30 ... +40 °C
HFD fluids	-
Water	+5 ... +50 °C
HETG (rape-seed oil)	-30 ... +60 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +40 °C
Mineral greases	-30 ... +110 °C
Running speed	1 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	*	*
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

* Surface roughness of the sliding surface to suit the sealing component used.

Tolerance recommendation

Nominal- \varnothing d	D	D_1
12 ... 200	H10	H11

The tolerance for the diameter d is determined by the upstream seal.

Design notes

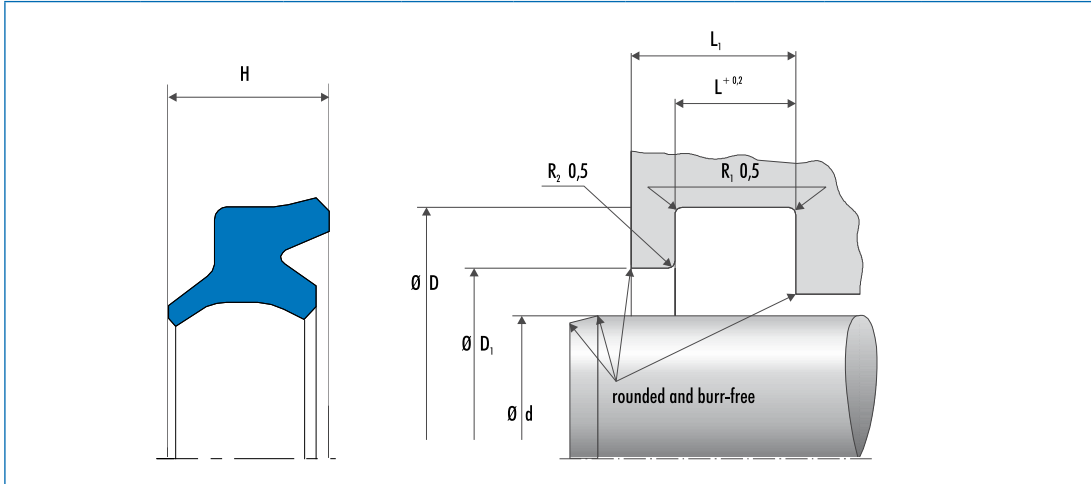
Please note our general design-related remarks in the *Merkel Technical Manual*.

Installation chamfers

Length and angle must be executed to suit the rod seal being used.

Installation & assembly

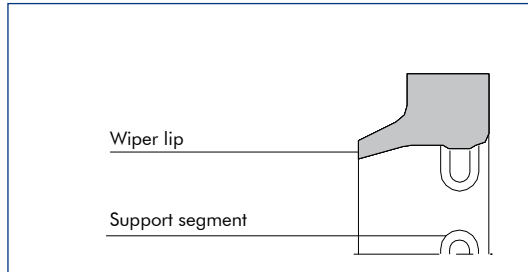
Careful installation is essential if the stripper is to function flawlessly. The strippers can be quickly and easily installed by compressing them into a kidney shape. Please note our general remarks on the installation of hydraulic seals in the *Merkel Technical Manual*.



Housing	d	D	D1	L	L1	H	Profile	Article No.
	60	70	63	6	8	8,5	5	49003030
	65	75	68	6	8	8,5	5	49000804
ISO	70	80	73	0	8	8,5	5	24338685
	75	85	78	6	8	8,5	5	49000806
ISO	80	90	83	6	8	8,5	5	24369056
ISO	90	100	93	0	8	8,5	5	24338686
ISO	110	125	114	0	10,5	12	7,5	24338687
ISO	140	155	144	8,5	10,5	12	7,5	24348685
	150	165	154	8,5	10,5	12	7,5	529428
	170	185	174	8,5	10,5	12	7,5	24349427

Further dimensions are available on request.

Merkel Wiper P 6



Product description

Single-acting elastomer dirt wiper with support segments to avoid twisting.

Product advantages

- Good seat in the outer diameter
- Very good wiping action
- Wiper can be used for a wide temperature range
- No twisting in the housing and no pressure build-up between seal and wiper

Material

Material	Designation	Color
Nitrile rubber	NBR	black
Fluoroelastomer	FKM	black

Applications

The P 6 dirt wiper is principally used in the large-diameter range for standard applications.

Operating conditions

Material	85 NBR B247
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Running speed	2 m/s

Material	85 FKM K664
Hydraulic oils, HL, HLP	-10 ... +200 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-
HFD fluids	-10 ... +200 °C
Water	+5 ... +80 °C
HETG (rape-seed oil)	-10 ... +80 °C
HEES (synth. ester)	-10 ... +100 °C
HEPG (glycol)	-10 ... +80 °C
Mineral greases	-10 ... +200 °C
Running speed	2 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	*	*
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

* Surface roughness of the sliding surface to suit the sealing component used.

Material content $M_r > 50\%$ to max. 90%, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$



Design notes

Please note our general design-related remarks in the *Merkel Technical Manual*.

Tolerance recommendation

Nominal-Ø d	D	D ₁
20 ... 2900	H10	H11

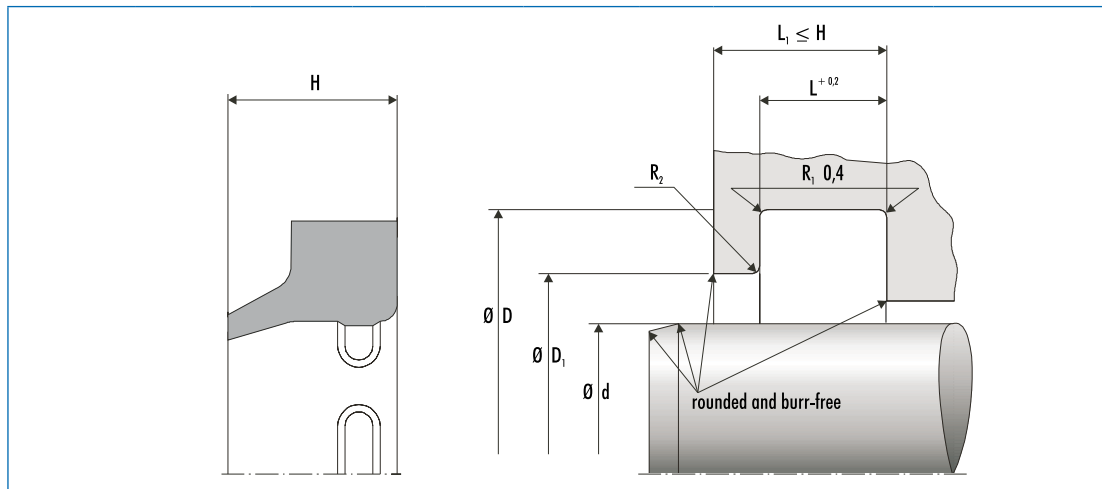
The tolerance for the diameter d is determined by the buffer seal.

Installation chamfers

Length and angle must be executed to suit the rod seal being used.

Installation & assembly

Careful installation is a prerequisite for the correct function of the wiper P 6. Generally, wipers can be quickly and easily fitted by deforming into a kidney shape. Please note our general remarks on the installation of hydraulic seals in the *Merkel Technical Manual*, assembling hydraulic seals.



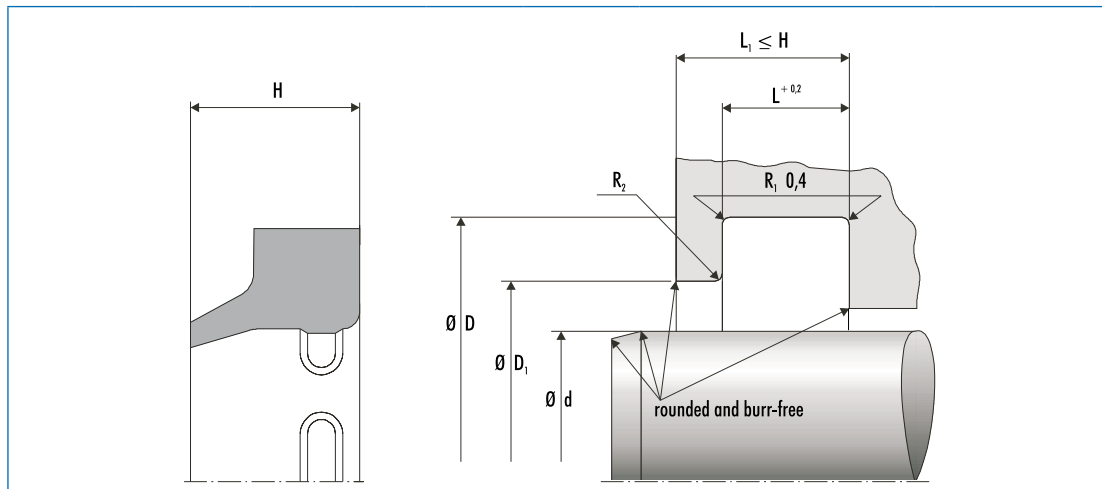
d	D	D ₁	L	H	Profile	R2	Material	Article No.
60	70,6	63	5,3	7	5,3	1,00	85 FKM K664	24038207
63	73,6	66	5,3	7	5,3	1,00	85 FKM K664	24040605
65	75,6	70	5,3	7	5,3	1,00	85 FKM K664	24040105
70	78,6	73	5,3	7	4,3	1,00	85 FKM K664	24147620
70	80,6	73	5,3	7	5,3	1,00	85 FKM K664	24046105
75	87,2	81	7,2	12	6,1	1,00	85 FKM K664	24043206
80	88,6	83	5,3	7	4,3	1,00	85 FKM K664	24044959
80	92,2	86	7,2	12	6,1	1,00	85 FKM K664	24032405
85	97,2	91	7,2	12	6,1	1,00	85 FKM K664	24031805
90	102,2	96	7,2	12	6,1	1,00	85 FKM K664	24033905
100	108,6	103	5,3	7,1	4,3	1,00	85 FKM K664	24051358
100	112,2	106	7,2	12	6,1	1,00	85 FKM K664	24031905
105	117,2	111	7,2	12	6,1	1,00	85 FKM K664	24046106
110	122,2	116	7,2	12	6,1	1,00	85 FKM K664	24042306
115	127,2	121	7,2	12	6,1	1,00	85 FKM K664	24041405
120	130,6	123	5,3	7	5,3	1,00	85 FKM K664	24050006
120	132,2	126	7,2	12	6,1	1,00	85 FKM K664	24047507
140	155	147,6	10,2	16	7,5	1,50	85 FKM K664	24043305
150	165	157,6	10,2	16	7,5	1,50	85 FKM K664	24048705
160	175	167,6	10,2	16	7,5	1,50	85 FKM K664	24030705
180	200	190	10,2	18	10	3,00	85 FKM K664	24072417
190	210	200	10,2	18	10	3,00	85 FKM K664	24059854
200	220	210	10,2	18	10	3,00	85 FKM K664	24031705
205	220	212,6	10,2	16	7,5	1,50	85 NBR B247	24231362
210	225	217,6	10,2	16	7,5	1,50	85 FKM K664	24293787
220	240	230	10,2	18	10	3,00	85 FKM K664	24066033

Further dimensions are available on request.



d	D	D ₁	L	H	Profile	R2	Material	Article No.
220	240	230	10,2	18	10	3,00	85 NBR B247	24005063
225	245	235	10,2	18	10	3,00	85 NBR B247	24005067
230	245	237,6	10,2	16	7,5	1,50	85 NBR B247	24005068
230	250	240	10,2	18	10	3,00	85 FKM K664	24089283
230	250	240	10,2	18	10	3,00	85 NBR B247	24005069
240	260	250	10,2	18	10	3,00	85 FKM K664	24143309
240	260	250	10,2	18	10	3,00	85 NBR B247	24005075
250	270	260	10,2	18	10	3,00	85 FKM K664	24064910
250	270	260	10,2	18	10	3,00	85 NBR B247	24005077
260	280	270	10,2	18	10	3,00	85 NBR B247	24005083
270	290	280	10,2	18	10	3,00	85 FKM K664	24339192
270	290	280	10,2	18	10	3,00	85 NBR B247	24005089
280	310	295	15,2	25	15	1,50	85 NBR B247	49014353
290	305	297,6	7,7	13,5	7,5	1,50	85 FKM K664	24145755
290	305	297,6	7,7	15	7,5	1,50	85 NBR B247	24005096
300	320	310	10,2	18	10	3,00	85 FKM K664	24170871
300	320	310	10,2	18	10	3,00	85 NBR B247	24005100
320	340	330	10,2	18	10	3,00	85 FKM K664	24123970
350	375	362,6	12,7	20	12,5	3,00	85 FKM K664	24068245
350	380	365	15,2	25	15	3,00	85 NBR B247	24108805
360	380	370	10,2	18	10	3,00	85 NBR B247	24375894
370	390	380	10,2	18	10	3,00	85 NBR B247	24327520
380	400	390	10,2	18	10	3,00	85 NBR B247	24114551
380	410	395	15,2	25	15	3,00	85 FKM K664	24067592
380	410	395	15,2	25	15	3,00	85 NBR B247	24005124
400	420	410	10,2	18	10	3,00	85 FKM K664	24149417
400	420	410	10,2	18	10	3,00	85 NBR B247	24005129
420	440	430	10,2	18	10	3,00	85 NBR B247	24090552
420	450	434,8	15,2	25	15	3,00	85 FKM K664	24222589
420	450	434,8	15,2	25	15	3,00	85 NBR B247	24005133
430	455	442,6	12,7	20	12,5	3,00	85 NBR B247	24073523
440	460	450	10,2	18	10	3,00	85 NBR B247	24197297
450	470	460	10,2	18	10	3,00	85 FKM K664	24216086
450	470	460	10,2	18	10	3,00	85 NBR B247	24005139
460	480	470	10,2	18	10	3,00	85 NBR B247	24095767
500	520	510	10,2	18	10	3,00	85 FKM K664	24239807
500	520	510	10,2	18	10	3,00	85 NBR B247	24005145
510	540	525	15,2	25	15	3,00	85 FKM K664	24350197

Further dimensions are available on request.

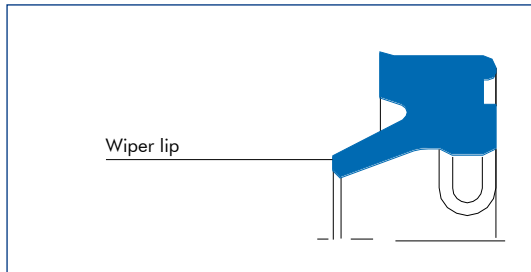


d	D	D1	L	H	Profile	R2	Material	Article No.
520	550	534,8	15,2	25	15	3,00	85 NBR B247	24193087
530	560	544,8	15,2	25	15	3,00	85 NBR B247	24005152
560	585	572,6	12,7	20	12,5	3,00	85 NBR B247	24079694
600	625	612,6	12,7	20	12,5	3,00	85 NBR B247	24112281
610	635	622,6	12,7	20	12,5	3,00	85 NBR B247	24138641
630	655	642,6	12,7	20	12,5	3,00	85 NBR B247	24073341
640	665	652,6	12,7	20	12,5	3,00	85 NBR B247	24133481
670	695	682,6	12,7	20	12,5	3,00	85 NBR B247	24075321
680	705	692,6	12,7	20	12,5	3,00	85 NBR B247	24170551
700	725	712,6	12,7	20	12,5	3,00	85 NBR B247	24356247
710	735	722,6	12,7	20	12,5	3,00	85 NBR B247	24075142
720	745	732,6	12,7	20	12,5	3,00	85 NBR B247	24181926
750	775	762,6	12,7	20	12,5	3,00	85 NBR B247	24104001
770	795	782,6	12,7	20	12,5	3,00	85 NBR B247	24343859
780	805	792,6	12,7	20	12,5	3,00	85 NBR B247	24100033
800	825	812,6	12,7	20	12,5	3,00	85 NBR B247	24069967
800	830	815	15,2	25	15	3,00	85 FKM K664	24362636
850	875	862,6	12,7	20	12,5	3,00	85 NBR B247	24082304
880	905	892,6	12,7	20	12,5	3,00	85 NBR B247	24182227
900	925	912,6	12,7	20	12,5	3,00	85 NBR B247	24005167

Further dimensions are available on request.



Merkel Wiper PU 6



Product description

Dirt wiper with support segments at the stripping heel and a slightly rounded wiper lip.

Product advantages

- Additional static sealing edge at the outer diameter
- Prevents dirt and splash water entering, stops dirt reliably
- Leaves a residual film of oil on the entering rod
- High wear-resistance
- Does not twist in the installation space, and no pressure builds up between the seal and the wiper.

Material

Diameter <320

Material	Designation	Color
Polyurethane	95 AU V149	dark blue

Diameter >320

Material	Designation	Color
Polyurethane	93 AU V142	dark blue

Diameter >480

Material	Designation	Color
Polyurethane	93 AU V168	light blue

Operating conditions

Material	95 AU V149 95 AU V142 93 AU V168
Hydraulic oils, HL, HLP	-30 ... +110 °C
HFA fluids	+5 ... +50 °C
HFB fluids	+5 ... +50 °C
HFC fluids	-30 ... +40 °C
HFD fluids	-
Water	+5 ... +50 °C
HETG (rape-seed oil)	-30 ... +60 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +40 °C
Mineral greases	-30 ... +110 °C
Running speed	2 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	*	*
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

* Surface roughness of the sliding surface to suit the sealing component used.

Tolerance recommendation

The tolerance for the diameter d is determined by the upstream seal.

Installation chamfers

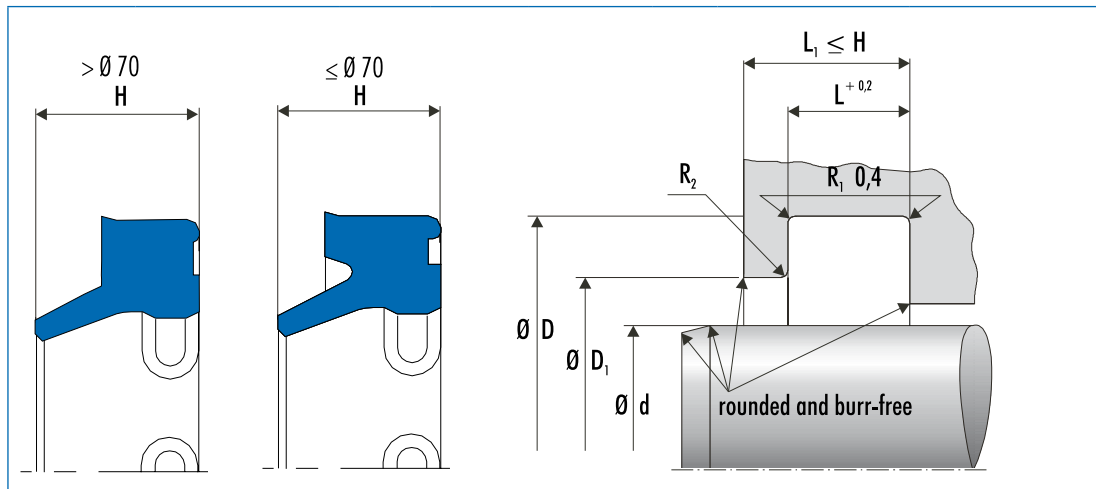
Length and angle must be executed to suit the rod seal being used.

Design notes

Please note our general design-related remarks in the *Merkel Technical Manual*.

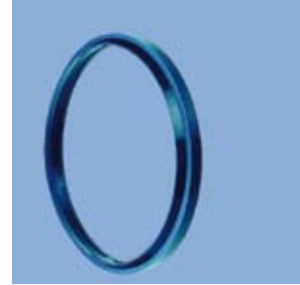
Installation & assembly

Careful installation is essential if the stripper is to function flawlessly. The strippers can be quickly and easily installed by compressing them into a kidney shape. Please note our general remarks on the installation of hydraulic seals in the *Merkel Technical Manual*.



d	D	D ₁	L	H	Profile	R2	Material	Article No.
60	68,6	63	5,3	6,5	4,3	1	95 AU V149	24375909*
60	70,6	63	5,3	7	5,3	1	95 AU V149	24004853*
63	73,6	66	5,3	7	5,3	1	95 AU V149	24004859*
65	75,6	68	5,3	7	5,3	1	95 AU V149	24004869*
70	78,6	73	5,3	6,5	4,3	1	95 AU V149	24375910*
70	80,6	73	5,3	7	5,3	1	95 AU V149	24004881*
75	87,2	81	7,2	12	6,1	1	95 AU V149	24004892*
80	92,2	86	7,2	12	6,1	1	95 AU V149	24004909*
85	97,2	91	7,2	12	6,1	1	95 AU V149	24004917*
90	102,2	96	7,2	12	6,1	1	95 AU V149	24004928*
100	112,2	106	7,2	12	6,1	1	95 AU V149	24004944*
110	122,2	116	7,2	12	6,1	1	95 AU V149	24004961*
115	127,2	121	7,2	12	6,1	1	95 AU V149	24004968*
120	132,2	126	7,2	12	6,1	1	95 AU V149	24004975*
125	140	132,6	10,2	16	7,5	1,5	95 AU V149	24004981*
140	155	147,6	10,2	16	7,5	1,5	95 AU V149	24005002*
150	165	157,6	10,2	16	7,5	1,5	95 AU V149	24005013*
160	175	167,6	10,2	16	7,5	1,5	95 AU V149	24005025*
180	200	190	10,2	18	10	3	95 AU V149	24005039*
190	210	200	10,2	18	10	3	95 AU V149	24005044*
200	220	210	10,2	18	10	3	95 AU V149	24005050*
225	245	235	10,2	18	10	3	95 AU V142	24372677
235	255	245	10,2	18	10	3	95 AU V142	24377298
270	290	280	10,2	18	10	3	95 AU V142	24361220
280	300	290	10,2	18	10	3	95 AU V142	24299202
300	325	314,5	11,7	17,3	12,5	3	95 AU V142	24005286

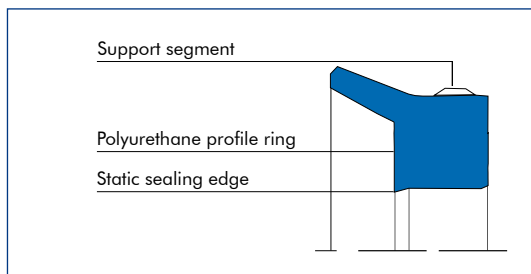
* Tools available
 Further dimensions are available on request.



d	D	D _i	L	H	Profile	R2	Material	Article No.
320	345	334,5	12,7	20	12,5	3	95 AU V142	24360728
345	365	355	10,2	18	10	3	95 AU V142	24105653
350	375	364,5	12,7	20	12,5	3	95 AU V142	24378440
360	385	374,5	12,7	20	12,5	3	95 AU V142	24246943
380	410	399,5	15,2	22,6	15	3	95 AU V142	24360324
400	420	410	10,2	18	10	3	95 AU V142	24353968
410	430	420	0	18	10	3	95 AU V142	24005130
420	450	439,5	15,2	22,6	15	3	95 AU V142	24353969
450	470	460	10,2	18	10	3	95 AU V142	24353970
470	490	480	7,7	15	10	3	95 AU V142	24005141
480	510	499,5	15,2	22,6	15	3	95 AU V142	24370299
570	600	589,5	15,2	22,6	15	3	93 AU V168	24354795
600	630	619,5	15,2	22,6	15	3	93 AU V168	24360323
620	650	639,5	15,3	20	15	3	93 AU V168	24353972
860	890	879,5	15,2	23	15	3	93 AU V168	24005166

Further dimensions are available on request.

Merkel Wiper PU 12



Product description

Single-acting dirt wiper towards the outside diameter, made of polyurethane with support segments, and a static sealing edge facing the groove.

Product advantages

- Very good wiping action due to inherently stable and wear & tear resistant wiper lip made of polyurethane.
- Secure collection of the remaining drag oil at the return stroke due to rounded wiper lip.
- Additional static sealing lip prevents ingress of dirt via the groove.
- Support segments offer stable positioning in the housing and assure high functional safety.

Material

Material	Designation	Color
Polyurethane	95 AU V149	dark blue

Material	Designation	Color
Polyurethane	93 AU V142	dark blue

Material	Designation	Color
Polyurethane	94 AU 925	light blue

The material is determined by the nominal diameter and the production process involved.

Application

Single acting dirt wiper for outer sealing applications.

Operating conditions

Material	95 AU V149 93 AU V142 94 AU 925
Hydraulic oils, HL, HLP	-30 ... +110
HFA fluids	+5 ... +50
HFB fluids	+5 ... +50
HFC fluids	-30 ... +40
HFD fluids	-
Water	+5 ... +50
HETG (rape-seed oil)	-30 ... +60
HEES (synth. ester)	-30 ... +80
HEPG (glycol)	-30 ... +40
Mineral greases	-30 ... +110
Running speed	2 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Gliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove side	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$.

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness. See also *Merkel Technical Manual*.



Surface finish of the sliding

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not currently apply for ceramic or semi-ceramic counterfaces. See also *Merkel Technical Manual*.

Tolerances

Diameter	Tolerance
$d \leq 400$	h10
$d > 400$	-0,4
d1	h10

The tolerance for the diameters d and D2 is specified in connection with the gap dimension calculation. In typical hydraulic applications up to a nominal dimension of 1,000 mm, the tolerance fields f7 and f8 or H7 and H8 are usually chosen.

Design notes

Please note our general design-related remarks in the *Merkel Technical Manual*.

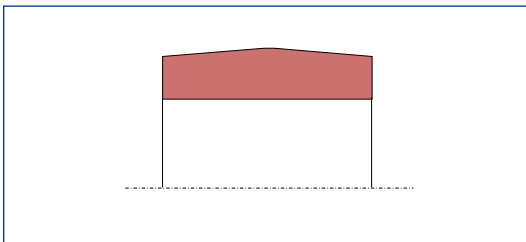
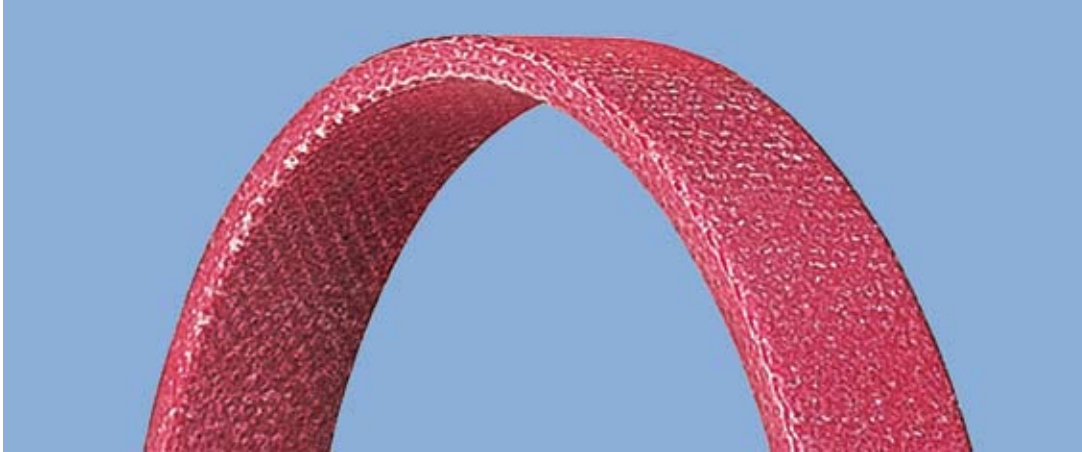
Installation & assembly

Please note our general remarks on hydraulic seal assembly in the *Merkel Technical Manual*





Merkel Guivex SBK Guide Bush



Product description

Profiled rod-type guide bush made of resin bonded fabric. Patented product design (patent No.: PCT/EP95/03874)

Product advantages

Intended, among others, for standardized housings as per ISO 10766

- Can replace current housings of type SB and SF
- High radial load capacity
- Very good guide-length utilization based on uniform stress distribution
- Enhanced penetration of lubricating media based on optimized stress distribution within the contact zone between the guide bush and the counter surface (favorable frictional behavior)
- Reduced propensity for stick-slip
- Excellent sliding behavior over a short guiding distance (no jamming)

Material

Material	Designation	Color
Resin bonded fabric	HGW HG650	red

Applications

- Long-stroke cylinder (piston-rod deflection)
- Short guiding distance (piston-rod tilting)
- Short stroke (inappropriate lubrication)
- Frictionally optimized sealing systems
- Replacement for metallic guides

Operating conditions

Guivex guide bushes can be used in all hydraulic fluids normally found in hydraulic systems such as oils and greases based on mineral oils, water, fire-resistant hydraulic fluids (HFA, HFB, HFC, HFD) and biodegradable hydraulic fluids (HETG, HEES, HEPG).

The maximum permissible operating temperature is 120°C

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90% with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness. See also Merkel Technical Manual. (See section with additional information on surfaces and Merkel Technical Manual).

Surface finish of the sliding surfaces

Characteristic value	Limit	
Ra	> 0,05 μm	< 0,30 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not apply, at the present stage, to ceramic or partly ceramic counterfaces.

Tolerances

Diameter D1
H9

Manufacturing tolerances

Profile thickness
-0,01 ... -0,06

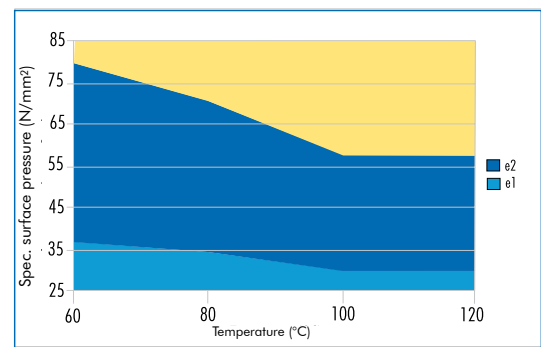
The tolerance regarding diameters d and DF is determined in connection with the calculation of the gap dimension. Tolerance zones f7 and f8 and/or H7 and H8 are usually selected for typical hydraulic applications with a nominal size of up to 1,000mm.

Surface load

The value for the specific surface pressure depends on the operating temperature and the scope of elastic deformation (spring deflection) of the guiding element involved. The maximum possible spring deflection in a sealing system is limited by the minimum gap dimension downstream of the primary seal. (See Merkel Technical Manual)

Spring deflection

- e1 = 0,1 at s = 2,5
- e1 = 0,15 at s = 4
- e2 = 0,15 at s = 2,5
- e2 = 0,2 at s = 4



Spec. surface pressure under parallel loads

Design notes

Diameter D1 indicated in the article list should be viewed solely in connection with the guide bush. The corresponding diameter of the connected seal housing must be in tune with the sealing element involved.

Please note our general remarks on design in the *Merkel Technical Manual*

Assembly

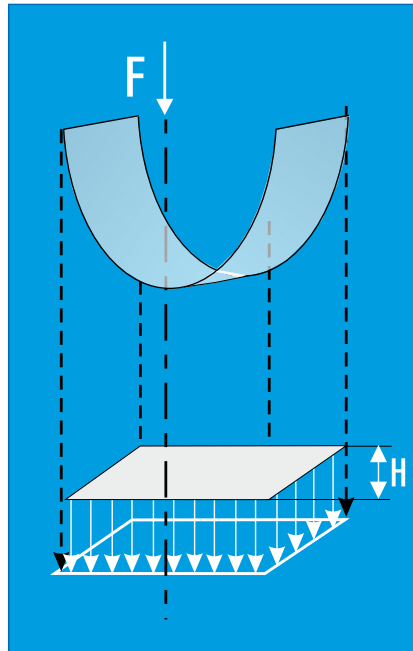
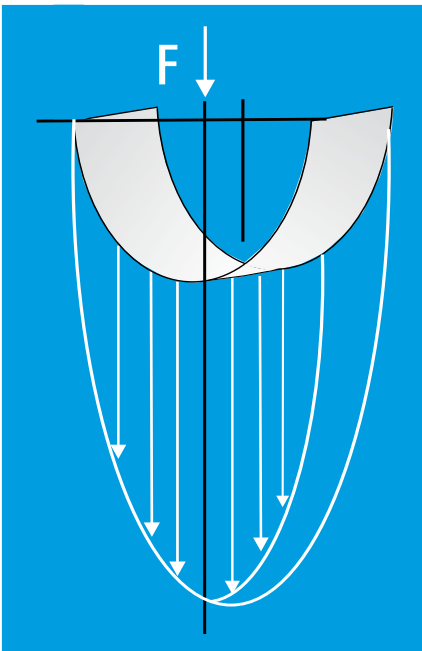
Please note our general remarks on the assembly of hydraulic seals in the *Merkel Technical Manual*.



Side load

Side loads within the contact area between the guide and the counterface are not linear. The guiding width required can be calculated by applying the formulas indicated below on the basis of the projected area. The non-linear progression of side

load pressures is taken into account in the contact pressure value. It may be advisable to reduce the loads by selecting a broader guide in individual cases to obtain an extended service life.



$$F = P \times A$$

$$A = d \times H$$

$$H = F / (d \times P)$$

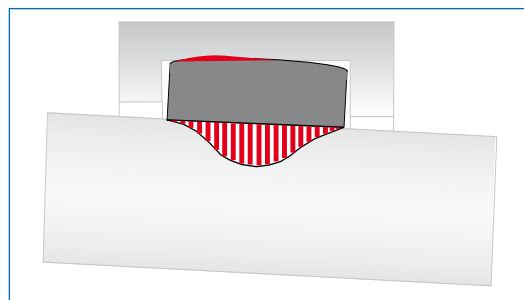
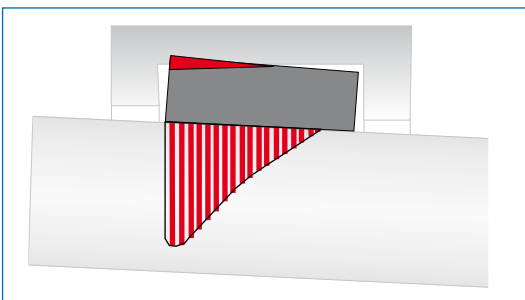
P = perm. surface pressure [N/mm²]
 d = Rod diameter with rod guide; Piston diameter with piston guide [mm]

H = Guide bandwidth [mm]
 F = Radial loads [N]
 A = Projected area [mm²]

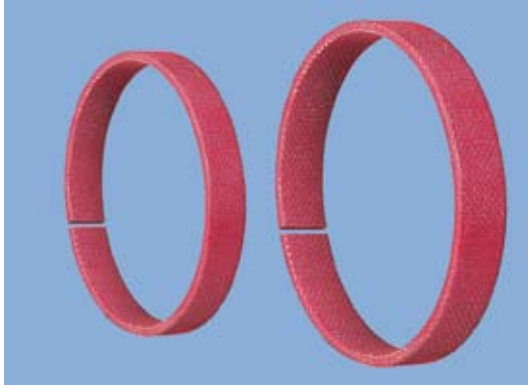
Operating principle

Rectangular guide bushes:
 Stress peaks within the edge area

Guivex guide bush:
 uniform stress distribution



Additional product description – Guide strips



Side load

The use of guide elements makes it possible to achieve low-friction and low-wear between the moving components of a hydraulic cylinder. Any side loads emerging during operation are absorbed effectively and any metal to metal contact between the piston rod and/or the piston barrel and the surrounding housing components is precluded.

The scope of the maximum side load is essentially determined by the geometrical marginal conditions and the properties of the guide element involved.

Excessive stresses

The guide play and elastic deformation of the elements under load results in an angular deviation between the piston rod and/or the piston barrel and the counterface during operation. Consequently, guides inside hydraulic cylinders will not remain parallel, but primarily stressed at the edges.

In this case, the permissible side load of the guide is defined by the lower maximum load up to edge break and not by the maximum compressive strength of the material. Excessive stresses within the edge area (Figure 01) make the penetration of lubricating media more difficult, too. The hydraulic medium is wiped along the edge stressed on the guide element and the lubricating film is reduced to a minimum, thus leading to stick-slip effects and greater wear.

Profiling

Guivex guide bushes are provided with a convex Profiling oriented towards the groove base. The side load applied is distributed evenly over the width of the guide element here. The maximum contact pressure value remains within the medium range and stress peaks on the edges are reduced (Figure 02).

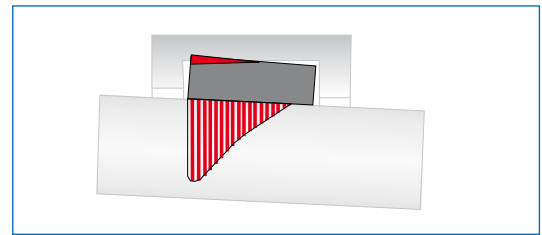


Figure 01: Rectangular guide bush
Excessive stress within the edge area

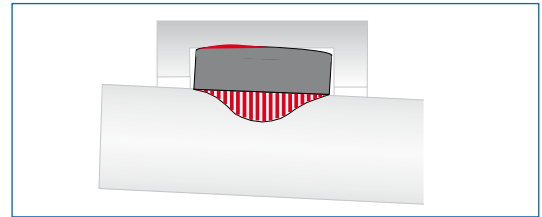


Figure 02: Guivex guide bush
Uniform stress distribution

Sliding properties

Guivex guide bushes made of HGW HG517 and HGW HG 650 materials are compounded with graphite and/or PTFE in order to achieve a better dry-running behavior. As a result, guide bushes made of resin bonded fabric exhibit excellent sliding properties, due to the material properties alone, even in the event of inappropriate lubrication.

The absorption of lubricating media within the area comprised between the guide and the counterface is greatly enhanced by the patented Profiling of Guivex guide bushes. Consequently, the sliding behavior is also improved by the Guivex geometry with correspondingly positive effects in terms of service life and stick-slip behavior.



Radial load capacity

Merkel resin bonded fabric materials are characterized by a high degree of load capacity.

The impact of the operating temperature on the load capacity of resin bonded fabric guide bushes is restricted, of course, when using duroplastic resin bonded fabric quality HGW HG517. The resin matrix of our material HGW HG650 includes both duroplastic and thermoplastic constituents. If permissible side loads are simultaneously less dependent on temperatures, the flexibility will be noticeably improved for assembly with small diameters.

Purely thermoplastic basic materials like polyester, for example, exhibit a temperature-dependent material behavior. Permissible cross loads are greatly reduced under the effect of rising operating temperatures. (See Figure 03).

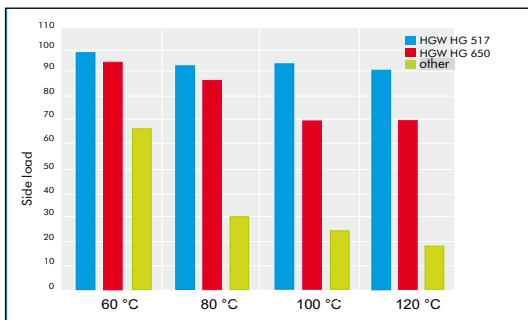


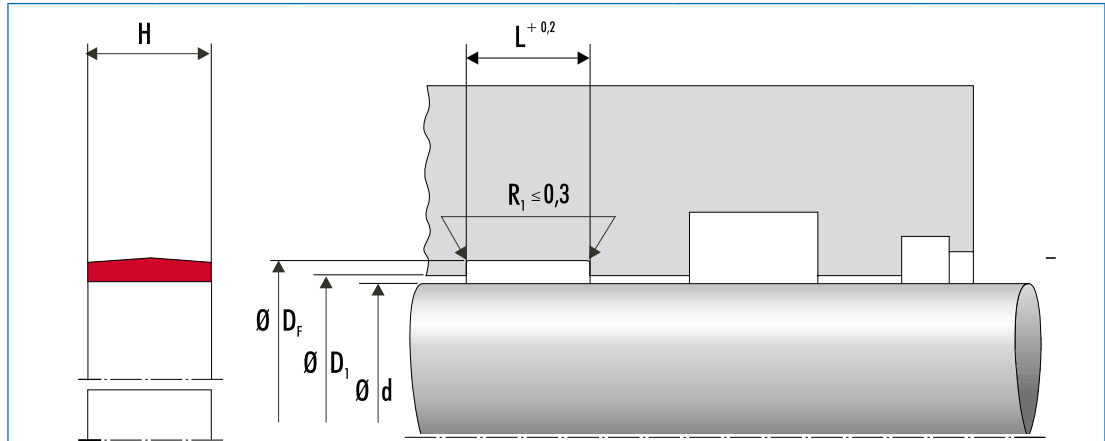
Figure 03: Resin bonded fabric materials in comparison of load capacity among plane-parallel guides depending on the operating temperature involved.

Forces are always introduced within the medium range of the guide bush in conjunction with the patented Guivex geometry. The maximum permissible cross load is not reduced here by excess stress at the edges. Uniform movements along the stroke, coupled with a high radial load capacity, can be achieved even in conjunction with short guide lengths and long-stroke cylinders with high angular offset to be expected.

The absorption of lubricating media within the area comprised between the guide and the counterface is greatly enhanced by the patented Profiling of Guivex guide bushes. Consequently, Guivex guide bushes exhibit a favorable frictional behavior with correspondingly positive effects in terms of service life and stick-slip behavior.

Forces are always introduced within the mid-section of the guide bush. Uniform movements along the stroke, coupled with a high radial load capacity, can be achieved even in conjunction with short guide lengths and long-stroke cylinders with the large angular offset to be expected. The system of guides inside the hydraulic cylinder will not be inclined to jam over a short guide distance either.

The use of Guivex guide bushes makes a vital contribution to the functional reliability and dependability of hydraulic cylinders.



All non-dimensioned edges rounded and burr-free.

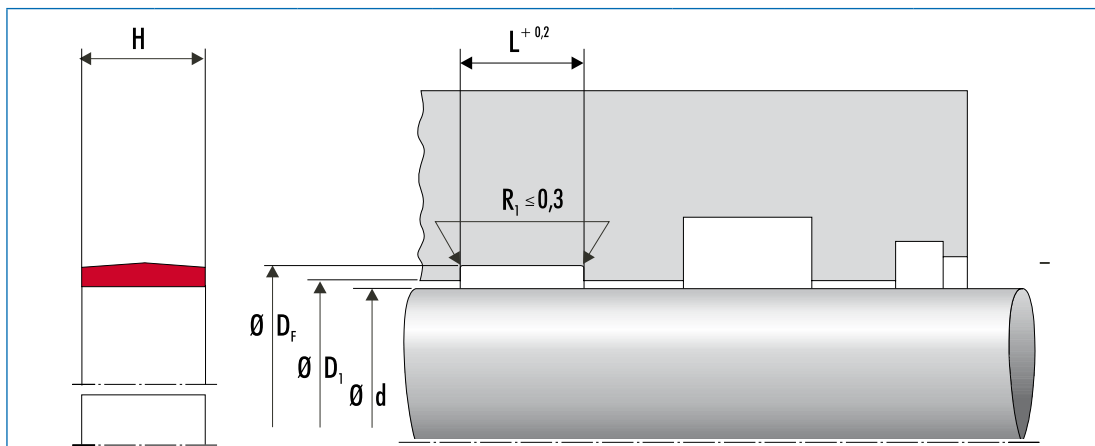
Housing	d	DF	D1	L	H	Profile	Article No.
	63	68	64,6	9,7	9,5	2,5	49006212
	63	68	64,6	15	14,8	2,5	49006213
	65	70	66,6	9,7	9,5	2,5	49006214
	65	70	66,6	15	14,8	2,5	49006215
ISO	70	75	71,6	9,7	9,5	2,5	49006216
	70	75	71,6	15	14,8	2,5	49002007
	75	80	76,6	9,7	9,5	2,5	49006217
	75	80	76,6	15	14,8	2,5	49006218
ISO	80	85	81,6	9,7	9,5	2,5	49006219
ISO	80	85	81,6	15	14,8	2,5	49002010
	85	90	86,6	9,7	9,5	2,5	49006220
	85	90	86,6	15	14,8	2,5	49006221
ISO	90	95	91,6	9,7	9,5	2,5	49006222
	90	95	91,6	15	14,8	2,5	49002008
	95	100	96,6	9,7	9,5	2,5	49006224
	95	100	96,6	15	14,8	2,5	49006225
ISO	100	105	101,6	9,7	9,5	2,5	49006226
ISO	100	105	101,6	15	14,8	2,5	49006227
	100	105	101,6	20	19,8	2,5	49067339
	105	110	106,6	9,7	9,5	2,5	49006228
	105	110	106,6	15	14,8	2,5	49006229
ISO	110	115	111,6	9,7	9,5	2,5	49006230
ISO	110	115	111,6	15	14,8	2,5	49006231
	115	120	116,6	15	14,8	2,5	49006232
	120	125	121,6	9,7	9,5	2,5	49006233
	120	125	121,6	15	14,8	2,5	49006234

Further dimensions are available on request.



Housing	d	DF	D1	L	H	Profile	Article No.
	120	125	121,6	25	24,5	2,5	49018492
ISO	125	130	126,6	9,7	9,5	2,5	49006235
ISO	125	130	126,6	15	14,8	2,5	49006236
	125	130	126,6	25	24,5	2,5	49006237
	130	135	131,6	15	14,8	2,5	49006238
	130	135	131,6	25	24,5	2,5	49040859
	135	140	131,6	9,7	9,5	2,5	49056035
	135	140	136,6	15	14,8	2,5	49006239
ISO	140	145	141,6	9,7	9,5	2,5	49006240
ISO	140	145	141,6	15	14,8	2,5	49006241
	140	145	141,6	25	24,5	2,5	49006242
	145	150	146,6	15	14,8	2,5	49006243
	145	150	146,6	25	24,5	2,5	49061342
	150	155	151,6	15	14,8	2,5	49006244
	150	155	151,6	25	24,5	2,5	49066813
	155	160	156,6	15	14,8	2,5	49006245
	155	160	156,6	25	24,5	2,5	49061343
ISO	160	165	161,6	15	14,8	2,5	49006247
	160	165	161,6	25	24,5	2,5	49006248
	170	175	171,6	15	14,8	2,5	49006250
	170	175	171,6	25	24,5	2,5	49006249
ISO	180	185	181,6	15	14,8	2,5	49006253
	180	185	181,6	25	24,5	2,5	49006252
	185	190	186,6	15	14,8	2,5	49030377
	190	195	191,6	15	14,8	2,5	49006254
ISO	200	205	201,6	15	14,8	2,5	49006259
ISO	200	205	201,6	25	24,5	2,5	49006258
	210	215	211,6	15	14,8	2,5	49006260
	210	215	211,6	25	24,5	2,5	49058459
ISO	220	225	221,6	15	14,8	2,5	49006281
ISO	220	225	221,6	25	24,5	2,5	49006282
	230	235	231,6	15	14,8	2,5	49006283
	230	235	231,6	25	24,5	2,5	49006284
	235	240	236,6	15	14,8	2,5	49023262
	240	245	241,6	15	14,8	2,5	49006285
ISO	250	255	251,6	15	14,8	2,5	49006286
ISO	250	255	251,6	25	24,5	2,5	49006287
	270	275	271,6	25	24,5	2,5	49006288

Further dimensions are available on request.



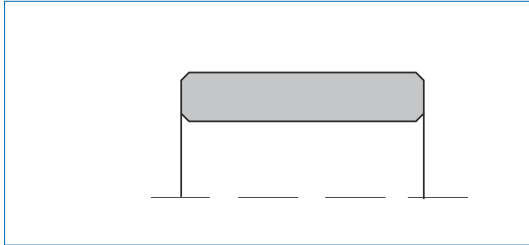
All non-dimensioned edges rounded and burr-free.

Housing	d	DF	D1	L	H	Profile	Article No.
ISO	280	285	281,6	15	14,8	2,5	49006290
ISO	280	285	281,6	25	24,5	2,5	49006289
	300	308	302,5	35	34,5	4	49056189
	300	308	302,5	40	39,5	4	49054647
	360	368	362,5	40	39,5	4	49059762
	400	408	402,5	40	39,5	4	49063893
	500	508	502,5	40	39,5	4	49062931
	670	678	672,5	40	39,5	4	49062942
	800	808	802,5	40	39,5	4	49061155
	850	858	852,5	40	39,5	4	49062409
	880	888	882,5	40	39,5	4	49062174
	900	908	902,5	40	39,5	4	49054648
	970	978	972,5	40	39,5	4	49063920
	1000	1008	1002,5	40	39,5	4	49069383
	1100	1108	1102,5	40	39,5	4	49066611
	1500	1508	1502,5	40	39,5	4	49044252

Further dimensions are available on request.



Merkel Guide Ring SB



Product description

Non metallic piston guide element

Product advantages

- metal/plastic material combination prevents „seizing“
- high load-bearing capacity, elastic (not plastic) behaviour up to break point
- chamfers Profile edges prevent pressing of edge
- into the corner radii of the housing groove simple snap in fitting ($d < 300$)

Material

Diameter < 300

Material	Designation	Color
Fabric base laminate	HGW HG600	dark grey

Diameter > 300

Material	Designation	Color
Fabric base laminate	HGW HG600	light grey

Application

Nonmetallic guide element for rods, also for standardised housing as per ISO 10766

Field of application

Material	HGW HG517/HGW HG600
Hydraulic oils, HL, HLP	-40° ... +120° C
HFA fluids	+5 ... +60
HFB fluids	+5 ... +60
HFC fluids	-40 ... +60
HFD fluids	-40° ... +120° C
Water	+5 ... +60
HETG (rape-seed oil)	-40° ... +80° C
HEES (synth. ester)	-40° ... +100° C
HEPG (glycol)	-40° ... +80° C
Mineral greases	-40° ... +120° C

For sliding speed, see sealing system.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90 %, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

Design notes

Please observe our general design notes in the *Merkel Technical Manual*

Tolerance recommendation

D_1
H8

The tolerance recommendation for dimensions D and d must be regarded in conjunction with the seal being used. The diameter D_1 stated in the dimensional table must be seen solely with reference to the guide ring. The corresponding diameter of an adjacent seal installation space must be matched to the sealing element involved.

Manufacturing tolerance

Profile thickness S
-0,02 ... -0,08

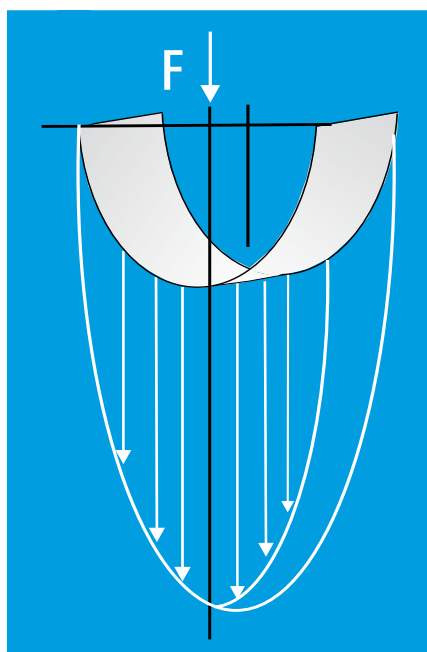
Surface load

Profile thickness S
$p < 50 \text{ N/mm}^2 \dots 60 \text{ }^\circ\text{C}$
$p < 25 \text{ N/mm}^2 \dots 100 \text{ }^\circ\text{C}$

Surface force

Pressure within the contact area between the guide and the counterface is not linear. The guiding width required can be calculated by applying the formulas mentioned below on the basis of the projected area. The non-linear progression of the contact pressure process is taken into account in the surface pressure value.

It may be advisable to reduce the loads by selecting a broader guide in individual cases to obtain an extended service life.

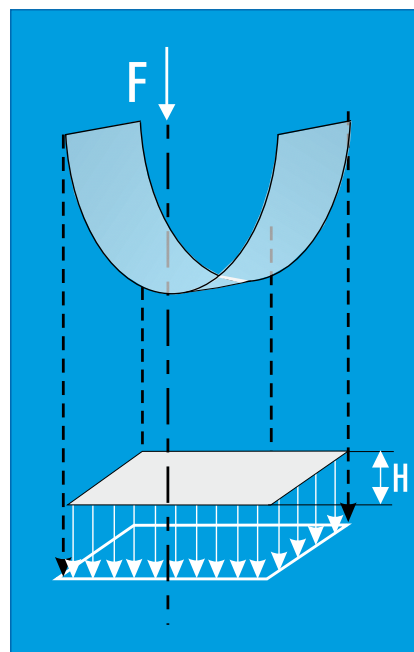


$$F = P \times A$$

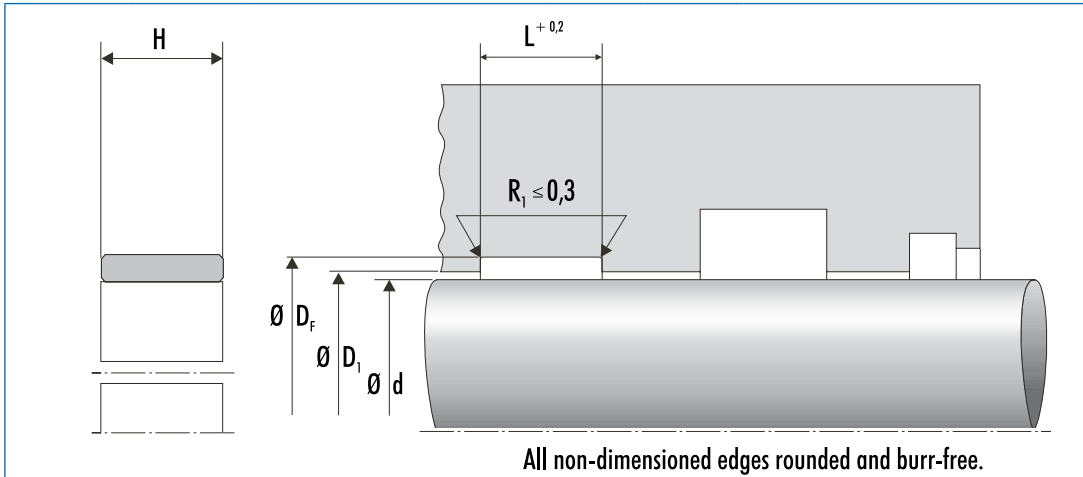
$$A = d \times H$$

$$H = F / (d \times P)$$

H = Guide bandwidth [mm]
 F = Radial loads [N]
 A = Projected area [mm²]

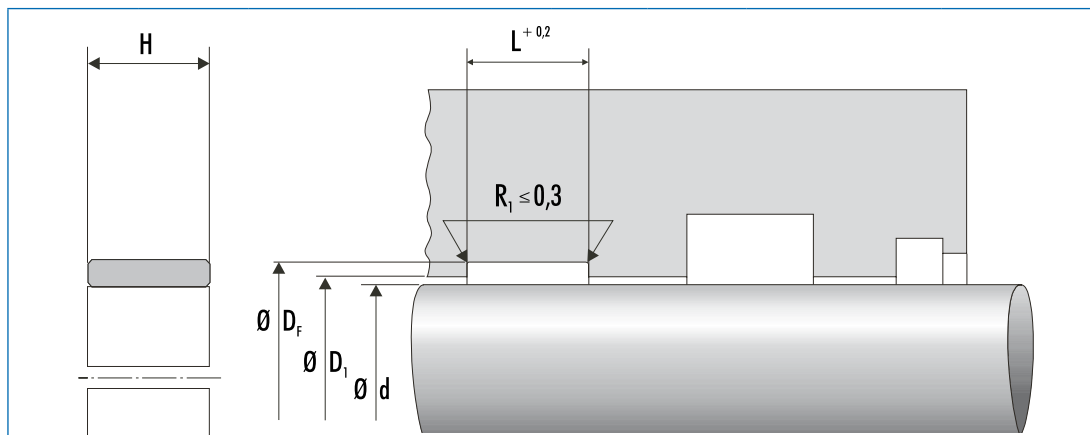


P = perm. surface pressure [N/mm²]
 d = Rod diameter with rod guide; Piston diameter with piston guide [mm]



Housing	d	DF	D1	H	L	Profile	Material	Article No.
	62	67	63,6	9,6	9,7	2,5	HGW HG517	24344687
ISO	63	68	64,6	9,6	9,7	2,5	HGW HG517	24131045
	63	68	64,6	14,8	15	2,5	HGW HG517	24174690
	65	70	66,6	9,6	9,7	2,5	HGW HG517	24131048
	65	70	66,6	14,8	15	2,5	HGW HG517	24341762
ISO	70	75	71,6	9,6	9,7	2,5	HGW HG517	24131051
	70	75	71,6	14,8	15	2,5	HGW HG517	24180724
	70	75	71,6	19,8	20	2,5	HGW HG517	24360175
	75	80	76,6	9,6	9,7	2,5	HGW HG517	24131054
	75	80	76,6	14,8	15	2,5	HGW HG517	24351115
	75	80	76,6	19,8	20	2,5	HGW HG517	24360176
ISO	80	85	81,6	9,6	9,7	2,5	HGW HG517	24131056
	80	85	81,6	14,8	15	2,5	HGW HG517	24138557
	85	90	86,6	9,6	9,7	2,5	HGW HG517	24131058
	85	90	86,6	14,8	15	2,5	HGW HG517	24346624
	85	90	86,6	19,8	20	2,5	HGW HG517	532048
ISO	90	95	91,6	9,6	9,7	2,5	HGW HG517	24131060
ISO	90	95	91,6	14,8	15	2,5	HGW HG517	24232557
	90	95	91,6	19,8	20	2,5	HGW HG517	24194266
	95	100	96,6	9,6	9,7	2,5	HGW HG517	24148244
	95	100	96,6	14,8	15	2,5	HGW HG517	24194699
ISO	100	105	101,6	9,6	9,7	2,5	HGW HG517	24131062
ISO	100	105	101,6	14,8	15	2,5	HGW HG517	24174684
	100	105	101,6	19,8	20	2,5	HGW HG517	49038074
	105	110	106,6	9,6	9,7	2,5	HGW HG517	24197459
	105	110	106,6	14,8	15	2,5	HGW HG517	24191184

Further dimensions are available on request.



All non-dimensioned edges rounded and burr-free.

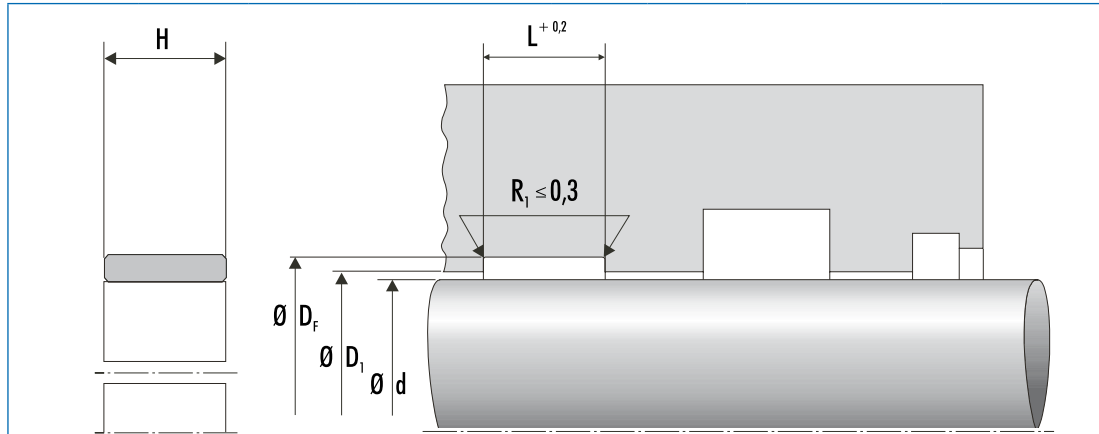
Housing	d	DF	D1	H	L	Profile	Material	Article No.
	105	110	106,6	19,8	20	2,5	HGW HG517	49035821
ISO	110	115	111,6	9,6	9,7	2,5	HGW HG517	24131064
ISO	110	115	111,6	14,8	15	2,5	HGW HG517	24193285
	110	115	111,6	19,8	20	2,5	HGW HG517	529339
	115	120	116,6	9,6	9,7	2,5	HGW HG517	24131066
	120	125	121,6	9,6	9,7	2,5	HGW HG517	24136649
	120	125	121,6	14,8	15	2,5	HGW HG517	24174685
	120	125	121,6	24,5	25	2,5	HGW HG517	24240122
ISO	125	130	126,6	9,6	9,7	2,5	HGW HG517	24131068
ISO	125	130	126,6	14,8	15	2,5	HGW HG517	24131069
	125	130	126,6	24,5	25	2,5	HGW HG517	24370505
	130	135	131,6	9,6	9,7	2,5	HGW HG517	24226062
	130	135	131,6	14,8	15	2,5	HGW HG517	24172594
	130	135	131,6	24,5	25	2,5	HGW HG517	24299513
	135	140	136,6	9,6	9,7	2,5	HGW HG517	24192116
	135	140	136,6	14,8	15	2,5	HGW HG517	24175948
	135	140	136,6	24,5	25	2,5	HGW HG517	49030962
ISO	140	145	141,6	9,6	9,7	2,5	HGW HG517	24131071
ISO	140	145	141,6	14,8	15	2,5	HGW HG517	24131072
	140	145	141,6	24,5	25	2,5	HGW HG517	24143420
	145	150	146,6	14,8	15	2,5	HGW HG517	24333990
	145	150	146,6	19,8	20	2,5	HGW HG517	24342271
	145	150	146,6	24,5	25	2,5	HGW HG517	24349284
	150	155	151,6	9,6	9,7	2,5	HGW HG517	24131074
	150	155	151,6	14,8	15	2,5	HGW HG517	24131075
	150	155	151,6	24,5	25	2,5	HGW HG517	24294288

Further dimensions are available on request.



Housing	d	DF	D1	H	L	Profile	Material	Article No.
	155	160	156,6	14,8	15	2,5	HGW HG517	24267941
ISO	160	165	161,6	9,6	9,7	2,5	HGW HG517	24131077
ISO	160	165	161,6	14,8	15	2,5	HGW HG517	24131078
	160	165	161,6	19,5	20	2,5	HGW HG517	24358994
	160	165	161,6	24,5	25	2,5	HGW HG517	24370170
	165	170	166,6	14,8	15	2,5	HGW HG517	24183087
	170	175	171,6	9,6	9,7	2,5	HGW HG517	24226065
	170	175	171,6	14,8	15	2,5	HGW HG517	24190517
	170	175	171,6	24,5	25	2,5	HGW HG517	24375858
	170	178	172,5	24,5	25	4	HGW HG517	49003856
	175	180	176,6	24,5	25	2,5	HGW HG517	24362381
ISO	180	185	181,6	9,6	9,7	2,5	HGW HG517	24131080
ISO	180	185	181,6	14,8	15	2,5	HGW HG517	24131081
	180	185	181,6	19,8	20	2,5	HGW HG517	24372691
	180	185	181,6	24,5	25	2,5	HGW HG517	24248725
	180	188	182,5	14,8	15	4	HGW HG517	24358565
	180	188	182,5	24,5	25	4	HGW HG517	24354370
	185	190	186,6	19,8	20	2,5	HGW HG517	24358050
	190	195	191,6	9,6	9,7	2,5	HGW HG517	24216235
	190	195	191,6	14,8	15	2,5	HGW HG517	24216375
	190	195	191,6	24,5	25	2,5	HGW HG517	24262387
	195	200	196,6	24,5	25	2,5	HGW HG517	24355516
	200	205	201,6	9,6	9,7	2,5	HGW HG517	24131083
ISO	200	205	201,6	14,8	15	2,5	HGW HG517	24131084
	200	205	201,6	19,8	20	2,5	HGW HG517	49038073
ISO	200	205	201,6	24,5	25	2,5	HGW HG517	24144513
	200	205	201,6	29,5	30	2,5	HGW HG517	24359113
	200	208	202,5	24,5	25	4	HGW HG517	24227974
	205	210	206,6	14,8	15	2,5	HGW HG517	24357229
	205	210	206,6	24,5	25	2,5	HGW HG517	24352606
	210	215	211,6	9,6	9,7	2,5	HGW HG517	24226066
	210	215	211,6	14,8	15	2,5	HGW HG517	24226067
	210	215	211,6	24,5	25	2,5	HGW HG517	49017661
	210	218	212,5	24,5	25	4	HGW HG517	24263732
	215	220	216,6	14,8	15	2,5	HGW HG517	24264168
	220	225	221,6	9,6	9,7	2,5	HGW HG517	24226068
ISO	220	225	221,6	14,8	15	2,5	HGW HG517	24209167
ISO	220	225	221,6	24,5	25	2,5	HGW HG517	24227311
	220	228	222,5	24,5	25	4	HGW HG517	24265230

Further dimensions are available on request.



All non-dimensioned edges rounded and burr-free.

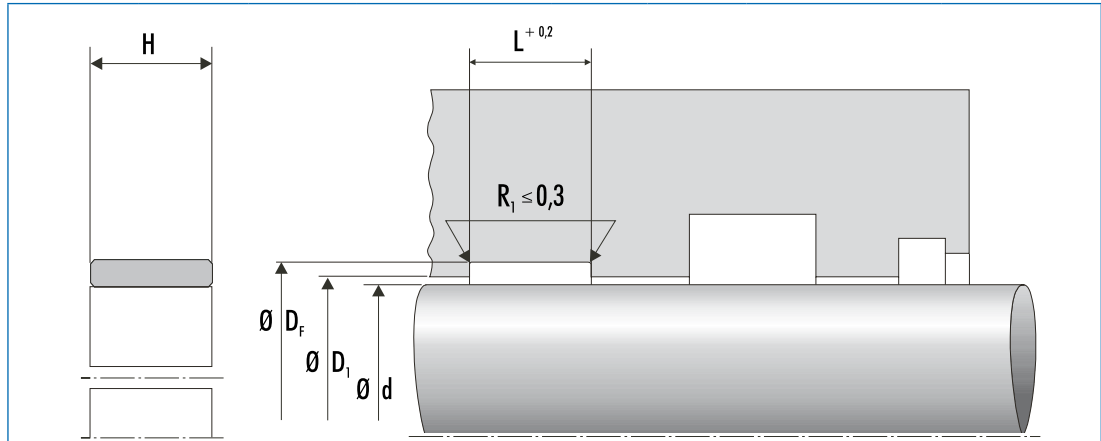
Housing	d	DF	D1	H	L	Profile	Material	Article No.
	225	230	226,6	14,8	15	2,5	HGW HG517	24373135
	225	230	226,6	24,5	25	2,5	HGW HG517	49033816
	230	235	231,6	14,8	15	2,5	HGW HG517	24226069
	230	235	231,6	19,8	20	2,5	HGW HG517	24342273
	230	235	231,6	24,5	25	2,5	HGW HG517	24368281
	230	235	231,6	29,5	30	2,5	HGW HG517	24356945
	230	238	232,5	24,5	25	4	HGW HG517	24362692
	235	240	236,6	24,5	25	2,5	HGW HG517	49017660
	240	245	241,6	14,8	15	2,5	HGW HG517	24197575
	240	245	241,6	19,5	20	2,5	HGW HG517	24358988
	240	245	241,6	24,5	25	2,5	HGW HG517	24354796
	240	248	242,5	24,5	25	4	HGW HG517	24262692
	245	250	246,6	14,8	15	2,5	HGW HG517	24345561
ISO	250	255	251,6	14,8	15	2,5	HGW HG517	24226070
ISO	250	255	251,6	24,5	25	2,5	HGW HG517	24373460
	250	258	252,5	24,5	25	4	HGW HG517	24370915
	260	265	261,6	9,6	9,7	2,5	HGW HG517	24359921
	260	265	261,6	14,8	15	2,5	HGW HG517	24226071
	260	265	261,6	24,5	25	2,5	HGW HG517	24376300
	260	268	262,5	24,5	25	4	HGW HG517	24363233
	270	275	271,6	14,8	15	2,5	HGW HG517	24226072
	270	275	271,6	24,5	25	2,5	HGW HG517	24236259
	270	278	272,5	24,5	25	4	HGW HG517	49045538
ISO	280	285	281,6	14,8	15	2,5	HGW HG517	24226073
ISO	280	288	282,5	24,5	25	4	HGW HG517	24353315

Further dimensions are available on request.



Housing	d	DF	D1	H	L	Profile	Material	Article No.
	290	295	291,6	14,8	15	2,5	HGW HG517	24226074
	290	295	291,6	19,8	20	2,5	HGW HG517	24342274
	290	295	291,6	24,5	25	2,5	HGW HG517	24360563
	290	298	292,5	24,5	25	4	HGW HG517	24370635
	300	305	301,6	14,8	15	2,5	HGW HG517	24191327
	300	305	301,6	19,8	20	2,5	HGW HG600	24358991
	300	305	301,6	24,5	25	2,5	HGW HG600	24334866
	300	308	302,5	24,5	25	4	HGW HG600	24256760
	310	315	311,6	14,8	15	2,5	HGW HG600	24226075
	310	315	311,6	24,5	25	2,5	HGW HG600	24343892
	310	318	312,5	24,5	25	4	HGW HG600	24294293
ISO	320	325	321,6	14,8	15	2,5	HGW HG600	24226076
ISO	320	325	321,6	24,5	25	2,5	HGW HG600	24226077
ISO	320	328	322,5	24,5	25	4	HGW HG600	24308092
	330	335	331,6	14,8	15	2,5	HGW HG600	24226078
	330	335	331,6	19,8	20	2,5	HGW HG600	24358993
	330	335	331,6	24,5	25	2,5	HGW HG600	24187413
	340	345	341,6	14,8	15	2,5	HGW HG600	24226079
	340	345	341,6	14,8	15	2,5	HGW HG600	24345971
	340	345	341,6	24,5	25	2,5	HGW HG600	24226080
	350	355	351,6	14,8	15	2,5	HGW HG600	24226081
	350	355	351,6	24,5	25	2,5	HGW HG600	24226082
	350	358	352,5	24,5	25	4	HGW HG600	24337997
ISO	360	365	361,6	14,8	15	2,5	HGW HG600	24226083
ISO	360	365	361,6	24,5	25	2,5	HGW HG600	24226084
ISO	360	368	362,5	24,5	25	4	HGW HG600	24342012
	360	368	362,5	39,5	40	4	HGW HG600	49033814
	370	375	371,6	14,8	15	2,5	HGW HG600	24356039
	370	375	371,6	24,5	25	2,5	HGW HG600	24327519
	380	385	381,6	14,8	15	2,5	HGW HG600	24353459
	380	385	381,6	24,5	25	2,5	HGW HG600	24250195
	380	388	382,5	24,5	25	4	HGW HG600	24371602
	390	395	391,6	14,8	15	2,5	HGW HG600	24375951
	390	395	391,6	24,5	25	2,5	HGW HG600	24187414
	390	398	392,5	24,5	25	4	HGW HG600	24307327
	400	405	401,6	14,8	15	2,5	HGW HG600	24345757
	400	405	401,6	14,8	15	2,5	HGW HG600	24344133
	400	405	401,6	24,5	25	2,5	HGW HG600	24333824

Further dimensions are available on request.



All non-dimensioned edges rounded and burr-free.

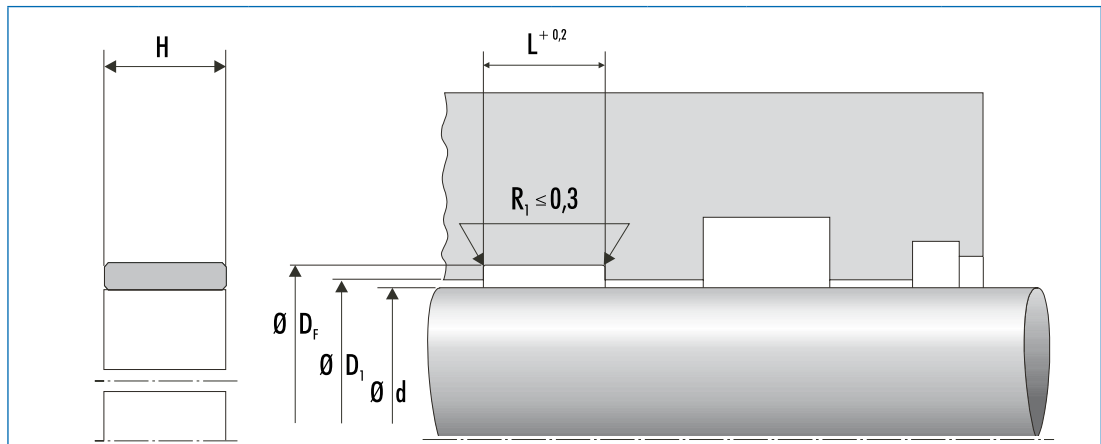
Housing	d	DF	D1	H	L	Profile	Material	Article No.
	400	408	402,5	24,5	25	4	HGW HG600	24259182
	410	415	411,6	14,9	15	2,5	HGW HG600	24288046
	410	415	411,6	24,5	25	2,5	HGW HG600	24294216
	420	425	421,6	14,8	15	2,5	HGW HG600	24356361
	420	425	421,6	24,5	25	2,5	HGW HG600	24329919
	420	425	421,6	24,5	25	2,5	HGW HG600	24224553
	420	428	422,5	19,8	20	4	HGW HG600	24376121
	420	428	422,5	24,5	25	4	HGW HG600	24269681
	420	428	422,5	24,5	25	4	HGW HG600	24346468
	430	438	432,5	24,5	25	4	HGW HG600	24377734
	440	445	441,6	24,5	25	2,5	HGW HG600	24369027
	440	448	442,5	24,5	25	4	HGW HG600	24363242
	450	455	451,6	14,8	15	2,5	HGW HG600	24265877
	450	455	451,6	24,5	25	2,5	HGW HG600	24339926
	450	458	452,5	24,5	25	4	HGW HG600	24294987
	460	465	461,6	14,8	15	2,5	HGW HG600	24356363
	460	465	461,6	24,5	25	2,5	HGW HG600	24339221
	460	468	462,5	24,5	25	4	HGW HG600	24269407
	470	475	471,6	14,8	15	2,5	HGW HG600	24327589
	470	475	471,6	24,5	25	2,5	HGW HG600	24359238
	470	478	472,5	24,5	25	4	HGW HG600	49017674
	480	485	481,6	24,5	25	2,5	HGW HG600	24339373
	480	488	482,5	24,5	25	4	HGW HG600	24291803
	490	495	491,6	24,5	25	2,5	HGW HG600	24379845
	490	498	492,5	24,5	25	4	HGW HG600	24290172
	500	505	501,6	14,8	15	2,5	HGW HG600	24356362

Further dimensions are available on request.



Housing	d	DF	D1	H	L	Profile	Material	Article No.
	630	638	632,5	24,5	25	4	HGW HG600	24308091
	640	645	641,6	24,5	25	2,5	HGW HG600	532206
	640	648	642,5	19,8	20	4	HGW HG600	24348254
	500	505	501,6	19,8	20	2,5	HGW HG600	49023334
	500	505	501,6	24,5	25	2,5	HGW HG600	24269675
	500	508	502,5	19,8	20	4	HGW HG600	24360926
	500	508	502,5	24,5	25	4	HGW HG600	24269421
	510	515	511,6	24,5	25	2,5	HGW HG600	24373093
	510	518	512,5	24,5	25	4	HGW HG600	24299556
	520	525	521,6	24,5	25	2,5	HGW HG600	24345682
	520	528	522,5	24,5	25	4	HGW HG600	24329460
	530	535	531,6	14,8	15	2,5	HGW HG600	24356360
	530	535	531,6	24,5	25	2,5	HGW HG600	24344464
	530	538	532,5	19,8	20	4	HGW HG600	528232
	530	538	532,5	24,5	25	4	HGW HG600	24363243
	535	540	536,6	9,6	9,7	2,5	HGW HG600	24351386
	540	545	541,6	24,5	25	2,5	HGW HG600	531226
	540	548	542,5	24,5	25	4	HGW HG600	24274965
	550	555	551,6	14,8	15	2,5	HGW HG600	24373950
	550	555	551,6	24,5	25	2,5	HGW HG600	24362838
	550	558	552,5	24,5	25	4	HGW HG600	49065782
	550	558	552,5	39,5	40	4	HGW HG600	49029012
	560	565	561,6	24,5	25	2,5	HGW HG600	24370281
	560	568	562,5	19,5	20	4	HGW HG600	24366773
	560	568	562,5	19,8	20	4	HGW HG600	24371091
	560	568	562,5	24,5	25	4	HGW HG600	24275169
	570	575	571,6	24,5	25	2,5	HGW HG600	24250196
	570	578	572,5	24,5	25	4	HGW HG600	24315103
	580	585	581,6	24,5	25	2,5	HGW HG600	49042821
	580	588	582,5	24,5	25	4	HGW HG600	24307424
	590	595	591,6	24,5	25	2,5	HGW HG600	24316066
	590	598	592,5	19,8	20	4	HGW HG600	49045943
	590	598	592,5	24,5	25	4	HGW HG600	24288148
	600	605	601,6	24,5	25	2,5	HGW HG600	24337098
	600	608	602,5	24,5	25	4	HGW HG600	24340044
	620	625	621,6	9,6	9,7	2,5	HGW HG600	24369760
	620	628	622,5	24,5	25	4	HGW HG600	24374232
	625	630	626,6	14,8	15	2,5	HGW HG600	24365411

Further dimensions are available on request.



All non-dimensioned edges rounded and burr-free.

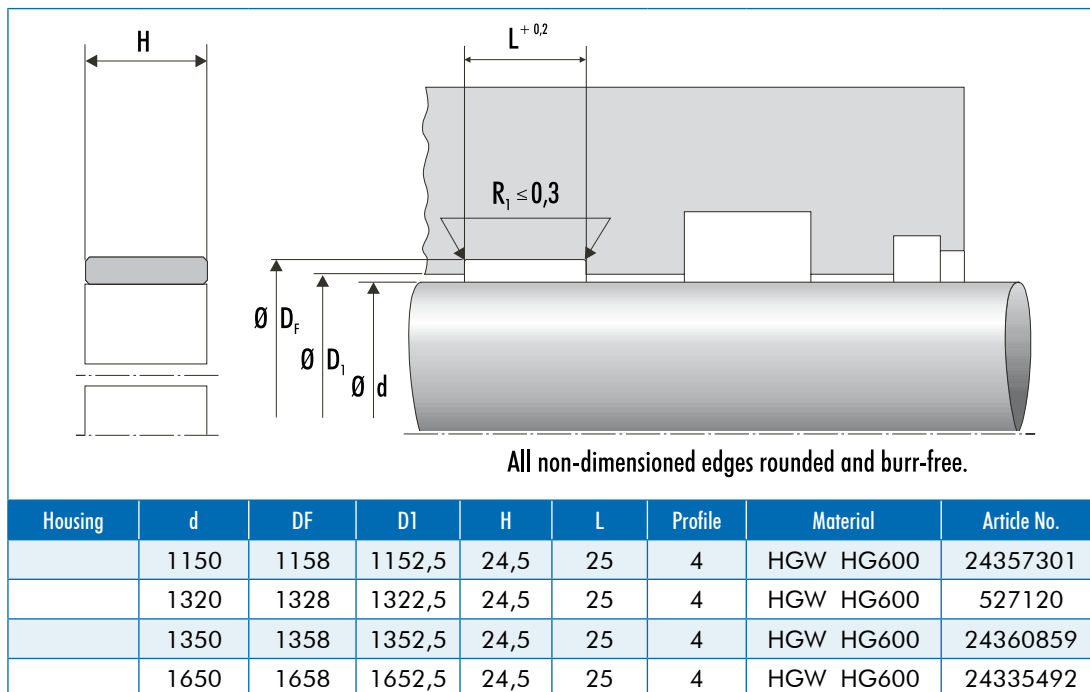
Housing	d	DF	D1	H	L	Profile	Material	Article No.
	640	648	642,5	24,5	25	4	HGW HG600	24298435
	650	655	651,6	14,8	15	2,5	HGW HG600	24302588
	650	655	651,6	24,8	25	2,5	HGW HG600	24302589
	650	658	652,5	24,5	25	4	HGW HG600	24293966
	660	665	661,6	24,5	25	2,5	HGW HG600	24336388
	660	668	662,5	24,5	25	4	HGW HG600	49026243
	670	675	671,6	24,5	25	2,5	HGW HG600	24353636
	670	678	672,5	24,5	25	4	HGW HG600	24300401
	680	685	681,6	24,5	25	2,5	HGW HG600	49004507
	680	688	682,5	24,5	25	4	HGW HG600	24269484
	690	698	692,5	24,5	25	4	HGW HG600	49059296
	700	705	701,6	14,8	15	2,5	HGW HG600	24257373
	700	705	701,6	24,5	25	2,5	HGW HG600	24373074
	700	708	702,5	24,5	25	4	HGW HG600	49006788
	710	715	711,6	24,5	25	2,5	HGW HG600	24359709
	720	728	722,5	24,5	25	4	HGW HG600	24295834
	730	735	731,6	24,5	25	2,5	HGW HG600	24362406
	730	738	732,5	24,5	25	4	HGW HG600	49018770
	740	748	742,5	24,5	25	4	HGW HG600	24243177
	750	755	751,6	24,5	25	2,5	HGW HG600	24378117
	750	758	752,5	24,5	25	4	HGW HG600	24306400
	750	758	752,5	29,5	30	4	HGW HG600	49002923
	760	768	762,5	24,5	25	4	HGW HG600	49036057
	770	778	772,5	24,5	25	4	HGW HG600	24353779
	790	798	792,5	24,5	25	4	HGW HG600	24351818

Further dimensions are available on request.



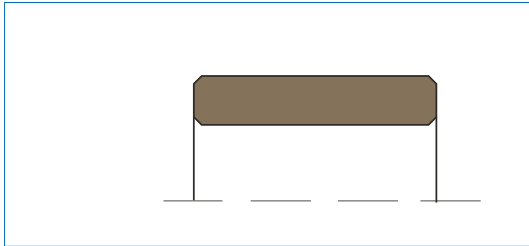
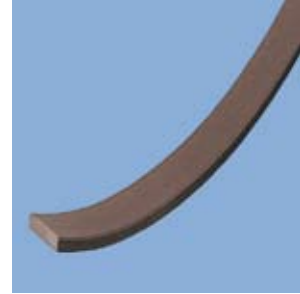
Housing	d	DF	D1	H	L	Profile	Material	Article No.
	1120	1128	1122,5	24	25	4	HGW HG600	49017765
	1145	1150	1146,6	24,5	25	2,5	HGW HG600	529898
	800	805	801,6	24,5	25	2,5	HGW HG600	24377891
	800	808	802,5	24,5	25	4	HGW HG600	24295217
	805	810	806,6	15	15	2,5	HGW HG600	24328293
	810	818	812,5	19,8	20	4	HGW HG600	49017997
	810	818	812,5	24,5	25	4	HGW HG600	24378134
	820	828	822,5	24,5	25	4	HGW HG600	24335809
	830	838	832,5	24,5	25	4	HGW HG600	24339267
	850	858	852,5	24,5	25	4	HGW HG600	24269891
	860	868	862,5	24,5	25	4	HGW HG600	24294618
	870	878	872,5	24,5	25	4	HGW HG600	49018776
	875	880	876,6	24,5	25	2,5	HGW HG600	528070
	880	888	882,5	24,5	25	4	HGW HG600	24336302
	890	898	892,5	14,8	15	4	HGW HG600	24297567
	890	898	892,5	19,8	20	4	HGW HG600	49040243
	890	898	892,5	24,5	25	4	HGW HG600	24338494
	900	905	901,6	24,5	25	2,5	HGW HG600	49031445
	900	908	902,5	24,5	25	4	HGW HG600	24257240
	920	925	921,6	24,5	25	2,5	HGW HG600	24378526
	920	928	922,5	24,5	25	4	HGW HG600	49060914
	945	953	947,5	24,5	25	4	HGW HG600	49017675
	950	958	952,5	19,5	20	4	HGW HG600	49023586
	950	958	952,5	24,5	25	4	HGW HG600	24294142
	970	978	972,5	24,5	25	4	HGW HG600	24344536
	970	978	972,5	24,5	25	4	HGW HG600	24359657
	975	983	977,5	24,5	25	4	HGW HG600	24293718
	1000	1005	1001,6	24,5	25	2,5	HGW HG600	24352886
	1000	1008	1002,5	24,5	25	4	HGW HG600	24269867
	1015	1020	1016,6	24,5	25	2,5	HGW HG600	529663
	1040	1045	1041,6	24,5	25	2,5	HGW HG600	49017257
	1050	1055	1051,6	24,5	25	2,5	HGW HG600	49056653
	1050	1058	1052,5	19,8	20	4	HGW HG600	530261
	1050	1058	1052,5	24,5	25	4	HGW HG600	24296553
	1060	1068	1062,5	24,5	25	4	HGW HG600	49017676
	1070	1078	1072,5	24,5	25	4	HGW HG600	49056416
	1085	1090	1086,6	24,5	25	2,5	HGW HG600	528071
	1100	1108	1102,5	24,5	25	4	HGW HG600	24374394

Further dimensions are available on request.



Further dimensions are available on request.

Merkel SF Guide Ring



Product description

Non-metallic guide ring, either cut to size and ready for installation, or supplied as yard ware.

Product advantages

Non-metallic guide element for rods, for standardized housings as per ISO 10766, too

- low friction, stick-slip-free

Material

Material	Designation	Color
PTFE-bronze compound	PTFE B500	brown

Operating conditions

Merkel SF Guide Ring can be used in all hydraulic fluids normally found in hydraulic systems such as oils and greases based on mineral oils, fire-resistant hydraulic fluids (HFD) and biodegradable hydraulic fluids (HETG, HEES, HEPG). We do not recommend to use Guide Rings SF in water or water based fluids (HFA, HFB, HFC).

The maximum permissible operating temperature is 120 °C

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content Mr >50% to max. 90% with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

Design notes

Please note our general remarks on design in the *Merkel Technical Manual*.

Manufacturing tolerance

L2	Manufacturing tolerance
>20 ... 80	... 0,5
>80 ... 250	... 1,0
>250 ... 500	... 1,5
>500 ... 1000	... 2,0
>1000 ... 2000	... 3,0
>2000 ... 4000	... 4,0

Recommended tolerances

D_1
H8

The tolerance for dimensions d and D_f must be viewed in connection with the seal used. Diameter D_1 stated in the table of dimensions must be considered exclusively in conjunction with the guide ring. The corresponding diameter of the connected seal housing has to be adapted to the sealing element involved.

Profile thickness

Profile thickness S
-0,05

Surface load

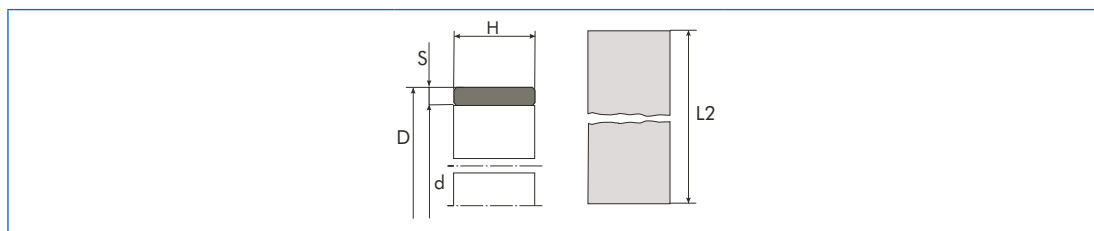
$p < 15 \text{ N/mm}^2 \dots 20 \text{ }^\circ\text{C}$
$p < 7,5 \text{ N/mm}^2 \dots 80 \text{ }^\circ\text{C}$
$p < 5 \text{ N/mm}^2 \dots 120 \text{ }^\circ\text{C}$

Sliding speed, see sealing system.

Cutting rolls to size

The dimensions indicated below are available as rolls ware from stock. Stretched length L_2 of sections cut to size must be determined in line with the formula of calculation. Gap k arising after assembly is required for thermal expansion purposes. We recommend therefore that the strips be cut straight. Butt joint tips may be damaged by fissures. Our cutter (article N. 507228) makes it possible to cut sections to size in a time-saving and accurate manner.

Calculating stretched length L_2 for pistons: $L_2 = (d + S) \times 3,11 - 0,5$

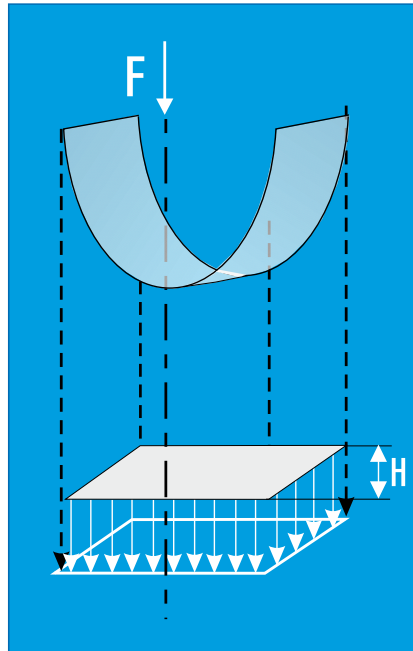
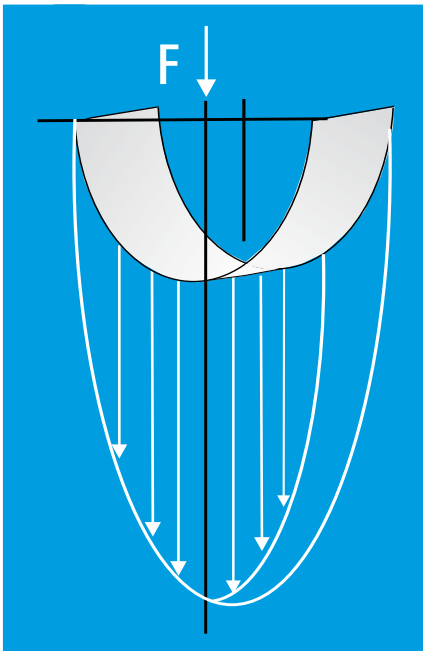


Groove length L	Strip thickness S	Article No.
8	2,5	24226174
9,7	2,5	24102775
10	2,5	24102563
12	2,5	24099191
15	2,5	24102564
20	2,5	24076217
25	2,5	24107955
15	4	24160019
20	4	24238052
25	4	24148093



Surface force

Pressure distribution over guide rings is not linear. The non-linear pressure progression within the contact area has been duly taken into account when determining the permissible specific surface contact pressure value. Permissible loads for guide strips are calculated by multiplying the projected area with the permissible specific surface contact pressure value. However, the angular offset of the piston likely to arise when using the recommended guide elements is duly taken into consideration in the permissible specific surface contact pressure value mentioned here.



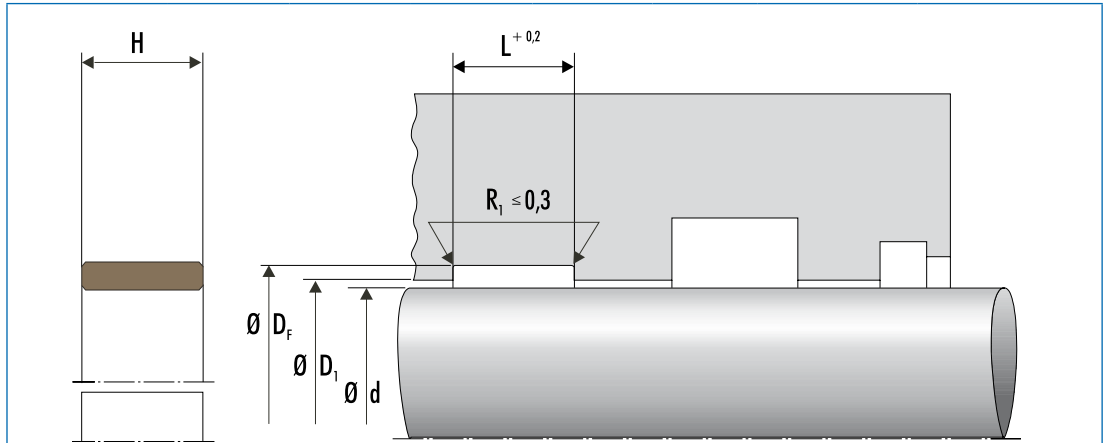
$$F = P \times A$$

$$A = d \times H$$

$$H = F / (d \times P)$$

H = Guide bandwidth [mm]
 F = Radial loads [N]
 A = Projected area [mm²]

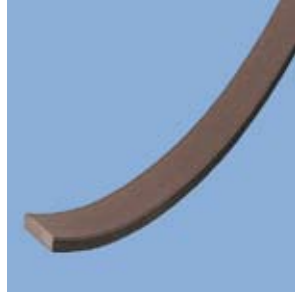
P = perm. surface pressure
 [N/mm²]
 d = Rod diameter with rod guide;
 Piston diameter with piston
 guide [mm]



All non-dimensioned edges rounded and burr-free.

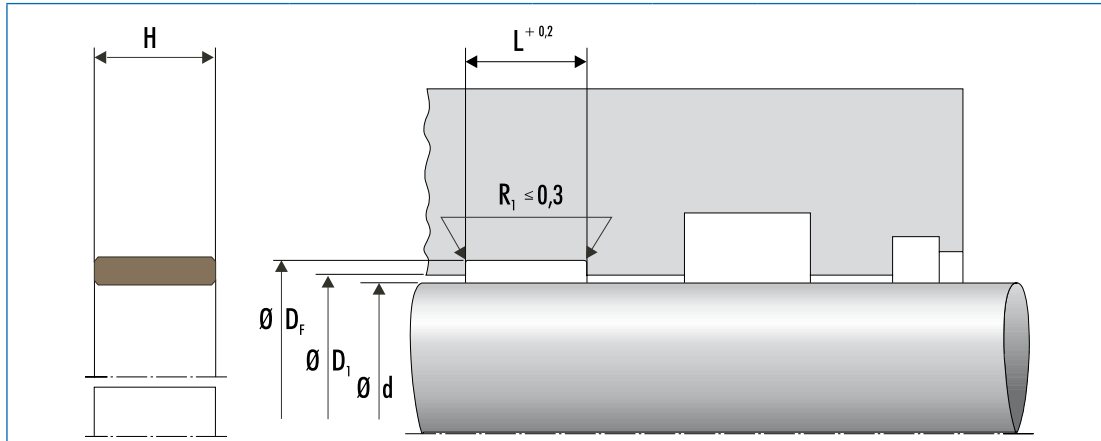
Housing	d	DF	D1	H	L	Profile	Artikel Nr
	60	65	61,2	9,6	9,7	2,5	24165598
	60	65	61,6	14,8	15	2,5	24203612
ISO	63	68	64,2	9,6	9,7	2,5	24300114
	63	68	64,6	14,8	15	2,5	24275191
	65	70	66,2	9,6	9,7	2,5	24300116
	65	70	66,6	14,8	15	2,5	24351400
ISO	70	75	71,2	9,6	9,7	2,5	24300118
	70	75	71,6	14,8	15	2,5	24165105
	75	80	76,2	9,6	9,7	2,5	24300120
	75	80	76,6	14,8	15	2,5	24244742
ISO	80	85	81,2	9,6	9,7	2,5	24300122
ISO	80	85	81,6	14,8	15	2,5	24266958
	85	90	86,2	9,6	9,7	2,5	24167352
	85	90	86,6	14,8	15	2,5	24244741
ISO	90	95	91,2	9,6	9,7	2,5	24300125
ISO	90	95	91,6	14,8	15	2,5	24291194
	95	100	96,2	9,6	9,7	2,5	24300127
	95	100	96,6	14,8	15	2,5	24350957
ISO	100	105	101,2	9,6	9,7	2,5	24300129
ISO	100	105	101,6	14,8	15	2,5	24250627
	100	105	101,6	24,5	25	2,5	24342265
	105	110	106,2	9,6	9,7	2,5	24300131
ISO	110	115	111,2	9,6	9,7	2,5	24300133
ISO	110	115	111,6	14,8	15	2,5	24293684
	110	115	111,6	25	25	2,5	24292915
	115	120	116,2	9,6	9,7	2,5	24300135

Further dimensions are available on request.



Housing	d	DF	D1	H	L	Profile	Artikel Nr
	120	125	121,2	9,6	9,7	2,5	24300137
	120	125	121,6	14,8	15	2,5	24300138
ISO	125	130	126,2	9,6	9,7	2,5	24300140
ISO	125	130	126,6	14,8	15	2,5	24300141
	130	135	131,2	9,6	9,7	2,5	24300143
	130	135	131,6	14,8	15	2,5	24300144
	130	135	131,6	25	25	2,5	24262562
	135	140	136,2	9,6	9,7	2,5	24300146
	135	140	136,6	14,8	15	2,5	24216377
ISO	140	145	141,2	9,6	9,7	2,5	24300148
ISO	140	145	141,6	14,8	15	2,5	24300149
	140	145	141,6	24,5	25	2,5	24256885
	145	150	146,2	9,6	9,7	2,5	24248043
	145	150	146,6	14,8	15	2,5	24333989
	150	155	151,2	9,6	9,7	2,5	24300150
	150	155	151,6	14,8	15	2,5	24300151
	150	155	151,6	24,5	25	2,5	24168884
	155	160	156,6	14,8	15	2,5	24352283
ISO	160	165	161,2	9,6	9,7	2,5	24204644
ISO	160	165	161,6	14,8	15	2,5	24204055
	160	165	161,6	25	25	2,5	24263903
	170	175	171,6	14,8	15	2,5	24300153
	175	180	176,6	25	25	2,5	24264758
ISO	180	185	181,2	9,6	9,7	2,5	24300154
ISO	180	185	181,6	14,8	15	2,5	24300155
	185	190	186,2	9,7	9,7	2,5	24291724
	190	195	191,6	14,8	15	2,5	24300157
	195	200	196,2	9,6	9,7	2,5	24242182
ISO	200	205	201,6	14,8	15	2,5	24154721
ISO	200	205	201,6	25	25	2,5	24266925
	210	215	211,2	9,6	9,7	2,5	24300159
	210	215	211,6	14,8	15	2,5	24300160
	220	225	221,2	9,6	9,7	2,5	24300161
ISO	220	225	221,6	14,8	15	2,5	24300162
ISO	220	225	221,6	24,5	25	2,5	24372919
	230	235	231,6	14,8	15	2,5	24154716
	240	245	241,2	9,7	9,7	2,5	24258216
	240	245	241,6	14,8	15	2,5	24223045

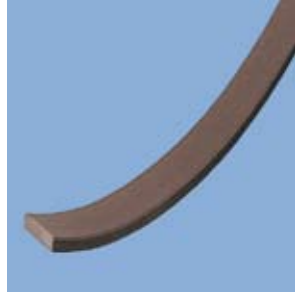
Further dimensions are available on request.



All non-dimensioned edges rounded and burr-free.

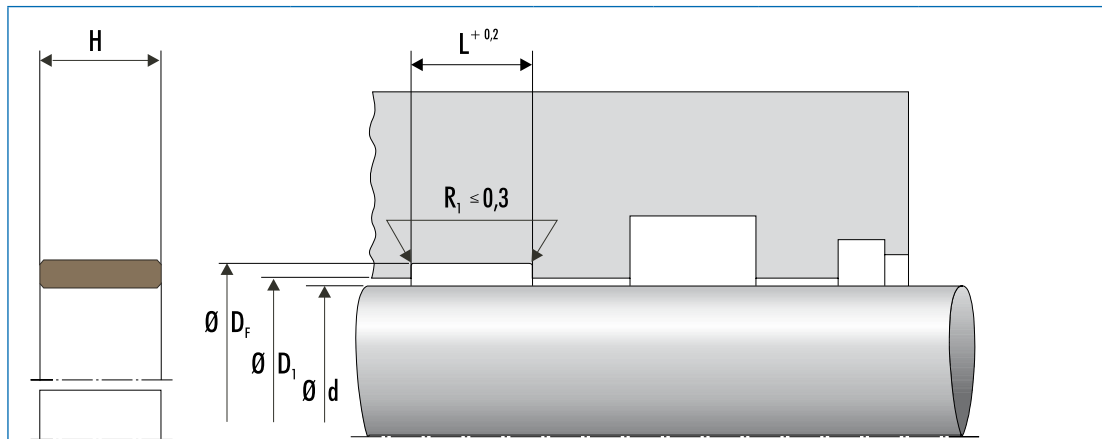
Housing	d	DF	D1	H	L	Profile	Artikel Nr
	240	245	241,6	24,5	25	2,5	24314554
	245	250	246,6	24,5	25	2,5	24311377
ISO	250	255	251,6	14,8	15	2,5	24300163
	255	260	256,6	14,8	15	2,5	49008824
	260	265	261,6	14,8	15	2,5	24300164
	270	275	271,6	14,8	15	2,5	24300165
	270	275	271,6	25	25	2,5	24262561
ISO	280	285	281,6	14,8	15	2,5	24300166
ISO	280	285	281,6	25	25	2,5	24264759
	290	295	291,6	14,8	15	2,5	24300167
	290	295	291,6	24,5	25	2,5	528337
	300	305	301,6	14,8	15	2,5	24300168
	300	305	301,6	24,5	25	2,5	24348072
	310	315	311,6	14,8	15	2,5	24300169
ISO	320	325	321,6	14,8	15	2,5	24300170
ISO	320	325	321,6	24,5	25	2,5	24300171
	330	335	331,6	14,8	15	2,5	24300172
	330	335	331,6	24,5	25	2,5	24300173
	340	345	341,6	14,8	15	2,5	24300174
	340	345	341,6	24,5	25	2,5	24162997
	350	355	351,6	14,8	15	2,5	24300175
	350	355	351,6	24,5	25	2,5	24300176
ISO	360	365	361,6	14,8	15	2,5	24300177
ISO	360	365	361,6	24,5	25	2,5	24300178
ISO	360	368	362,5	24,5	25	4	24342011
	370	375	371,6	14,8	15	2,5	49012515

Further dimensions are available on request.



Housing	d	DF	D1	H	L	Profile	Artikel Nr
	380	385	381,2	9,6	9,7	2,5	24353979
	380	385	381,6	14,8	15	2,5	24353454
	390	395	391,6	14,8	15	2,5	24350238
	390	395	391,6	24,5	25	2,5	24336658
	400	405	401,6	15	15	2,5	24274959
	400	405	401,6	24,5	25	2,5	24163717
	410	415	411,2	9,6	9,7	2,5	49033428
	410	415	411,6	14,8	15	2,5	49045103
	410	415	411,6	25	25	2,5	24296901
	420	425	421,6	24,5	25	2,5	24233817
	430	435	431,6	24,5	25	2,5	24348071
	440	445	441,6	24,5	25	2,5	24344261
	450	455	451,2	9,6	9,7	2,5	24358967
	450	455	451,6	14,8	15	2,5	24265878
	450	455	451,6	25	25	2,5	24257338
	460	465	461,2	9,6	9,7	2,5	528394
	460	465	461,6	24,5	25	2,5	24308715
	470	475	471,6	24,5	25	2,5	24347036
	480	485	481,6	25	25	2,5	24261536
	490	495	491,6	14,8	15	2,5	24366903
	500	505	501,6	14,8	15	2,5	24264832
	500	505	501,6	25	25	2,5	24263467
	500	508	502,5	9,6	9,7	4	24378467
	500	508	502,5	24,5	25	4	24269420
	510	515	511,6	25	25	2,5	24269186
	520	525	521,6	14,8	15	2,5	24361367
	520	528	522,5	9,6	9,7	4	24345671
	530	538	532,5	9,6	9,7	4	24373255
	540	548	542,5	9,6	9,7	4	49030357
	540	548	542,5	24,5	25	4	24332687
	550	555	551,6	24,5	25	2,5	24344262
	560	568	562,5	9,6	9,7	4	49017774
	560	568	562,5	24,5	25	4	24274998
	570	575	571,5	25	25	2,5	24263227
	580	585	581,6	14,8	15	2,5	24361368
	580	585	581,6	24,5	25	2,5	49001719
	580	588	582,5	9,6	9,7	4	49042820
	580	588	582,5	24,5	25	4	24307426

Further dimensions are available on request.



All non-dimensioned edges rounded and burr-free.

Housing	d	DF	D1	H	L	Profile	Artikel Nr
	590	595	591,6	25	25	2,5	24290939
	590	598	592,5	9,6	9,7	4	49020310
	600	605	601,6	14,8	15	2,5	24316132
	600	608	602,5	9,6	9,7	4	24354583
	600	608	602,5	24,5	25	4	24354936
	620	625	621,6	24,5	25	2,5	24354129
	630	635	631,6	25	25	2,5	24263904
	630	638	632,5	9,6	9,7	4	49054617
	630	638	632,5	24,5	25	4	49057673
	640	648	642,5	9,6	9,7	4	49017775
	640	648	642,5	24,5	25	4	24298429
	650	658	652,5	24,5	25	4	24293967
	670	675	671,6	24,5	25	2,5	24162996
	670	678	672,5	9,6	9,7	4	24370825
	670	678	672,5	24,5	25	4	24361116
	690	698	692,5	9,6	9,7	4	49059297
	700	705	701,6	14,8	15	2,5	24234909
	700	705	701,6	24,5	25	2,5	24223046
	710	718	712,5	14,8	15	4	24216172
	720	728	722,5	24,5	25	4	24359660
	730	738	732,5	24,5	25	4	24263632
	740	748	742,5	24,5	25	4	24243175
	750	755	751,6	24,5	25	2,5	24227972
	750	758	752,5	9,6	9,7	4	49017694
	770	778	772,5	24,5	25	4	24353778
	780	785	781,6	24,5	25	2,5	49065106

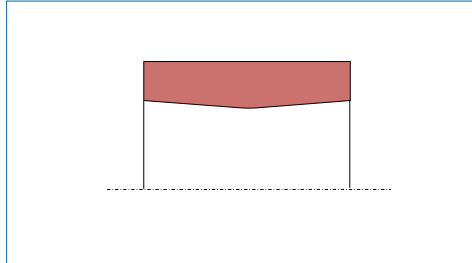
Further dimensions are available on request.



Housing	d	DF	D1	H	L	Profile	Artikel Nr
	790	798	792,5	24,5	25	4	24351827
	800	805	801,6	24,5	25	2,5	24162994
	800	808	802,5	9,6	9,7	4	49017777
	800	808	802,5	24,5	25	4	24295216
	820	828	822,5	9,6	9,7	4	49054178
	830	835	831,6	14,8	15	2,5	49003529
	830	838	832,5	24,5	25	4	24344381
	850	858	852,5	9,6	9,7	4	49017695
	850	858	852,5	24,5	25	4	24314615
	890	898	892,5	9,6	9,7	4	49017778
	890	898	892,5	15	15	4	24263607
	890	898	892,5	24,5	25	4	24263885
	900	908	902,5	24,5	25	4	24257241
	920	928	922,5	9,6	9,7	4	49008630
	950	958	952,5	24,5	25	4	24233242
	960	965	961,6	24,5	25	2,5	49065104
	970	978	972,5	24,5	25	4	24344537
	990	998	992,5	9,6	9,7	4	49039186
	1000	1008	1002,5	9,6	9,7	4	49017779
	1000	1008	1002,5	24,5	25	4	24269866
	1050	1058	1052,5	9,6	9,7	4	49062246
	1050	1058	1052,5	24,5	25	4	24296554
	1060	1068	1062,5	9,6	9,7	4	49017697
	1070	1078	1072,5	24,5	25	4	24361414
	1120	1128	1122,5	9,6	9,7	4	49017780
	1150	1158	1152,5	24,5	25	4	24357284

Further dimensions are available on request.

Merkel Guivex KBK Guide Bush



Product description

Profiled piston guide bush made of resin bonded fabric. Patented product design (patent No.: PCT/EP95/03874)

Product advantages

intended, among others, for standardized housings as per ISO 10766

- interchangeable with current housings of type KB and KF
- high radial load capacity
- very good guide-length utilization based on uniform stress distribution
- enhanced penetration of lubricating media based on optimized stress distribution within the contact zone between the guide bush and the counterface (favorable frictional behavior)
- reduced propensity for stick-slip
- excellent sliding behavior over a short guiding distance (no jamming)

Material

Material	Designation	Color
Resin bonded fabric	HGW HG650	red

Other materials are available on request.

Applications

- Long-stroke cylinder (piston-rod deflection)
- Short guiding distance (piston tilting)
- Short stroke (inappropriate lubrication)
- Frictionally optimized sealing systems
- Replacement for metallic guides

Operating conditions

Guivex guide bushes can be used in all hydraulic fluids normally found in hydraulic systems such as oils and greases based on mineral oils, water, fire-resistant hydraulic fluids (HFA, HFB, HFC, HFD) and biodegradable hydraulic fluids (HETG, HEES, HEPG).

The maximum permissible operating temperature is 120 °C.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90% with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$



The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the dynamic surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness. See also *Merkel Technical Manual*.

Surface finish of the sliding surfaces

Characteristic value	Limit	
	Ra	> 0,05 μm
Rmax	< 2,5 μm	
Rpkx	< 0,5 μm	
Rpk	< 0,5 μm	
Rk	>0,25 μm	<0,7 μm
Rvk	>0,2 μm	<0,65 μm
Rvkx	>0,2 μm	<2,0 μm

The limit values listed in the table do not apply, at the present stage, to ceramic or partly ceramic counterfaces.

Tolerances

Diameter d_1
h9

Manufacturing tolerances

Profile thickness
-0,01 ... -0,06

The tolerance regarding diameters d_e and D is determined in connection with the calculation of the gap dimension. Tolerance zones H7 and H8 and/or h7 and h8 are usually selected for typical hydraulic applications with a nominal size of up to 1,000mm.

Surface load

The value for the specific surface pressure depends on the operating temperature and the scope of elastic deformation (spring deflection) of the guiding element involved. The maximum possible spring deflection in a sealing system is limited by the minimum gap dimension downstream of the primary seal. (See also *Merkel Technical Manual*)

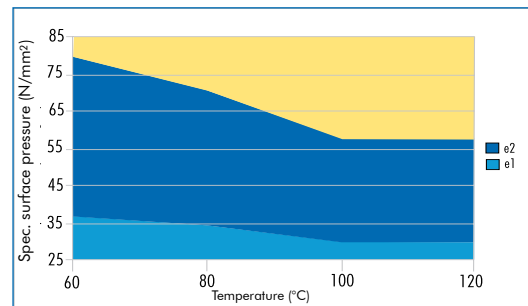
Spring deflection

$e_1 = 0,1$ at $s = 2,5$

$e_1 = 0,15$ at $s = 4$

$e_2 = 0,15$ at $s = 2,5$

$e_2 = 0,2$ at $s = 4$



Spec. surface pressure under parallel loads

Design notes

Diameter d_1 indicated in the table of dimensions should be viewed solely in connection with the guide bush. The corresponding diameter of the connected seal housing must be in tune with the sealing element involved.

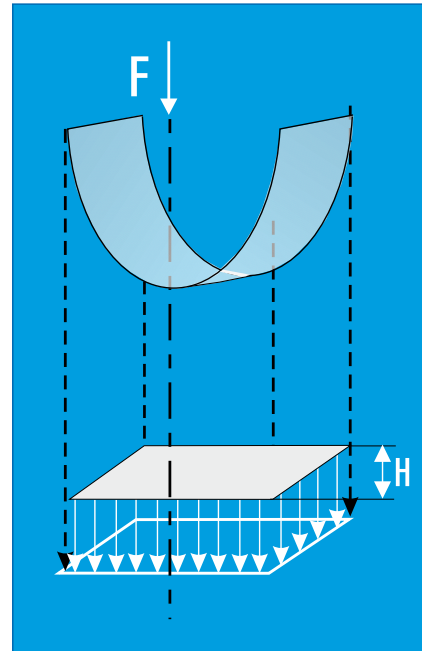
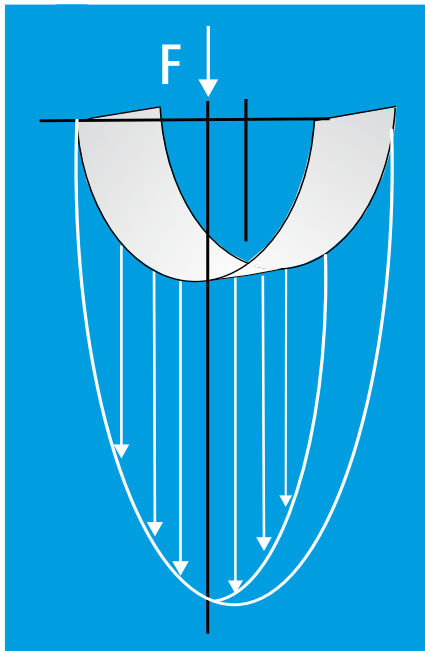
Installation & assembly

Please note our general remarks on the installation of hydraulic seals in the *Merkel Technical Manual*.

Side load

Pressure within the contact area between the guide and the counterface is not linear. The guiding width required can be calculated by applying the formulas mentioned below on the basis of the projected area. The non-linear progression of the contact pressure process is taken into account in

the surface pressure value. It may be advisable to reduce the loads by selecting a broader guide in individual cases to obtain an extended service life.



$F = P \times A$
 $A = d \times H$
 $H = F / (d \times P)$

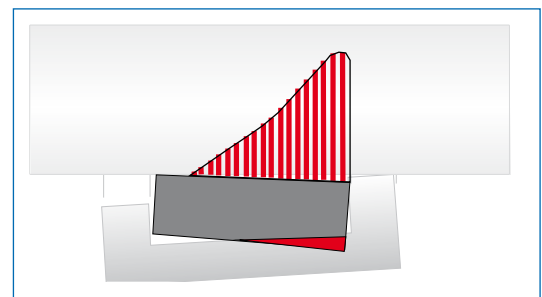
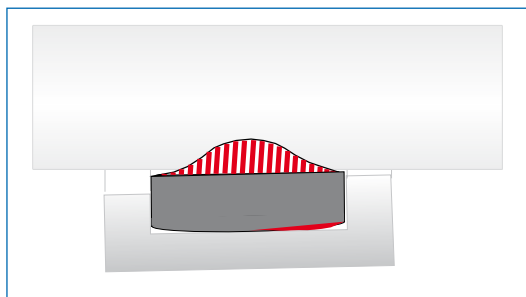
$P =$ perm. surface pressure [N/mm²]
 $d =$ Rod diameter with rod guide; Piston diameter with piston guide [mm]

$H =$ Guide bandwidth [mm]
 $F =$ Radial loads [N]
 $A =$ Projected area [mm²]

Operating principle

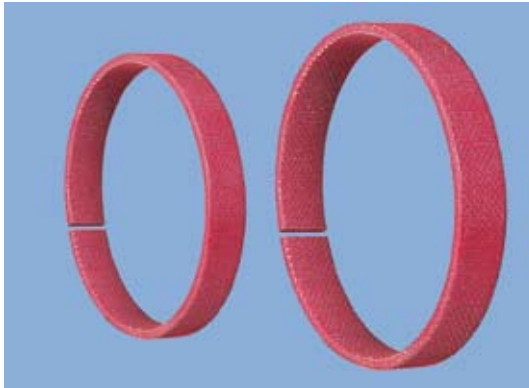
Rectangular guide bushes:
 Stress peaks within the edge area

Guivex guide bush:
 uniform stress distribution





Additional product description – Guide strips



Side load

The use of guide elements makes it possible to achieve a low-friction and low-wear relative motion between the mobile components of the hydraulic cylinder. Any side loads arising during operation are absorbed effectively and any undesirable metal to metal contact between the piston rod and/or the piston barrel and the surrounding housing components is reduced. The scope of the maximum side load is essentially determined by the geometrical marginal conditions and the properties of the guide element involved.

Excessive stresses

The guide play and elastic deformation of the partners under loads result in an angular deviation between the piston rod and/or the piston barrel and the counterface during operation. Consequently, guides inside hydraulic cylinders will not be ideally parallel, but primarily stressed at the edges. In this case, the permissible side load of the guide is defined by the lower maximum load up to edge break and not by the maximum compressive strength of the material. Excessive stresses within the edge area (Figure 01) make the penetration of lubricating media more difficult, too. The hydraulic medium is wiped along the edge stressed on the guide element and the lubricating film is reduced to a minimum, thus leading to stick-slip effects and more significant wear.

Profiling

Guivex guide bushes are provided with a convex Profiling oriented towards the groove base. The side load applied is distributed evenly over the width of the guide element here. The maximum contact pressure value remains within the medium range and excessive stresses are reduced at the edges (Figure 02).

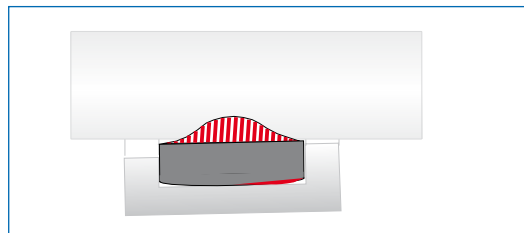


Figure 01: Rectangular guide bush
Excessive stress within the edge area

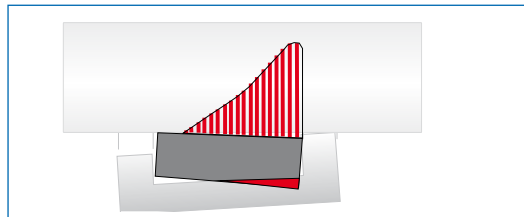


Figure 02: Guivex guide bush
Uniform stress distribution

Sliding properties

Guivex guide bushes made of HGW HG517 and HGW HG 650 materials are compounded with graphite and/or PTFE in order to achieve a better dry-running behavior. As a result, guide bushes made of resin bonded fabric exhibit excellent sliding properties, due to the material properties alone, even in the event of inappropriate lubrication.

The absorption of lubricating media within the area comprised between the guide and the counterface is greatly enhanced by the patented Profiling of Guivex guide bushes. Consequently, the sliding behavior is also improved by the Guivex geometry with correspondingly positive effects in terms of service life and stick-slip behavior.

Radial load capacity

Merkel resin bonded fabric materials are characterized by a high degree of radial load capacity.

The impact of the operating temperature on the load capacity of resin bonded fabric guide bushes is restricted, of course, when using duroplastic resin bonded fabric quality HGW HG517. The resin matrix of our material HGW HG650 includes both duroplastic and thermoplastic constituents. If permissible cross loads are simultaneously less dependent on temperatures, the flexibility will be tangibly enhanced for assembly with small diameters.

Purely thermoplastic basic materials like polyester, for example, exhibit a temperature-dependent material behavior. Permissible cross loads are greatly reduced under the effect of rising operating temperatures. (See Figure 03).

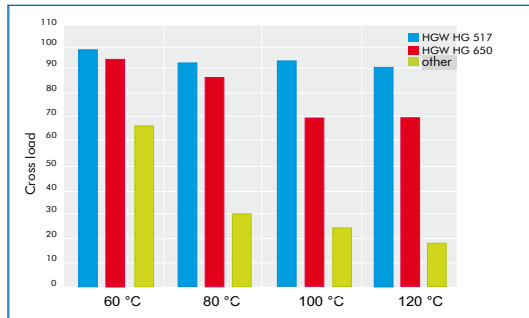


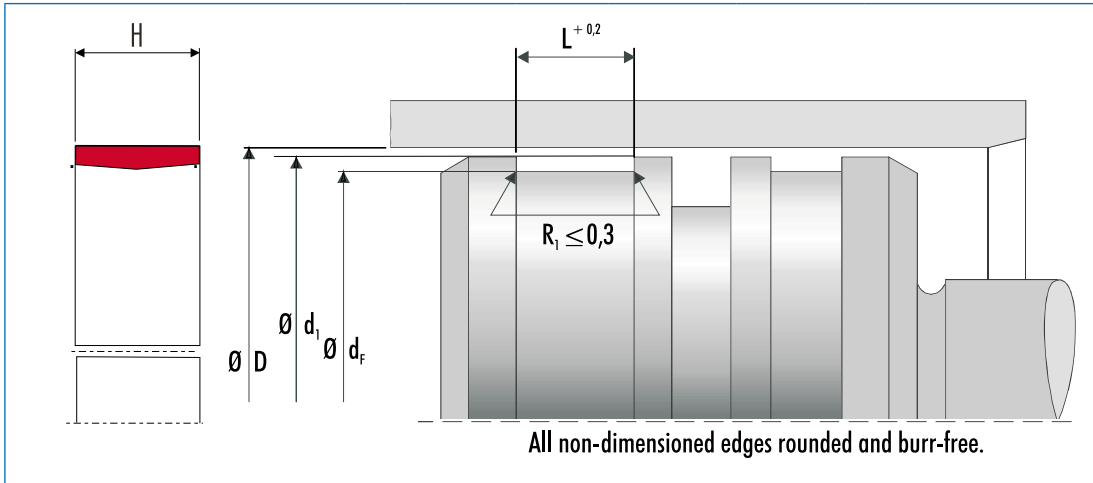
Figure 03: Resin bonded fabric materials in comparison of load capacity among plane-parallel guides depending on the operating temperature involved.

Forces are always introduced within the medium range of the guide bush in conjunction with the patented Guivex geometry. The maximum permissible cross load is not reduced here by excess stresses within the edge area. Uniform movements along the stroke, coupled with a high radial load capacity, can be achieved even in conjunction with short guide lengths and long-stroke cylinders with the large angular offset to be expected.

The absorption of lubricating media within the area comprised between the guide and the counterface is greatly enhanced by the patented Profileing of Guivex guide bushes. Consequently, Guivex guide bushes exhibit a favorable frictional behavior with correspondingly positive effects in terms of service life and stick-slip behavior.

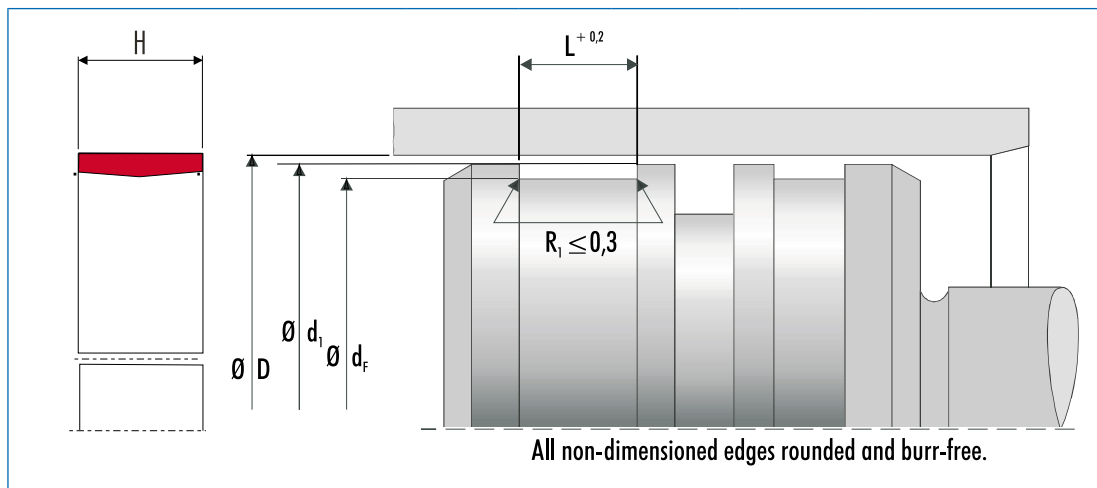
Forces are always introduced within the medium range of the guide bush. Uniform movements along the stroke, coupled with a high radial load capacity, can be achieved even in conjunction with short guide lengths and long-stroke cylinders with the large angular offset to be expected. The system of guides inside the hydraulic cylinder will not be inclined to jam over a short guide distance either.

The use of Guivex guide bushes makes a vital contribution to the functional reliability and dependability of hydraulic cylinders.



Housing	D	dF	d1	L	H	Profile	Artikel Nr
	60	55	58,4	15	14,8	2,5	49005778
ISO	63	58	61,4	9,7	9,5	2,5	49005779
	63	58	61,4	15	14,8	2,5	49005780
	65	60	63,4	9,7	9,5	2,5	49005792
	65	60	63,4	15	14,8	2,5	49005793
	70	65	68,4	9,7	9,5	2,5	49005794
	70	65	68,4	15	14,8	2,5	49005795
	75	70	73,4	9,7	9,5	2,5	49005796
	75	70	73,4	15	14,8	2,5	49005797
ISO	80	75	78,4	9,7	9,5	2,5	49002931
	80	75	78,4	15	14,8	2,5	49005798
	80	75	78,4	20	19,8	2,5	49018501
	85	80	83,4	9,7	9,5	2,5	49005812
	85	80	83,4	15	14,8	2,5	49005828
	90	85	88,4	9,7	9,5	2,5	49005829
	90	85	88,4	15	14,8	2,5	49005830
	90	85	88,4	25	24,5	2,5	49069207
	95	90	93,4	9,7	9,5	2,5	49005832
	95	90	93,4	15	14,8	2,5	49005833
ISO	100	95	98,4	9,7	9,5	2,5	49005835
	100	95	98,4	15	14,8	2,5	49005581
	100	95	98,4	20	19,8	2,5	49065296
	105	100	103,4	9,7	9,5	2,5	49005836
	105	100	103,4	15	14,8	2,5	49044491
	105	100	103,4	20	19,8	2,5	49018503
	110	105	108,4	9,7	9,5	2,5	49005838

Further dimensions are available on request.



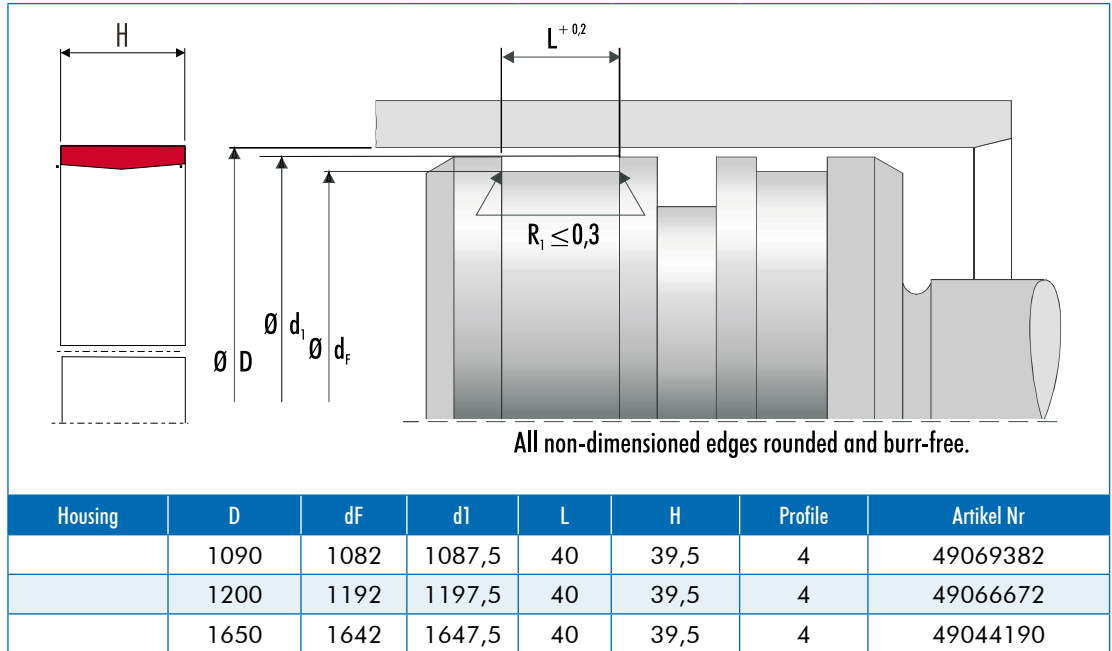
Housing	D	dF	d1	L	H	Profile	Artikel Nr
	110	105	108,4	15	14,8	2,5	49003729
	110	105	108,4	20	19,8	2,5	49040031
	110	105	108,4	25	24,5	2,5	49026578
	115	110	113,4	15	14,8	2,5	49005839
	120	115	118,4	9,7	9,5	2,5	49038027
	120	115	118,4	20	19,8	2,5	49018504
	125	117	122,5	25	24,5	4	49030799
ISO	125	120	123,4	9,7	9,5	2,5	49005841
	125	120	123,4	15	14,8	2,5	49003232
	125	120	123,4	20	19,8	2,5	49040310
	125	120	123,4	25	24,5	2,5	49005842
	130	125	128,4	9,7	9,5	2,5	49005843
	130	125	128,4	15	14,8	2,5	49005844
	130	125	128,4	25	24,5	2,5	49005845
	135	130	133,4	9,7	9,5	2,5	49005846
	135	130	133,4	15	14,8	2,5	49005847
ISO	140	135	138,4	9,7	9,5	2,5	49005899
ISO	140	135	138,4	15	14,8	2,5	49005900
	140	135	138,4	20	19,8	2,5	49040311
	140	135	138,4	25	24,5	2,5	49005898
	145	140	143,4	25	24,5	2,5	49020659
	150	145	148,4	15	14,8	2,5	49005911
	150	145	148,4	20	19,8	2,5	49018505
	155	150	153,4	9,7	9,5	2,5	49015382
ISO	160	155	158,4	9,7	9,5	2,5	49005912
ISO	160	155	158,4	15	14,8	2,5	49005913

Further dimensions are available on request.



Housing	D	dF	dI	L	H	Profile	Artikel Nr
	190	185	188,4	25	24,5	2,5	49006011
ISO	200	195	198,4	9,7	9,5	2,5	49006013
ISO	200	195	198,4	15	14,8	2,5	49006012
	200	195	198,4	20	19,8	2,5	49019433
	200	195	198,4	25	24,5	2,5	49044277
	200	195	198,4	35	34,5	2,5	49040578
	210	205	208,4	15	14,8	2,5	49037027
	215	210	213,4	15	14,8	2,5	49006014
ISO	220	215	218,4	9,7	9,5	2,5	49006015
ISO	220	215	218,4	15	14,8	2,5	49006016
	225	220	223,4	15	14,8	2,5	49037028
	225	220	223,4	25	24,5	2,5	49006017
	230	225	228,4	9,7	9,5	2,5	49006018
	230	225	228,4	15	14,8	2,5	49006019
	240	232	237,5	20	19,8	4	49056166
	240	235	238,4	15	14,8	2,5	49006021
	240	235	238,4	25	24,5	2,5	49006020
ISO	250	245	248,4	9,7	9,5	2,5	49006022
ISO	250	245	248,4	15	14,8	2,5	49006023
	255	250	253,4	15	14,8	2,5	49030447
	260	255	258,4	25	24,5	2,5	49006024
	270	265	268,4	15	14,8	2,5	49041396
ISO	280	275	278,4	15	14,8	2,5	49006025
ISO	280	275	278,4	25	24,5	2,5	49006026
	285	280	283,4	25	24,5	2,5	49046214
	320	312	317,5	20	19,8	4	49057715
	330	322	327,5	20	19,8	4	49056191
	330	322	327,5	40	39,5	4	49059764
	390	382	387,5	40	39,5	4	49059765
	410	402	407,5	20	19,8	4	49057716
	410	402	407,5	40	39,5	4	49063894
	440	432	437,5	40	39,5	4	49059766
	480	472	477,5	40	39,5	4	49063895
	630	622	627,5	40	39,5	4	49062927
	710	702	707,5	40	39,5	4	49062930
	880	872	877,5	40	39,5	4	49062929
	1050	1042	1047,5	25	24,5	4	49063005
	1050	1042	1047,5	40	39,5	4	49063919

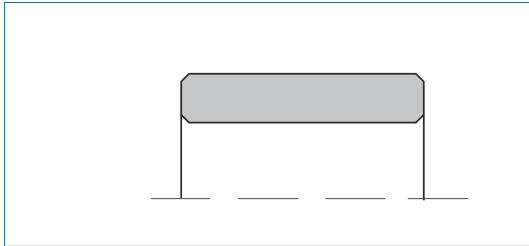
Further dimensions are available on request.



Further dimensions are available on request.



Merkel Guide Ring KB



Product description

Non metallic piston guide element

Product advantages

- metal/plastic material combination prevents „seizing“
- high load-bearing capacity, elastic (not plastic) behaviour up to break point
- chamfers Profile edges prevent pressing of edge
- into the corner radii of the housing groove simple snap in fitting ($d < 300$)

Material

Diameter < 300

Material	Designation	Color
Fabric base laminate	HGW HG600	dark grey

Diameter > 300

Material	Designation	Color
Fabric base laminate	HGW HG600	light grey

Application

Nonmetallic guide element for pistons, also for standardised housing as per ISO 10766

Operating conditions

Material	HGW HG517/HGW HG600
Hydraulic oils, HL, HLP	-40° ... +120° C
HFA fluids	+5 ... +60
HFB fluids	+5 ... +60
HFC fluids	-40 ... +60
HFD fluids	-40° ... +120° C
Water	+5 ... +60
HETG (rape-seed oil)	-40° ... +80° C
HEES (synth. ester)	-40° ... +100° C
HEPG (glycol)	-40° ... +80° C
Mineral greases	-40° ... +120° C

For sliding speed, see sealing system.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content $M_r > 50\%$ to max. 90%, with cut depth $c = R_z/2$ and reference line $C_{ref} = 0\%$

Design notes

Please observe our general design notes in the Merkel Technical Manual

Tolerance recommendation

d_1
h8

The tolerance recommendation for dimensions D and dF must be regarded in conjunction with the seal being used. The diameter d_1 stated in the dimensional table must be seen solely with reference to the guide ring. The corresponding diameter of an adjacent seal installation space must be matched to the sealing element involved.

Manufacturing tolerance

Profile thickness S
-0,02 ... -0,08

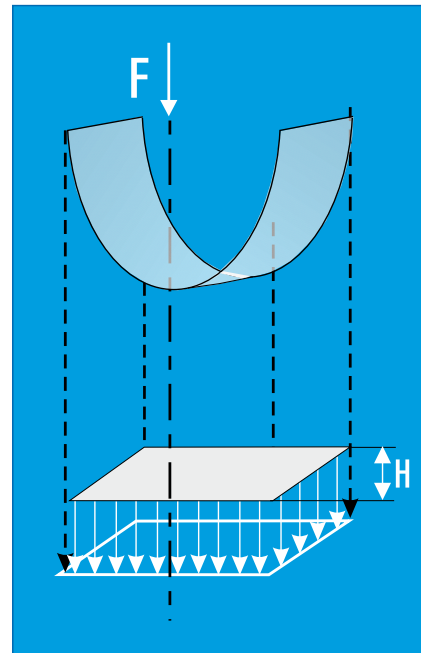
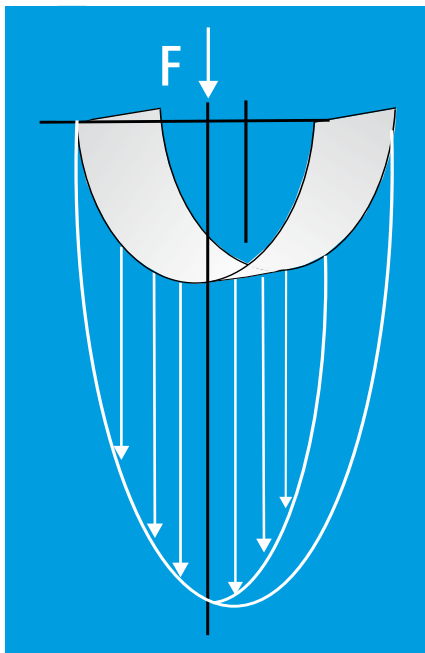
Surface load

Profile thickness S
$p < 50 \text{ N/mm}^2 \dots 60 \text{ }^\circ\text{C}$
$p < 25 \text{ N/mm}^2 \dots 100 \text{ }^\circ\text{C}$

Surface force

Pressure within the contact area between the guide and the counterface is not linear. The guiding width required can be calculated by applying the formulas mentioned below on the basis of the projected area. The non-linear progression of the contact pressure process is taken into account in the surface pressure value.

It may be advisable to reduce the loads by selecting a broader guide in individual cases to obtain an extended service life.



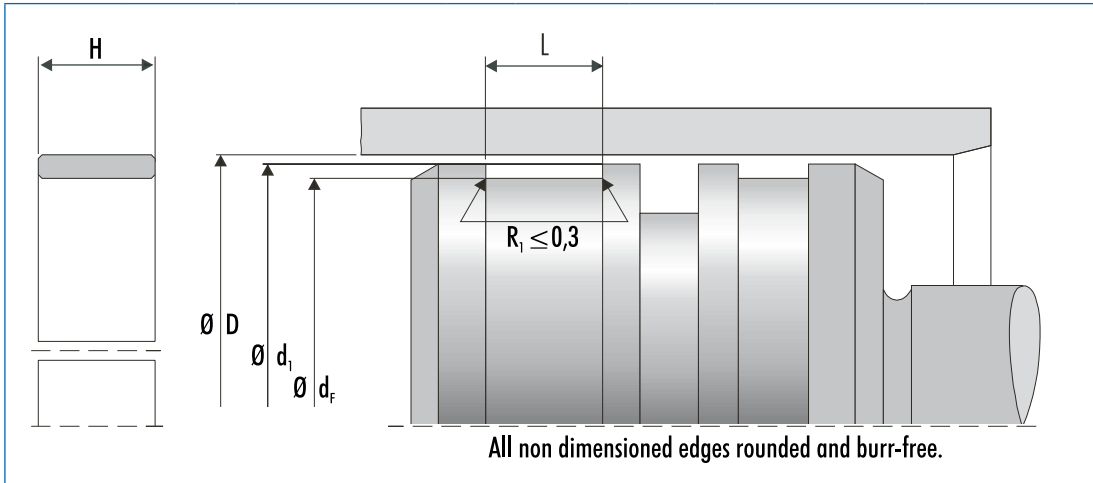
$$F = P \times A$$

$$A = d \times H$$

$$H = F / (d \times P)$$

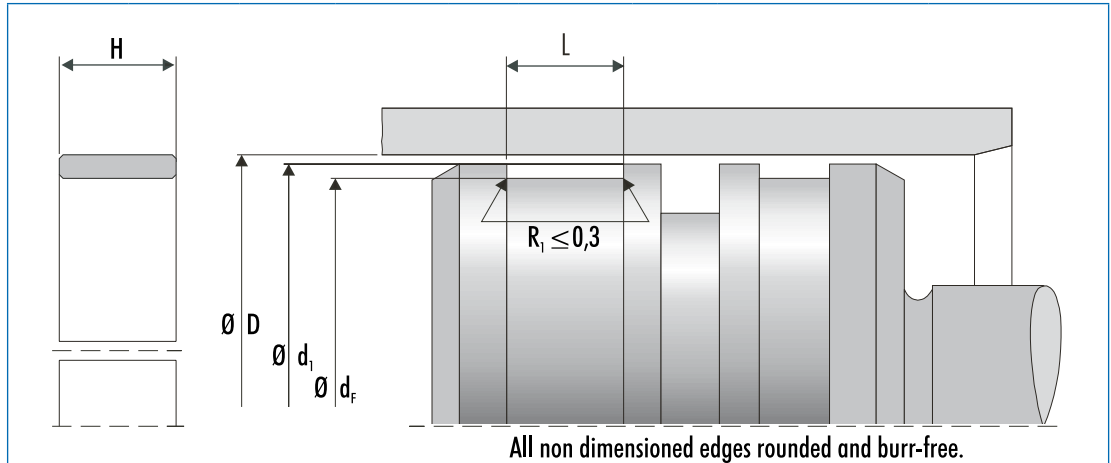
H = Guide bandwidth [mm]
 F = Radial loads [N]
 A = Projected area [mm²]

P = perm. surface pressure [N/mm²]
 d = Rod diameter with rod guide; Piston diameter with piston guide [mm]



Housing	D	dF	d1	L	H	Profile	Material	Artikel Nr
	60	55	58,4	9,7	9,6	2,5	HGW HG517	24130942
	60	55	58,4	15	14,8	2,5	HGW HG517	24247237
ISO	63	58	61,4	9,7	9,6	2,5	HGW HG517	24130945
	65	60	63,4	9,7	9,6	2,5	HGW HG517	24133632
	65	60	63,4	15	14,8	2,5	HGW HG517	24372905
	65	60	63,4	20	19,8	2,5	HGW HG517	24362040
	70	65	68,4	9,7	9,6	2,5	HGW HG517	24130948
	70	65	68,4	15	14,8	2,5	HGW HG517	24345783
	70	65	68,4	20	19,8	2,5	HGW HG517	24354510
	75	70	73,4	9,7	9,6	2,5	HGW HG517	24220353
	75	70	73,4	15	14,8	2,5	HGW HG517	24355519
ISO	80	75	78,4	9,7	9,6	2,5	HGW HG517	24130950
	80	75	78,4	15	14,8	2,5	HGW HG517	24128202
	80	75	78,4	20	19,8	2,5	HGW HG517	24262426
	85	80	83,4	9,7	9,6	2,5	HGW HG517	24135787
	85	80	83,4	15	14,8	2,5	HGW HG517	24351574
	90	85	88,4	9,7	9,6	2,5	HGW HG517	24130952
	90	85	88,4	15	14,8	2,5	HGW HG517	24269687
	90	85	88,4	20	19,8	2,5	HGW HG517	24355775
	95	90	93,4	9,7	9,6	2,5	HGW HG517	24300241
	95	90	93,4	15	14,8	2,5	HGW HG517	24337625
ISO	100	95	98,4	9,7	9,6	2,5	HGW HG517	24130954
	100	95	98,4	15	14,8	2,5	HGW HG517	24132237
	100	95	98,4	20	19,8	2,5	HGW HG517	24353694
	105	100	103,4	9,7	9,6	2,5	HGW HG517	24209853
	105	100	103,4	15	14,8	2,5	HGW HG517	24360178

Further dimensions are available on request.



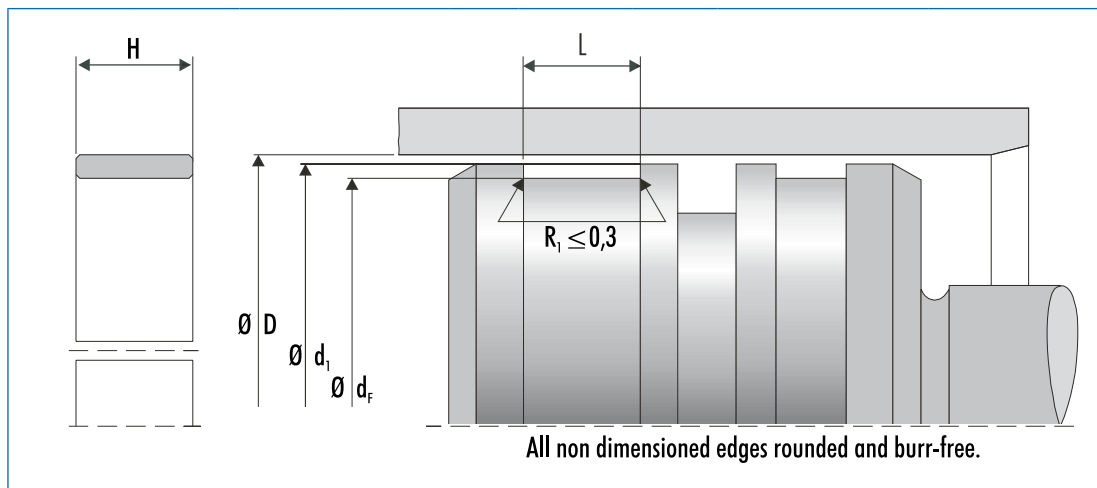
Housing	D	dF	d1	L	H	Profile	Material	Artikel Nr
	105	100	103,4	20	19,8	2,5	HGW HG517	49018535
	110	105	108,4	9,7	9,6	2,5	HGW HG517	24130956
	110	105	108,4	15	14,8	2,5	HGW HG517	24245043
	115	110	113,4	9,7	9,6	2,5	HGW HG517	24130958
	115	110	113,4	15	14,8	2,5	HGW HG517	24245178
	115	110	113,4	20	19,8	2,5	HGW HG517	24352607
	120	115	118,4	9,7	9,6	2,5	HGW HG517	24300246
	120	115	118,4	15	14,8	2,5	HGW HG517	24144161
ISO	125	120	123,4	9,7	9,6	2,5	HGW HG517	24130960
	125	120	123,4	15	14,8	2,5	HGW HG517	24130961
	125	120	123,4	20	19,8	2,5	HGW HG517	521952
	125	120	123,4	25	24,5	2,5	HGW HG517	24174689
	130	125	128,4	9,7	9,6	2,5	HGW HG517	24135786
	130	125	128,4	15	14,8	2,5	HGW HG517	24136426
	130	125	128,4	25	24,5	2,5	HGW HG517	528521
	135	130	133,4	9,7	9,6	2,5	HGW HG517	24362405
	135	130	133,4	15	14,8	2,5	HGW HG517	24183086
	135	130	133,4	30	29,5	2,5	HGW HG517	24361928
ISO	140	135	138,4	9,7	9,6	2,5	HGW HG517	24130963
ISO	140	135	138,4	15	14,8	2,5	HGW HG517	24130964
	140	135	138,4	25	24,5	2,5	HGW HG517	24195765
	145	140	143,4	15	14,8	2,5	HGW HG517	24219554
	150	145	148,4	9,7	9,6	2,5	HGW HG517	24130966
	150	145	148,4	15	14,8	2,5	HGW HG517	24130967
	150	145	148,4	25	24,5	2,5	HGW HG517	24245817
	155	150	153,4	9,7	9,6	2,5	HGW HG517	24237342

Further dimensions are available on request.



Housing	D	dF	dI	L	H	Profile	Material	Artikel Nr
	155	150	153,4	15	14,8	2,5	HGW HG517	24356169
ISO	160	155	158,4	9,7	9,6	2,5	HGW HG517	24130969
ISO	160	155	158,4	15	14,8	2,5	HGW HG517	24130970
	160	155	158,4	25	24,5	2,5	HGW HG517	24263520
	165	160	163,4	9,7	9,6	2,5	HGW HG517	24183088
	165	160	163,4	15	14,8	2,5	HGW HG517	24199261
	170	165	168,4	9,7	9,6	2,5	HGW HG517	24130972
	170	165	168,4	15	14,8	2,5	HGW HG517	24130973
	170	165	168,4	25	24,5	2,5	HGW HG517	24339191
	175	170	173,4	9,7	9,6	2,5	HGW HG517	24237343
	175	170	173,4	15	14,8	2,5	HGW HG517	24379388
	175	170	173,4	25	24,5	2,5	HGW HG517	49006998
ISO	180	175	178,4	9,7	9,6	2,5	HGW HG517	24130975
ISO	180	175	178,4	15	14,8	2,5	HGW HG517	24130976
	180	175	178,4	25	24,5	2,5	HGW HG517	24132235
	190	185	188,4	9,7	9,6	2,5	HGW HG517	24130978
	190	185	188,4	15	14,8	2,5	HGW HG517	24130979
	190	185	188,4	25	24,5	2,5	HGW HG517	24341395
	195	190	193,4	9,7	9,6	2,5	HGW HG517	49031557
ISO	200	195	198,4	9,7	9,6	2,5	HGW HG517	24130981
ISO	200	195	198,4	15	14,8	2,5	HGW HG517	24130982
	200	195	198,4	25	24,5	2,5	HGW HG517	24344891
	200	195	198,4	35	34,5	2,5	HGW HG517	532978
	210	205	208,4	15	14,8	2,5	HGW HG517	24334874
	210	205	208,4	25	24,5	2,5	HGW HG517	49035934
	215	210	213,4	15	14,8	2,5	HGW HG517	24366765
	215	210	213,4	25	24,5	2,5	HGW HG517	525038
ISO	220	215	218,4	9,7	9,6	2,5	HGW HG517	24130984
ISO	220	215	218,4	15	14,8	2,5	HGW HG517	24300249
	220	215	218,4	25	24,5	2,5	HGW HG517	24143328
	225	220	223,4	15	14,8	2,5	HGW HG517	24212963
	225	220	223,4	25	24,5	2,5	HGW HG517	24142350
	230	225	228,4	15	14,8	2,5	HGW HG517	24334044
	230	225	228,4	25	24,5	2,5	HGW HG517	24355950
	235	230	233,4	15	14,8	2,5	HGW HG517	24315952
	240	235	238,4	15	14,8	2,5	HGW HG517	24147696
	240	235	238,4	25	24,5	2,5	HGW HG517	24349511
	245	240	243,4	15	14,8	2,5	HGW HG517	24355518

Further dimensions are available on request.



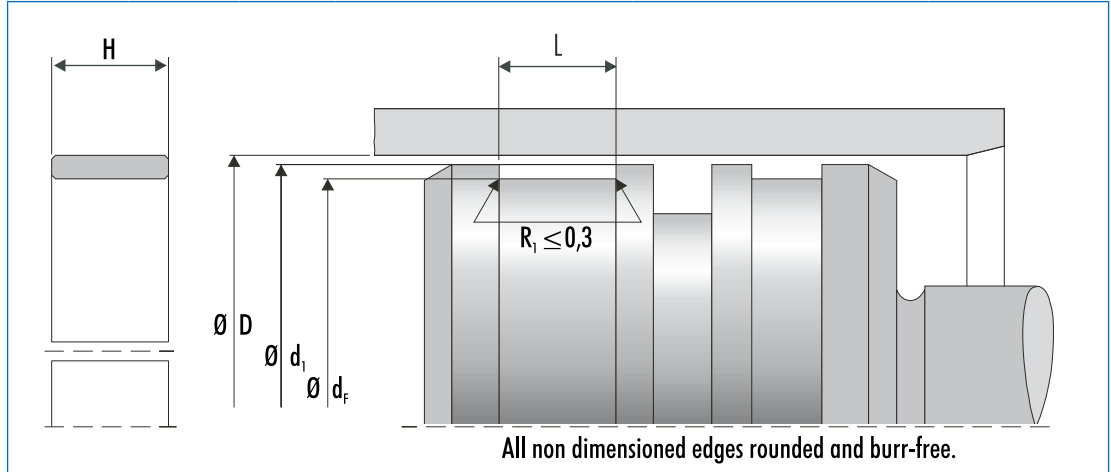
Housing	D	dF	d1	L	H	Profile	Material	Artikel Nr
ISO	250	245	248,4	9,7	9,6	2,5	HGW HG517	24342021
ISO	250	245	248,4	15	14,8	2,5	HGW HG517	24130988
	250	245	248,4	25	24,5	2,5	HGW HG517	24144514
	260	255	258,4	15	14,8	2,5	HGW HG517	24131488
	270	265	268,4	15	14,8	2,5	HGW HG517	24336389
ISO	280	272	277,5	25	24,5	4	HGW HG517	24373118
ISO	280	275	278,4	15	14,8	2,5	HGW HG517	24130991
ISO	280	275	278,4	25	24,5	2,5	HGW HG517	24350273
	290	285	288,4	15	14,8	2,5	HGW HG517	24375938
	300	295	298,4	15	14,8	2,5	HGW HG517	24137782
	300	295	298,4	25	24,5	2,5	HGW HG517	24143070
	310	305	308,4	25	24,5	2,5	HGW HG600	24353021
	310	305	308,4	40	39,5	2,5	HGW HG600	49008591
ISO	320	315	318,4	15	14,8	2,5	HGW HG600	24130993
ISO	320	315	318,4	25	24,5	2,5	HGW HG600	24130994
	320	315	318,4	35	34,5	2,5	HGW HG600	49024813
	330	325	328,4	15	14,5	2,5	HGW HG600	24311172
	330	325	328,4	25	24,5	2,5	HGW HG600	24260227
	340	335	338,4	15	14,8	2,5	HGW HG600	24300250
	340	335	338,4	25	24,5	2,5	HGW HG600	24300251
	350	345	348,4	15	14,8	2,5	HGW HG600	24338667
	350	345	348,4	25	24,5	2,5	HGW HG600	24330500
ISO	360	352	357,5	25	24,5	4	HGW HG600	24331493
ISO	360	355	358,4	15	14,8	2,5	HGW HG600	24130996
ISO	360	355	358,4	25	24,5	2,5	HGW HG600	24130997
	380	375	378,4	15	14,8	2,5	HGW HG600	24333136

Further dimensions are available on request.



Housing	D	dF	dI	L	H	Profile	Material	Artikel Nr
	380	375	378,4	25	24,5	2,5	HGW HG600	24352259
	380	375	378,4	35	34,5	2,5	HGW HG600	49024814
	390	385	388,4	15	14,8	2,5	HGW HG600	24338260
	390	385	388,4	25	24,5	2,5	HGW HG600	24256744
ISO	400	392	397,5	25	24,5	4	HGW HG600	24307328
ISO	400	395	398,4	15	14,8	2,5	HGW HG600	24300252
ISO	400	395	398,4	25	24,5	2,5	HGW HG600	24300253
	410	402	407,5	40	39,5	4	HGW HG600	49033815
	410	405	408,4	15	14,8	2,5	HGW HG600	24375939
	420	415	418,4	15	14,8	2,5	HGW HG600	24259239
	420	415	418,4	25	24,5	2,5	HGW HG600	24261300
	430	425	428,4	15	14,8	2,5	HGW HG600	24296973
	430	425	428,4	25	24,5	2,5	HGW HG600	24339689
	440	435	438,4	15	14,8	2,5	HGW HG600	24338261
	440	435	438,4	25	24,5	2,5	HGW HG600	24368282
ISO	450	442	447,5	25	24,5	4	HGW HG600	24259181
ISO	450	445	448,4	15	14,5	2,5	HGW HG600	24345674
ISO	450	445	448,4	25	24,5	2,5	HGW HG600	24250199
	460	455	458,4	15	14,8	2,5	HGW HG600	24341856
	460	455	458,4	25	24,5	2,5	HGW HG600	24339270
	470	465	468,4	25	24,5	2,5	HGW HG600	24294215
	480	472	477,5	40	39,5	4	HGW HG600	49064254
	480	475	478,4	25	24,5	2,5	HGW HG600	24250198
	490	485	488,4	15	14,8	2,5	HGW HG600	49055991
ISO	500	492	497,5	25	24,5	4	HGW HG600	24294986
ISO	500	495	498,4	15	14,8	2,5	HGW HG600	24184185
ISO	500	495	498,4	25	24,5	2,5	HGW HG600	24302073
	510	505	508,4	25	24,5	2,5	HGW HG600	24359433
	520	515	518,4	15	14,8	2,5	HGW HG600	24274934
	530	522	527,5	25	24,5	4	HGW HG600	24290173
	530	525	528,4	15	14,8	2,5	HGW HG600	24294259
	540	532	537,5	25	24,5	4	HGW HG600	24299558
	540	535	538,4	15	14,8	2,5	HGW HG600	24359735
	540	535	538,4	25	24,5	2,5	HGW HG600	24359576
	550	545	548,4	25	24,5	2,5	HGW HG600	24302134
	560	552	557,5	25	24,5	4	HGW HG600	24332680
	560	555	558,4	15	14,8	2,5	HGW HG600	24185838
	560	555	558,4	25	24,5	2,5	HGW HG600	24336491

Further dimensions are available on request.



Housing	D	dF	dI	L	H	Profile	Material	Artikel Nr
	570	562	567,5	25	24,5	4	HGW HG600	49009837
	570	565	568,4	25	24,5	2,5	HGW HG600	24351059
	580	572	577,5	25	24,5	4	HGW HG600	24298400
	580	575	578,4	25	24,5	2,5	HGW HG600	24345487
	600	592	597,5	25	24,5	4	HGW HG600	24275141
	600	595	598,4	15	14,8	2,5	HGW HG600	24274937
	600	595	598,4	25	24,5	2,5	HGW HG600	24362837
	610	602	607,5	25	24,5	4	HGW HG600	24344890
	620	612	617,5	25	24,5	4	HGW HG600	24291804
	620	615	618,4	25	24,5	2,5	HGW HG600	24309946
	630	622	627,5	25	24,5	4	HGW HG600	24340041
	640	632	637,5	25	24,5	4	HGW HG600	24275165
	650	642	647,5	25	24,5	4	HGW HG600	24358966
	660	652	657,5	25	24,5	4	HGW HG600	24315102
	670	662	667,5	25	24,5	4	HGW HG600	49046154
	680	672	677,5	25	24,5	4	HGW HG600	24298436
	680	675	678,5	25	24,5	2,5	HGW HG600	24344258
	700	692	697,5	25	24,5	4	HGW HG600	24314495
	700	695	698,4	15	14,8	2,5	HGW HG600	24275184
	710	702	707,5	25	24,5	4	HGW HG600	24340042
	710	705	708,4	15	14,8	2,5	HGW HG600	24287808
	710	705	708,4	25	24,5	2,5	HGW HG600	528066
	720	715	718,4	15	14,8	2,5	HGW HG600	24302590
	720	715	718,4	25	24,5	2,5	HGW HG600	24250197
	730	722	727,5	25	24,5	4	HGW HG600	24269481
	740	732	737,5	25	24,5	4	HGW HG600	24263271

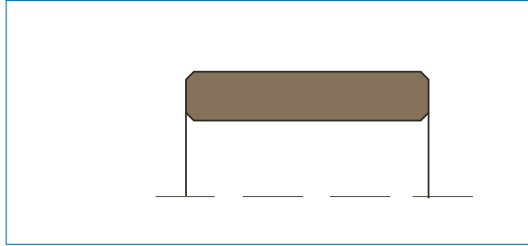
Further dimensions are available on request.



Housing	D	dF	dI	L	H	Profile	Material	Artikel Nr
	750	742	747,5	25	24,5	4	HGW HG600	24293965
	760	752	757,5	25	24,5	4	HGW HG600	49026244
	760	755	758,4	25	24,5	2,5	HGW HG600	532205
	770	765	768,4	25	24,5	2,5	HGW HG600	24344259
	780	775	778,4	15	14,8	2,5	HGW HG600	24358669
	790	782	787,5	25	24,5	4	HGW HG600	49017847
	800	792	797,5	25	24,5	4	HGW HG600	24243178
	800	795	798,4	15	14,8	2,5	HGW HG600	24257374
	820	812	817,5	25	24,5	4	HGW HG600	24341040
	830	822	827,5	25	24,5	4	HGW HG600	24295835
	840	832	837,5	40	39,5	4	HGW HG600	49000615
	850	842	847,5	25	24,5	4	HGW HG600	24293544
	870	862	867,5	25	24,5	4	HGW HG600	24359019
	880	872	877,5	25	24,5	4	HGW HG600	24339269
	900	892	897,5	25	24,5	4	HGW HG600	24344382
	950	942	947,5	25	24,5	4	HGW HG600	49003953
	1000	992	997,5	40	39,5	4	HGW HG600	49000296
	1020	1012	1017,5	25	24,5	4	HGW HG600	49012502
	1030	1025	1028,4	25	24,5	2,5	HGW HG600	529664
	1050	1042	1047,5	25	24,4	4	HGW HG600	24257239
	1080	1072	1077,5	25	24,5	4	HGW HG600	49065739
	1120	1112	1117,5	25	24,5	4	HGW HG600	49017848
	1150	1142	1147,5	25	24,5	4	HGW HG600	49064949
	1160	1155	1158,4	25	24,5	2,5	HGW HG600	529897
	1200	1192	1197,5	25	24,5	4	HGW HG600	49036176
	1250	1242	1247,5	25	24,5	4	HGW HG600	49017849
	1750	1742	1747,5	25	24,5	4	HGW HG600	24368101

Further dimensions are available on request.

Merkel Guide Ring KF



Product description

Non-metallic guide ring, either cut to size and ready for installation, or supplied as rolls.

Product advantages

Non-metallic guide element for pistons, for standardized housings as per ISO 10766, too

- Low friction, stick-slip-free

Material

Material	Designation	Color
PTFE-bronze compound	PTFE B500	brown

Operating conditions

Merkel KF Guide Rings can be used in all hydraulic fluids normally found in hydraulic systems such as oils and greases based on mineral oils, fire-resistant hydraulic fluids (HFD) and biodegradable hydraulic fluids (HETG, HEES, HEPG). We do not recommend to used Guide Rings KF in water or water based fluids (HFA, HFB, HFC).

The maximum permissible operating temperature is 120 °C.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content Mr >50% to max. 90% with cut depth c = Rz/2 and reference line Cref = 0%

Design notes

Please note our general remarks on design in the *Merkel Technical Manual*.

Manufacturing tolerance

L2	Manufacturing tolerances
>20 ... 80	... 0,5
>80 ... 250	... 1,0
>250 ... 500	... 1,5
>500 ... 1000	... 2,0
>1000 ... 2000	... 3,0
>2000 ... 4000	... 4,0



Recommended tolerances

d_1
h8

The tolerance for dimensions D and d_f must be viewed in connection with the seal used. Diameter d_1 stated in the table of dimensions must be considered exclusively in conjunction with the guide ring. The corresponding diameter of the connected seal housing has to be adapted to the sealing element involved.

Profile thickness

Profile thickness S
-0,05

Surface load

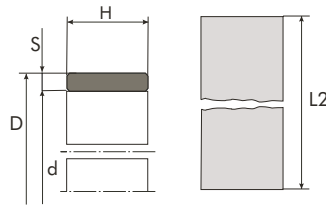
$p < 15 \text{ N/mm}^2 \dots 20 \text{ }^\circ\text{C}$
$p < 7,5 \text{ N/mm}^2 \dots 80 \text{ }^\circ\text{C}$
$p < 5 \text{ N/mm}^2 \dots 120 \text{ }^\circ\text{C}$

Sliding speed, see sealing system.

Cutting rolls to size

The dimensions indicated below are available as rolls from stock. Stretched length L2 of sections cut to size must be determined in line with the formula of calculation. Gap k arising after assembly is required for thermal expansion purposes. We recommend therefore that the strips be cut straight. Butt joint tips may be damaged by fissures. Our cutter (article N. 507228) makes it possible to cut sections to size in a time-saving and accurate manner.

Calculating stretched length L2 for pistons: $L2 = (D - S) \times 3,11 - 0,5$

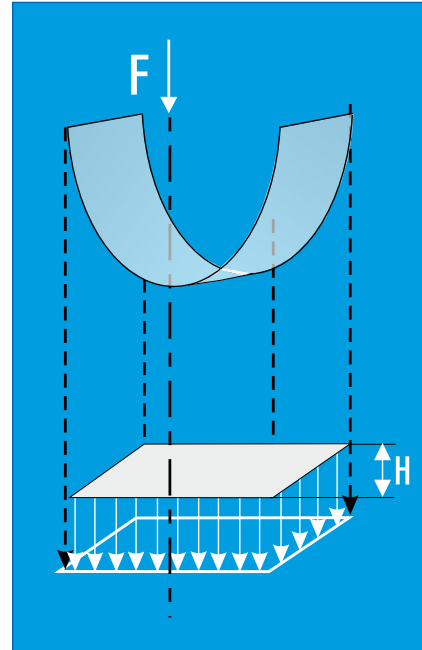
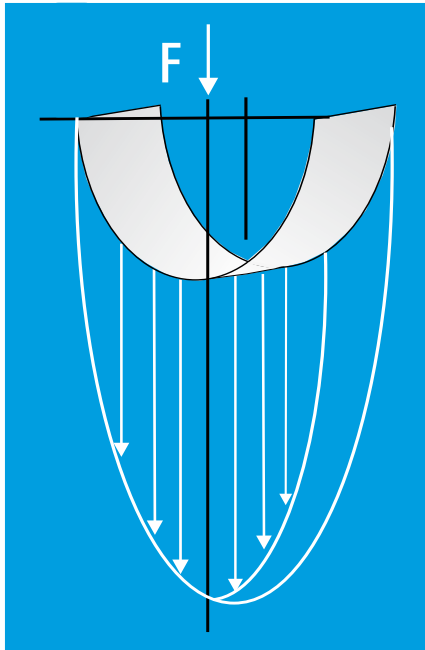


Groove length L	Strip thickness S	Article No.
8	2,5	24226174
9,7	2,5	24102775
10	2,5	24102563
12	2,5	24099191
15	2,5	24102564
20	2,5	24076217
25	2,5	24107955
15	4	24160019
20	4	24238052
25	4	24148093

Surface force

Pressure within the contact area between the guide and the counterface is not linear. The guiding width required can be calculated by applying the formulas mentioned below on the basis of the projected area. The non-linear progression of the contact pressure process is taken into account in the surface pressure value.

It may be advisable to reduce the loads by selecting a broader guide in individual cases to obtain an extended service life.



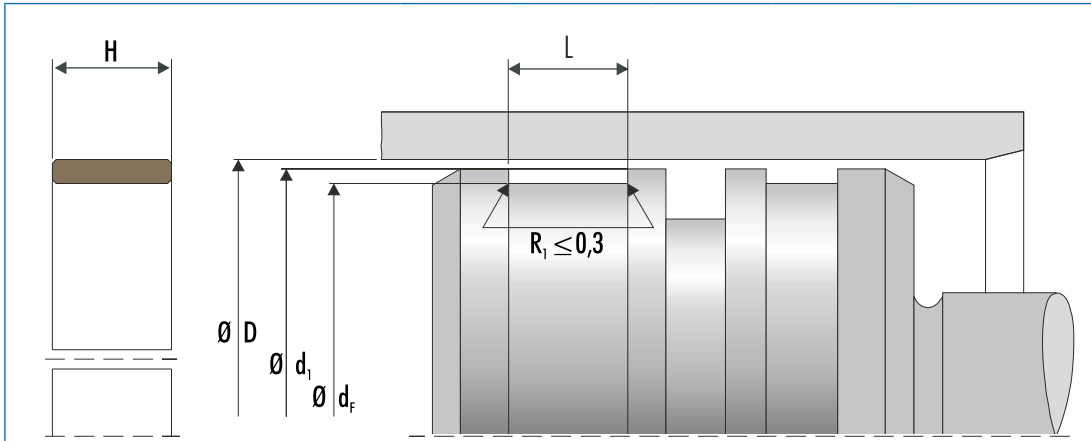
$$F = P \times A$$

$$A = d \times H$$

$$H = F / (d \times P)$$

H = Guide bandwidth [mm]
 F = Radial loads [N]
 A = Projected area [mm²]

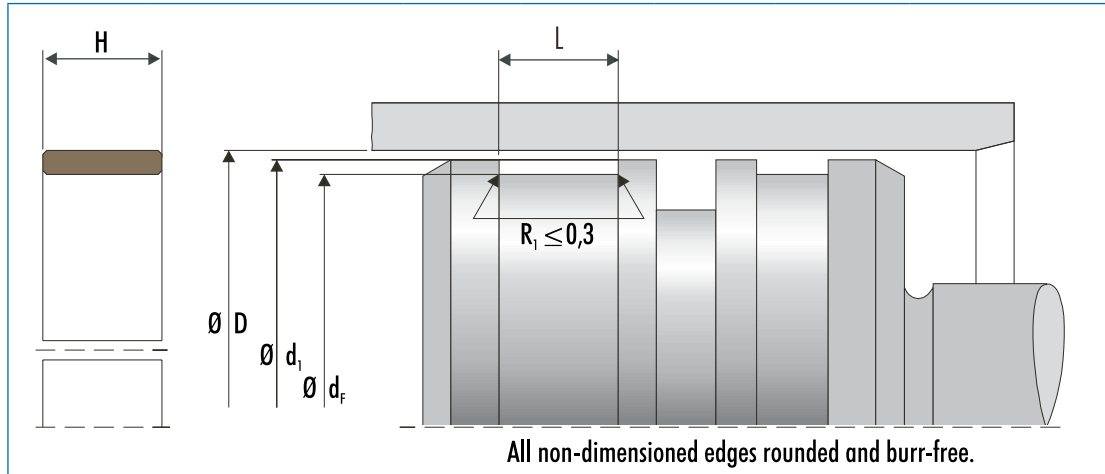
P = perm. surface pressure [N/mm²]
 d = Rod diameter with rod guide;
 Piston diameter with piston guide [mm]



All non-dimensioned edges rounded and burr-free.

Housing	D	df	d1	L	H	Profile	Article No.
	60	55	58,4	9,7	9,6	2,5	24163238
	60	55	58,4	15	14,8	2,5	24337627
ISO	63	58	61,4	9,7	9,6	2,5	24169847
	65	60	63,4	9,7	9,6	2,5	24300192
	70	65	68,4	9,7	9,6	2,5	24165146
	70	65	68,4	15	14,8	2,5	24338058
	75	70	73,4	9,7	9,6	2,5	24300193
	75	70	73,4	15	14,8	2,5	24311932
	75	70	73,4	25	24,5	2,5	24367346
	76	71	74,4	9,7	9,6	2,5	24264453
ISO	80	75	78,4	9,7	9,6	2,5	24217207
	80	75	78,4	15	14,8	2,5	24376294
	80	75	78,4	25	24,5	2,5	24356534
	85	80	83,4	9,7	9,6	2,5	24169641
	85	80	83,4	15	14,8	2,5	24258738
	85	80	83,4	25	24,5	2,5	24341190
	90	85	88,4	9,7	9,6	2,5	24165145
	90	85	88,4	15	14,8	2,5	24164295
	90	85	88,4	20	19,5	2,5	24229424
	95	90	93,4	9,7	9,6	2,5	24300197
	95	90	93,4	15	14,8	2,5	24343224
ISO	100	95	98,4	9,7	9,6	2,5	24153611
	100	95	98,4	15	14,8	2,5	24165294
	100	96	98,4	20	19,5	2,5	24360229
	100	95	98,4	25	24,5	2,5	24311931
	105	100	103,4	9,7	9,6	2,5	24216699

Further dimensions are available on request.



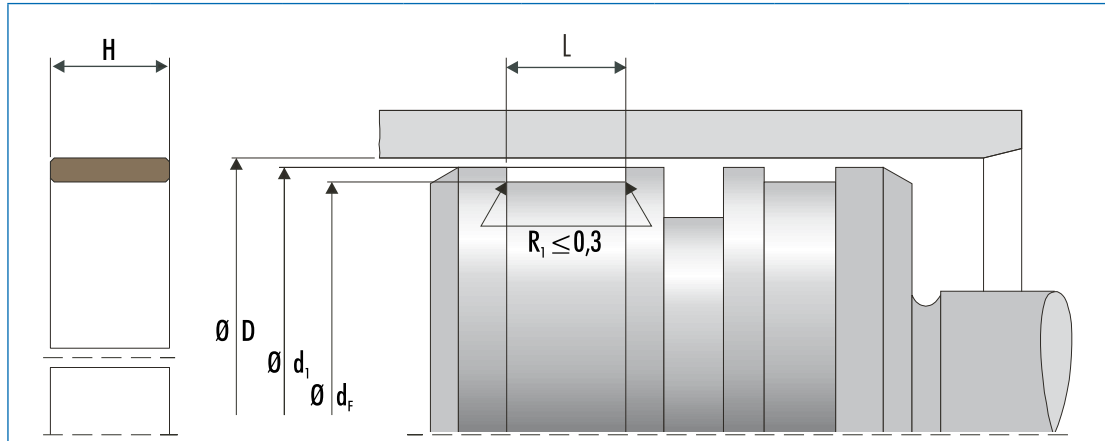
Housing	D	df	d1	L	H	Profile	Article No.
	105	100	103,4	15	14,8	2,5	24290913
	105	100	103,4	25	24,5	2,5	24333282
	110	105	108,4	9,7	9,6	2,5	24165147
	110	105	108,4	15	14,8	2,5	24291125
	110	105	108,4	20	19,5	2,5	24243431
	115	110	113,4	9,7	9,6	2,5	24153613
	115	110	113,4	15	14,8	2,5	24301084
	120	115	118,4	9,7	9,6	2,5	24166736
	120	115	118,4	15	14,8	2,5	24300203
	120	115	118,4	25	24,5	2,5	24356538
ISO	125	120	123,4	9,7	9,6	2,5	24204056
	125	120	123,4	9,7	9,6	2,5	24346326
	125	120	123,4	15	14,8	2,5	24165043
	125	120	123,4	25	24,5	2,5	24367345
	130	125	128,4	9,7	9,6	2,5	24153612
	130	125	128,4	15	14,8	2,5	24300206
	130	125	128,4	20	19,5	2,5	24166634
	130	125	128,4	25	24,5	2,5	24360565
	135	130	133,4	9,7	9,6	2,5	24203611
	135	130	133,4	15	14,8	2,5	24340099
ISO	140	135	138,4	9,7	9,6	2,5	24102436
ISO	140	135	138,4	15	14,8	2,5	24236467
	140	135	138,4	20	19,5	2,5	24339882
	140	135	138,4	25	24,5	2,5	24370754
	140	135	138,4	25	24,5	2,5	24338745
	145	140	143,4	15	14,8	2,5	24327686

Further dimensions are available on request.



Housing	D	df	d1	L	H	Profile	Article No.
	170	165	168,4	15	14,8	2,5	24300211
	170	165	168,4	20	19,5	2,5	24336310
	175	170	173,4	9,7	9,6	2,5	24237344
	175	170	173,4	15	14,8	2,5	24244767
	175	170	173,4	25	24,5	2,5	24298508
ISO	180	175	178,4	9,7	9,6	2,5	24203474
ISO	180	175	178,4	15	14,8	2,5	24219351
	180	175	178,4	25	24,5	2,5	24258396
	185	180	183,4	9,7	9,6	2,5	24237346
	185	180	183,4	15	14,8	2,5	24360095
	185	180	183,4	25	24,5	2,5	24339890
	185	180	183,4	25	24,5	2,5	24169314
	190	185	188,4	9,7	9,6	2,5	24300212
	190	185	188,4	15	14,8	2,5	24300213
ISO	200	195	198,4	9,7	9,6	2,5	24300214
	200	195	198,4	15	14,8	2,5	24346325
ISO	200	195	198,4	15	14,8	2,5	24300215
	200	195	198,4	20	19,5	2,5	24227497
	200	195	198,4	25	24,5	2,5	24306765
	205	200	203,4	15	14,8	2,5	24290221
	205	200	203,4	25	24,5	2,5	24332742
	210	205	208,4	9,7	9,6	2,5	24301068
	210	205	208,4	15	14,8	2,5	24236228
	215	210	213,4	9,7	9,6	2,5	24240867
	215	210	213,4	15	14,8	2,5	24380697
ISO	220	215	218,4	9,7	9,6	2,5	24300216
ISO	220	215	218,4	15	14,8	2,5	24203911
	220	215	218,4	20	19,5	2,5	24340941
	220	215	218,4	20	19,5	2,5	24204870
	220	215	218,4	25	24,5	2,5	24290417
	225	220	223,4	9,7	9,6	2,5	24259939
	225	220	223,4	15	14,8	2,5	24169846
	225	220	223,4	20	19,5	2,5	24260604
	225	220	223,4	25	24,5	2,5	24298509
	230	225	228,4	15	14,8	2,5	24301085
	230	225	228,4	20	19,5	2,5	24233567
	235	230	233,4	20	19,5	2,5	24164522
	240	235	238,4	15	14,8	2,5	24167876

Further dimensions are available on request.



All non-dimensioned edges rounded and burr-free.

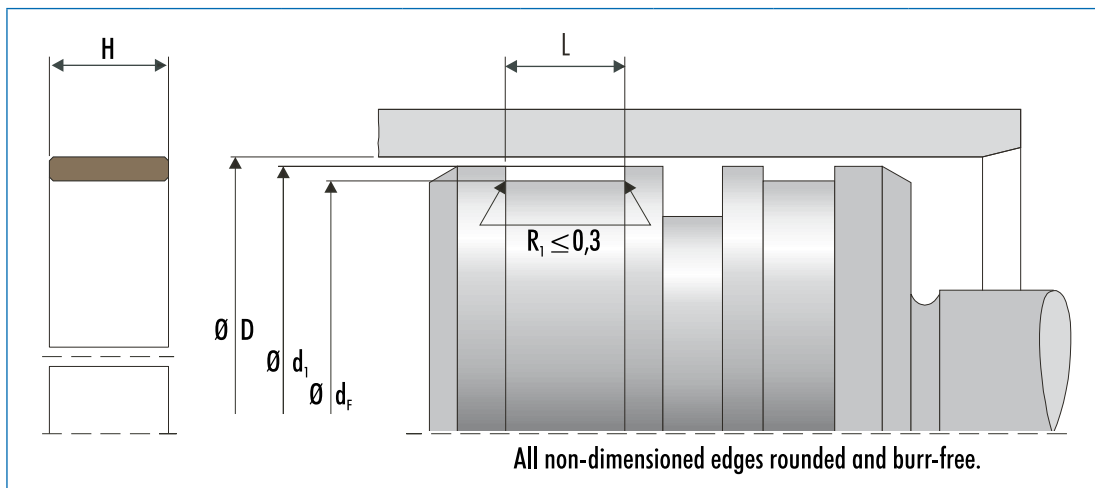
Housing	D	df	d1	L	H	Profile	Article No.
	240	235	238,4	15	14,8	2,5	24340827
	240	235	238,4	25	24,5	2,5	24372788
	245	240	243,4	25	24,5	2,5	24314898
ISO	250	245	248,4	9,7	9,6	2,5	24344263
ISO	250	245	248,4	15	14,8	2,5	24300217
	250	245	248,4	20	19,5	2,5	24338719
	260	255	258,4	9,7	9,6	2,5	24372787
	260	255	258,4	15	14,8	2,5	24300218
	260	255	258,4	25	24,5	2,5	24293567
	270	265	268,4	15	14,8	2,5	24238840
	270	265	268,4	25	24,5	2,5	24332002
ISO	280	275	278,4	15	14,8	2,5	24300219
	280	275	278,4	20	19,5	2,5	24153362
ISO	280	275	278,4	25	24,5	2,5	24203990
	290	285	288,4	15	14,8	2,5	24359376
	300	295	298,4	9,7	9,6	2,5	530228
	300	295	298,4	15	14,8	2,5	24137238
	300	295	298,4	20	19,5	2,5	24328393
	300	295	298,4	25	24,5	2,5	24134951
	310	305	308,4	15	14,8	2,5	24380698
	310	305	308,4	25	24,5	2,5	24237194
ISO	320	315	318,4	15	14,8	2,5	24300220
	320	315	318,4	20	19,5	2,5	24231223
ISO	320	315	318,4	25	24,5	2,5	24300221
	330	325	328,4	9,7	9,6	2,5	24363283
	330	325	328,4	15	14,8	2,5	24296714

Further dimensions are available on request.



Housing	D	df	d1	L	H	Profile	Article No.
	330	325	328,4	25	24,5	2,5	24314011
	340	335	338,4	15	14,8	2,5	24300222
	340	335	338,4	25	24,5	2,5	24300223
	350	345	348,4	9,7	9,6	2,5	24316713
	350	345	348,4	15	14,8	2,5	24234725
	350	345	348,4	25	24,5	2,5	24361333
ISO	360	355	358,4	15	14,8	2,5	24300224
ISO	360	355	358,4	25	24,5	2,5	24164558
ISO	360	352	357,5	25	24,5	4	24298511
	370	365	368,4	25	24,5	2,5	24350638
	380	375	378,4	15	14,8	2,5	24361143
	380	375	378,4	20	19,5	2,5	24257157
	380	375	378,4	25	24,5	2,5	24299555
	390	385	388,4	9,7	9,6	2,5	49023287
	390	385	388,4	20	19,5	2,5	24248042
	390	385	388,4	25	24,5	2,5	24215936
ISO	400	395	398,4	15	14,8	2,5	24300225
	400	395	398,4	20	19,5	2,5	24241924
ISO	400	395	398,4	25	24,5	2,5	24237477
ISO	400	392	397,5	25	24,5	4	24353170
	410	405	408,4	25	24,5	2,5	24292267
	420	415	418,4	20	19,5	2,5	24246829
	420	415	418,4	25	24,5	2,5	24298563
	430	425	428,4	15	14,8	2,5	24274579
	430	425	428,4	25	24,5	2,5	24356343
	440	435	438,4	15	14,8	2,5	24362293
	440	435	438,4	25	24,5	2,5	24238056
ISO	450	445	448,4	15	14,8	2,5	24295904
	450	445	448,4	20	19,5	2,5	24218386
ISO	450	445	448,4	25	24,5	2,5	24339916
ISO	450	442	447,5	25	24,5	4	24336064
	460	455	458,4	15	14,8	2,5	24237495
	460	455	458,4	20	19,5	2,5	24216297
	460	455	458,4	25	24,5	2,5	24258000
	480	475	478,4	25	24,5	2,5	24250182
	490	485	488,4	20	19,5	2,5	49018007
ISO	500	495	498,4	15	14,8	2,5	24274580
ISO	500	495	498,4	25	24,5	2,5	24263977

Further dimensions are available on request.



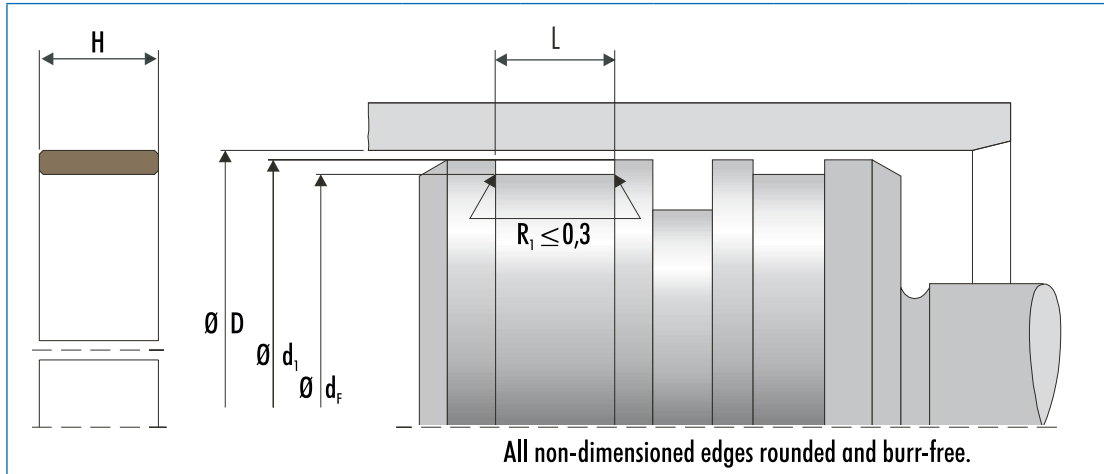
Housing	D	df	d1	L	H	Profile	Article No.
ISO	500	492	497,5	25	24,5	4	24261230
	510	505	508,4	15	14,8	2,5	24291161
	510	505	508,4	25	24,5	2,5	24360396
	510	502	507,5	25	24,5	4	24369177
	520	515	518,4	20	19,5	2,5	24230163
	530	525	528,4	15	14,8	2,5	24258834
	530	522	527,5	25	24,5	4	24361404
	540	535	538,4	25	24,5	2,5	24339008
	550	545	548,4	15	14,8	2,5	24358665
	550	545	548,4	20	19,5	2,5	533582
	550	545	548,4	25	24,5	2,5	24257339
	560	555	558,4	15	14,8	2,5	24351466
	560	555	558,4	25	24,5	2,5	24269185
	560	552	557,5	25	24,5	4	24359710
	570	565	568,4	25	24,5	2,5	24372789
	570	562	567,5	15	14,8	4	24352095
	570	562	567,5	25	24,5	4	24351060
	580	575	578,4	25	24,5	2,5	24339500
	580	572	577,5	15	14,8	4	24344267
	600	595	598,4	15	14,8	2,5	24234910
	600	595	598,4	20	19,5	2,5	24329803
	600	595	598,4	25	24,5	2,5	24234912
	600	592	597,5	20	19,5	4	24274599
	600	592	597,5	25	24,5	4	24275000
	620	615	618,4	15	14,8	2,5	529805
	620	615	618,4	25	24,5	2,5	24370213

Further dimensions are available on request.



Housing	D	df	d1	L	H	Profile	Article No.
	630	625	628,4	15	14,8	2,5	24161640
	630	625	628,4	25	24,5	2,5	24263466
	630	622	627,5	25	24,5	4	24373682
	640	632	637,5	25	24,5	4	24275167
	650	645	648,4	25	24,5	2,5	24239182
	650	642	647,5	25	24,5	4	24358984
	680	675	678,4	25	24,5	2,5	24357190
	680	672	677,5	15	14,8	4	24344269
	680	672	677,5	25	24,5	4	24298430
	690	682	687,5	25	24,5	4	24361405
	700	695	698,4	15	14,8	2,5	24275183
	700	695	698,4	25	24,5	2,5	24338859
	700	692	697,5	25	24,5	4	24349705
	710	705	708,4	15	14,8	2,5	24343758
	710	705	708,4	20	19,5	2,5	24162128
	720	715	718,4	15	14,8	2,5	24348252
	720	715	718,4	20	19,5	2,5	24291417
	720	715	718,4	25	24,5	2,5	24240256
	720	712	717,5	20	19,5	4	24226253
	720	712	717,5	25	24,5	4	24355876
	730	722	727,5	25	24,5	4	24372998
	740	735	738,4	25	24,5	2,5	24374383
	750	742	747,5	25	24,5	4	24293964
	760	755	758,4	25	24,5	2,5	24162992
	760	752	757,5	15	14,8	4	24216171
	760	752	757,5	20	19,5	4	24216170
	770	762	767,5	15	14,8	4	24344270
	780	775	778,4	15	14,8	2,5	24358668
	780	772	777,5	25	24,5	4	24379541
	800	795	798,4	25	24,5	2,5	24352905
	800	792	797,5	15	14,8	4	24348279
	800	792	797,5	20	19,5	4	24344925
	800	792	797,5	25	24,5	4	24243176
	820	815	818,4	25	24,5	2,5	24360159
	820	812	817,5	25	24,5	4	24341042
	830	825	828,4	25	24,5	2,5	24353637
	830	822	827,5	25	24,5	4	24354856
	840	835	838,4	15	14,8	2,5	24361144

Further dimensions are available on request.



Housing	D	df	d1	L	H	Profile	Article No.
	850	845	848,4	20	19,5	2,5	24265124
	850	845	848,4	25	24,5	2,5	24163721
	850	842	847,5	25	24,5	4	24300402
	900	895	898,4	25	24,5	2,5	24162990
	900	892	897,5	20	19,5	4	24238053
	900	892	897,5	25	24,5	4	24344380
	920	915	918,4	25	24,5	2,5	24258318
	940	935	938,4	25	24,5	2,5	24163720
	940	932	937,5	25	24,5	4	24352164
	950	945	948,4	25	24,5	2,5	24373138
	1000	995	998,4	25	24,5	2,5	24162989

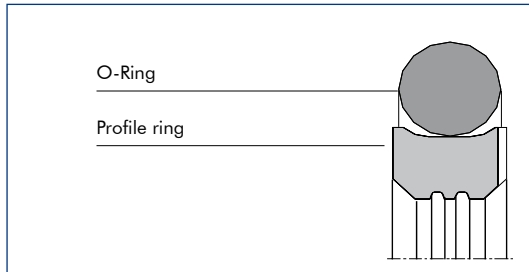
Further dimensions are available on request.







Merkel Rotomatic M 15



Product description

Two-piece seal set for sealing piston rods, consisting of a PTFE profile ring and an O-ring as a pre-stress element.

Product advantages

- Quick assembly
- Highly resistant to hydraulic fluids
- Low friction, stick-slip free

Application

Double-action rod seal for pivoting motion in hydraulic plant, preferably for use in hydraulic joints and rotary transmissions.

Material

Profile ring

Material	Designation	Color
PTFE-Glas-MoS ₂ -Compound	GM 201	light grey

O-Ring

Material	Designation	Color
Nitrile rubber	NBR	black

Other material combinations are available on request.

Operating conditions

Material	GM 201/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	0,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R _a	R _{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content Mr > 50 % to max. 90 %, with cut depth c = Rz/2 and reference line Cref = 0 %

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness See also *Merkel Technical Manual*.

Tolerance recommendation

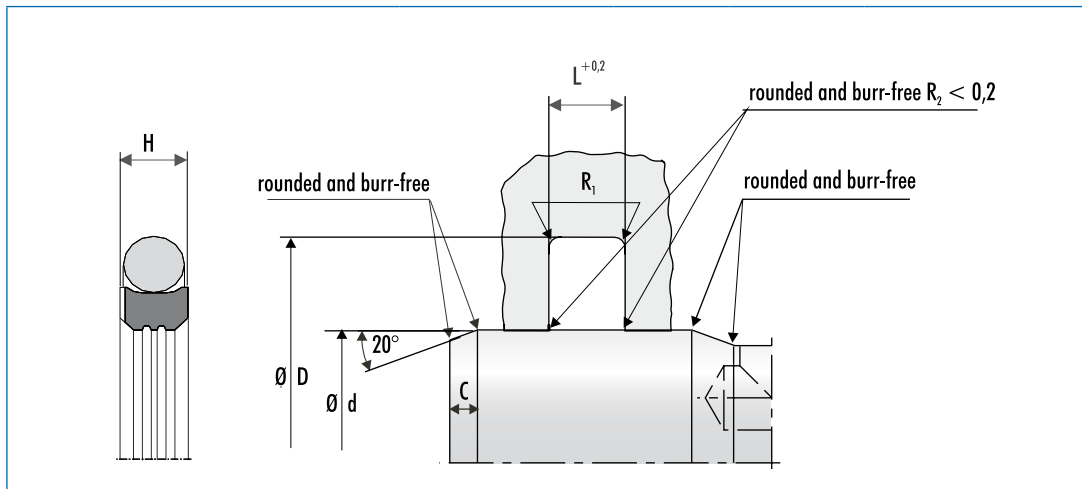
Diameter d	Borehole	Shaft	Groove base
... 500	H9	f8	H9
> 500	H8	f7	H8

Design notes

Please note our general design remarks in the *Merkel Technical Manual*.

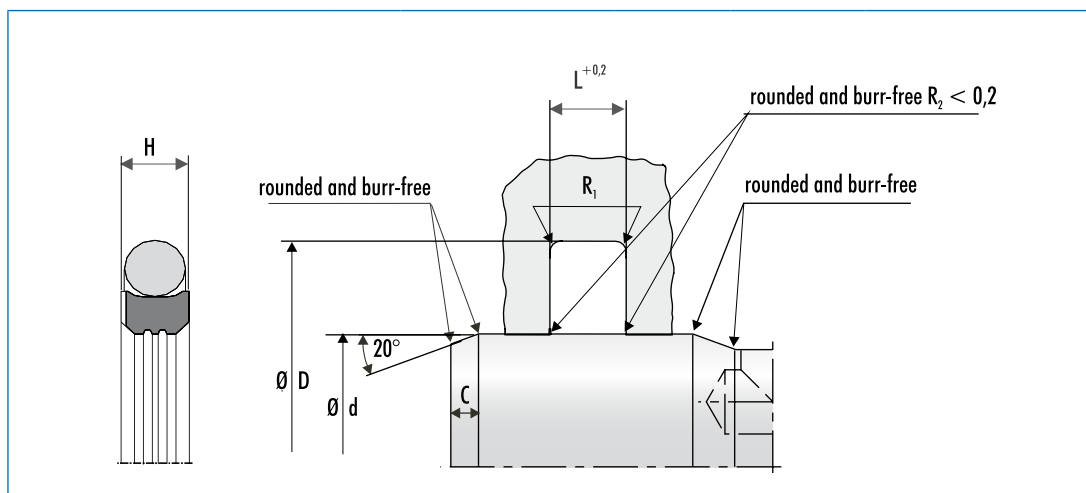
Installation & assembly

Please note our general remarks on hydraulic seal assembly in the *Merkel Technical Manual*.



d	D	R1	L	C	Profile	H	Article No.
60	71	0,8	4,2	4	5,5	3,9	24265194
63	74	0,8	4,2	4	5,5	3,9	24342641
65	76	0,8	4,2	4	5,5	3,9	24379352
70	81	0,8	4,2	4	5,5	3,9	24261512
75	86	0,8	4,2	4	5,5	3,9	24274587
80	91	0,8	4,2	6	5,5	3,9	24269431
80	95,5	0,8	6,3	6	7,75	5,9	24268439
90	101	0,8	4,2	4	5,5	3,9	24295714
90	105,5	0,8	6,3	6	7,75	5,9	24269461
100	111	0,8	4,2	4	5,5	3,9	24334450
110	121	0,8	4,2	4	5,5	3,9	24342642
110	125,5	0,8	6,3	6	7,75	5,9	24269828
115	126	0,8	4,2	4	5,5	3,9	24275310
120	131	0,8	4,2	4	5,5	3,9	24244324
125	136	0,8	4,2	4	5,5	3,9	24342643
125	140,5	0,8	6,3	6	7,75	5,9	24264533
130	145,5	0,8	6,3	6	7,75	5,9	49018186
140	151	0,8	4,2	4	5,5	3,9	24342644
140	155,5	0,8	6,3	6	7,75	5,9	24275177
150	161	0,8	4,2	4	5,5	3,9	24342645
150	165,5	0,8	6,3	6	7,75	5,9	24275214
160	171	0,8	4,2	4	5,5	3,9	24332460
160	175,5	0,8	6,3	6	7,75	5,9	24345425
180	191	0,8	4,2	4	5,5	3,9	24265195
180	195,5	0,8	6,3	6	7,75	5,9	24258164
200	215,5	1,2	6,3	6	7,75	5,9	24342646

Other material combinations and further dimensions are available on request.

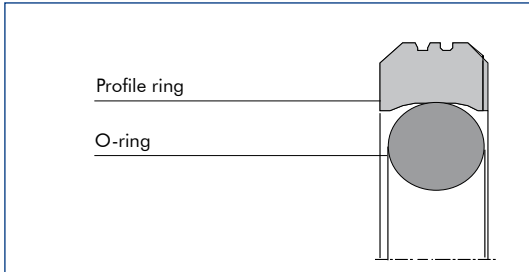


d	D	R1	L	C	Profile	H	Article No.
220	235,5	1,2	6,3	6	7,75	5,9	24342647
240	255,5	1,2	6,3	6	7,75	5,9	24300256
250	265,5	1,2	6,3	6	7,75	5,9	24258166
280	301	1,2	8,1	7	10,5	7,7	24362271
300	321	2	8,1	7,5	10,5	7,7	49059198
320	344,5	2	8,1	8	12,25	7,7	24348407
350	374,5	2	8,1	8	12,25	7,7	24352373
360	384,5	2	8,1	8	12,25	7,7	49006745
380	401	2	8,1	7,5	10,5	7,7	49011805
380	404,5	2	8,1	7,5	12,25	7,7	24377578
400	424,5	2	8,1	8	12,25	7,7	24257070
440	461	2	8,1	7,5	10,5	7,7	49022472
460	484,5	2	8,1	8	12,25	7,7	24373000
480	505,5	2	8,1	8	12,25	7,7	49034397
530	551	2	8,1	7,5	10,5	7,7	24349316
680	708	2	9,5	11	14	9,5	24261907
850	878	2	9,5	11	14	9,1	49036060
1000	1028	2	9,5	11	14	9,1	24377339

Other material combinations and further dimensions are available on request.



Merkel Rotomatic M 16



Product description

Two-piece seal set for sealing pistons, consisting of a PTFE profile ring and an O-ring as a pre-stress element.

Product advantages

- Quick assembly
- Highly resistant to hydraulic fluids
- Low friction, stick-slip free

Application

Double-action piston seal for pivoting motion in hydraulic plant, preferably for use in hydraulic joints and rotary transmissions.

Material

Profile ring

Material	Designation	Color
PTFE-Glas-MoS ₂ -Compound	GM 201	light grey

O-Ring

Material	Designation	Color
Nitrile rubber	NBR	black

Other material combinations are available on request.

Operating conditions

Material	GM 201/NBR
Hydraulic oils, HL, HLP	-30 ... +100 °C
HFA fluids	+5 ... +60 °C
HFB fluids	+5 ... +60 °C
HFC fluids	-30 ... +60 °C
HFD fluids	-
Water	+5 ... +100 °C
HETG (rape-seed oil)	-30 ... +80 °C
HEES (synth. ester)	-30 ... +80 °C
HEPG (glycol)	-30 ... +60 °C
Mineral greases	-30 ... +100 °C
Pressure	40 MPa
Running speed	0,5 m/s

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R _a	R _{max}
Sliding surface	0,05 ... 0,3 μm	<2,5 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<3,0 μm	<15,0 μm

Material content Mr > 50 % to max. 90 %, with cut depth c = Rz/2 and reference line Cref = 0 %

The long term behavior of a sealing element and its dependability against early failures are crucially influenced by the quality of the counterface. Therefore a precise description and assessment of the surface is critical.

Based on recent findings, we recommend supplementing the above definition of surface finish for the sliding surface by the characteristics detailed in the table below. With these new characteristics derived from the material content, previous more general descriptions of the material content are significantly improved, especially in regard to surface roughness See also *Merkel Technical Manual*.

Tolerance recommendation

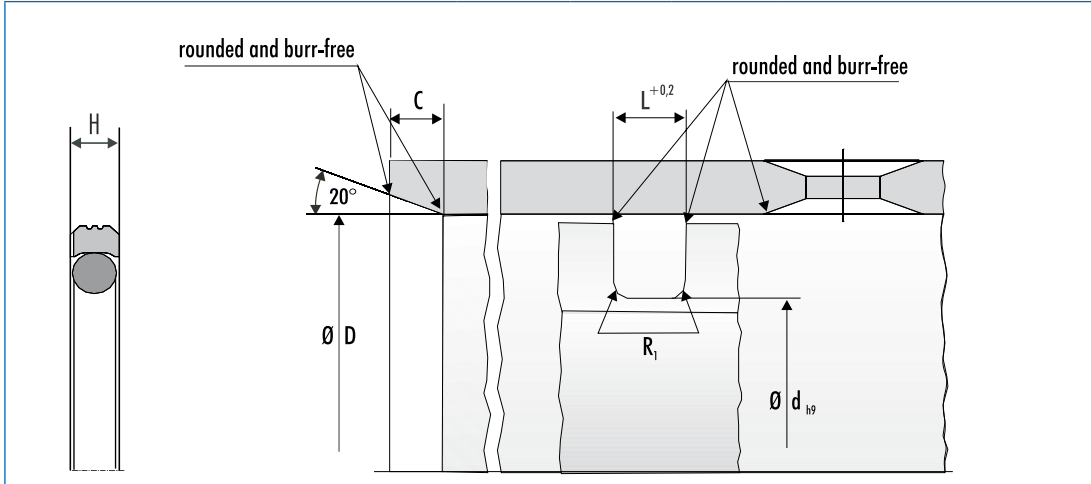
Diameter D	Borehole	Shaft	Groove base
... 500	H9	f8	h9
> 500	H8	f7	h8

Design notes

Please note our general design remarks in the *Merkel Technical Manual*.

Installation & assembly

Please note our general remarks on hydraulic seal assembly in the *Merkel Technical Manual*.



D	d	R1	L	C	Profile	H	Artikel Nr
60	49	0,8	4,2	8	5,5	3,9	49061548
60	52,5	0,5	3,2	6	3,75	2,9	24344595
63	55,5	0,5	3,2	6	3,75	2,9	24344596
70	62,5	0,5	3,2	6	3,75	2,9	24344597
80	69	0,8	4,2	8	5,5	3,9	24275277
90	79	0,8	4,2	8	5,5	3,9	24344598
100	89	0,8	4,2	8	5,5	3,9	24344633
105	94	0,8	4,2	8	5,5	3,9	24360325
110	94,5	1,2	6,3	10	7,75	5,9	526444
110	99	0,8	4,2	8	5,5	3,9	24344625
125	109,5	1,2	6,3	10	7,75	5,9	24355900
125	114	0,8	4,2	8	5,5	3,9	24261557
130	114,5	1,2	6,3	10	7,75	5,9	24332008
135	114	2	8,1	10	10,5	7,7	532255
140	124,5	1,2	6,3	10	7,75	5,9	24265781
145	129,5	1,2	6,3	10	7,75	5,9	24295612
150	134,5	1,2	6,3	10	7,75	5,9	24344626
160	144,5	1,2	6,3	10	7,75	5,9	24344627
170	154,5	1,2	6,3	10	7,75	5,9	24362008
175	159,5	1,2	6,3	10	7,75	5,9	49001716
180	164,5	1,2	6,3	10	7,75	5,9	24344599
200	184,5	1,2	6,3	10	7,75	5,9	24333651
210	194,5	1,2	6,3	10	7,75	5,9	24329202
220	204,5	1,2	6,3	10	7,75	5,9	24330686
230	214,5	1,2	0	10	7,75	5,9	24223399
240	224,5	1,2	6,3	10	7,75	5,9	24331499

Other material combinations and further dimensions are available on request.

D	d	R1	L	C	Profile	H	Artikel Nr
250	234,5	1,2	6,3	10	7,75	5,9	24331860
270	254,5	1,2	6,3	10	7,75	5,9	24350021
280	264,5	1,2	6,3	10	7,75	5,9	24377949
300	284,5	1,2	6,3	10	7,75	5,9	24369438
310	289	2	8,1	10	10,5	7,7	24341182
330	314,5	1,2	6,3	10	7,75	5,9	24331955
400	375,5	2	8,1	12	12,25	7,7	24363097
500	475,5	2	8,1	12	12,25	7,7	24363098
560	535,5	2	8,1	12	12,25	7,7	49032333
630	605,5	2	8,1	12	12,25	7,7	24363099
680	652	2	9,5	13	14	9,1	24357188
780	752	2	9,5	13	14	9,1	24361922
800	772	2	9,5	13	14	9,1	24374719
820	792	2	9,5	13	14	9,1	24356201
900	872	2	9,5	13	14	9,1	24345423

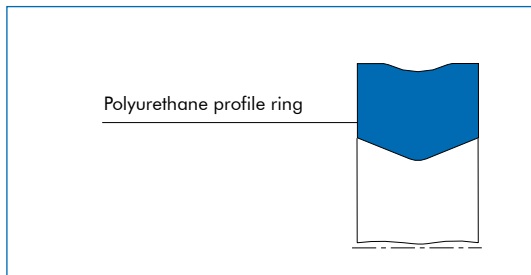
Other material combinations and further dimensions are available on request.







Merkel Cover Seal PU 82



Product description

Single-piece, double-acting compact seal made of polyurethane for static sealing, internal sealing.

Product advantages

- Interchangeable with housings for O-ring and O-ring with back-up ring
- High degree of functional reliability provided by the sturdy Profile ring made of polyurethane
- Great resistance to extrusion (dimensional stability)
- Simple and safe assembly (single-piece element)
- Simplified inventory
- Gastight

Material

Material	Designation	Color
Polyurethane	95 AU V142	dark blue
Polyurethane	94 AU 925	light blue

The material is determined on the basis of the nominal diameter and the manufacturing process.

Applications

- High operating pressure (up to 60 MPa)
- Breathing gap (cylinder expansion)
- Short pressure build-up time (end-of-travel damping)
- Reciprocal operating pressure
- Nominal diameter up to 2,000mm

Operating conditions

Material	95 AU V142/94 AU 925
Hydraulic oils, HL, HLP	-30 ... +110 °C
HFA fluids	+5 ... +50 °C
HFB fluids	+5 ... +50 °C
HFC fluids	-30 ... +40 °C
HFD fluids	-
Water	+5 ... +40 °C
HETG (rape-seed oil)	-30 ... +60 °C
HEES (synth. ester)	-30 ... +60 °C
HEPG (glycol)	-30 ... +40 °C
Mineral greases	-30 ... +110 °C
Pressure	60 MPa

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	<0,8 μm	<3,2 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<6,3 μm	<20 μm

* burr-free transition

Gap dimension

The maximum permissible extrusion gap with a piston rod arranged on one side, while taking cylinder expansion into account, is determined, to a large extent, by the maximum operating pressure and the dimensional stability of the sealing material, depending on the temperature involved.

Gap dimension

The maximum permissible extrusion gap with a piston rod arranged on one side, while taking cylinder expansion into account, is determined, to a large extent, by the maximum operating pressure and the dimensional stability of the sealing material, depending on the temperature involved.

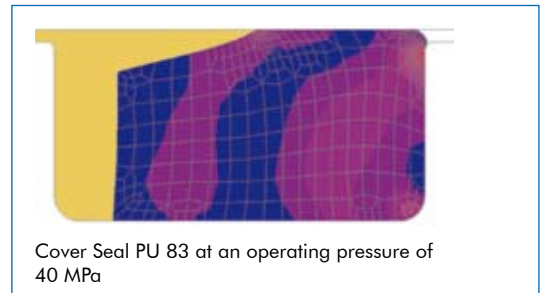
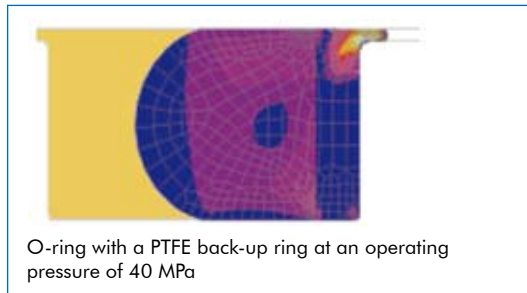
Section*	Max. perm. gap dimension				
	16 MPa	26 MPa	32 MPa	40 MPa	60 MPa
L					
1,78	0,2	0,2	0,15	0,1	0,1
2,62	0,35	0,3	0,25	0,15	0,1
3,5/3,53	0,5	0,4	0,35	0,25	0,2
5,33	0,5	0,4	0,35	0,25	0,2
6,99/7	0,55	0,45	0,35	0,35	0,25
8	0,55	0,45	0,4	0,35	0,25
8,4	0,55	0,45	0,4	0,35	0,25
10	0,6	0,5	0,45	0,4	0,3
12	0,6	0,5	0,45	0,4	0,3

* Cord thickness for housing recommendation O-ring with a back-up ring

Tolerance recommendation

Diameter d	Tolerance
< 800	H7/f7
> 800	+0,1 /-0,15/-0,05

Operating principle



Design notes

Please note our general remarks in the *Merkel Technical Manual*.

Installation & assembly

Please note our general remarks on the installation of hydraulic seals in the *Merkel Technical Manual*.



Additional product description – Cover Seal PU 82



O-ring and back-up ring

Static sealing is usually achieved by combining an O-ring and a back-up ring for operation at a pressure exceeding 15 MPa and for pressurization on one side. At higher operating pressures, the back-up ring function is restricted by the resulting tube expansion. This causes damage to the O-ring as well as the back-up ring, as a result of gap extrusion.

Two back-up rings are required in the event of alternate pressurization. Under such operating conditions, O-rings are frequently twisted inside the groove until the sealing element fails. A series of possible defects likely to jeopardize the lasting functionality of the sealing element also arise during installation and operation of the combined O-ring and back-up ring.

Cylinder expansion

A conventional back-up ring fills the gap to the main functional surface in pressureless condition. Back-up rings are made either of virgin PTFE or more dimensionally stable materials like PA, for example. Pure PTFE tends to creep under the effects of lengthy stresses. The back-up ring adapts itself to the housing, while filling the gap. At high pressure, the surfaces to be sealed are moved as a result of cylinder expansion. The PTFE back-up ring penetrates into the sealing gap and is squeezed when relieved (Figure 01). Dimensionally stable PA back-up rings are only slightly distorted under pressure and fail, therefore, to adapt their shape to the housing. The O-ring may penetrate

into the sealing gap arising under pressure. If the pressure drops suddenly, the extrusion lug may be sheared off as a result. In this case, the elastic deformation of the metal (cylinder expansion) is reduced within a shorter period of time than that required by the O-ring to get out of the gap. The gap resulting from the manufacturing to-lerances of the back-up ring on the side facing the groove bottom represents a further source of defects in terms of damage caused by extrusion to the O-ring (Figure 02).

The cover seal is subject to comparatively moderate deformations only at high operating pressures (Figure 03). The element bridges the extrusion gap, but does not penetrate into it. The deformation is entirely reversible.

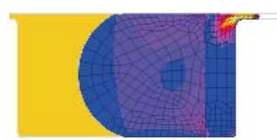


Figure 01: PTFE back-up ring at 40 MPa

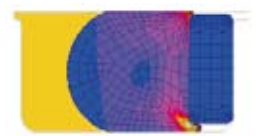


Figure 02: PA back-up ring at 20 MPa

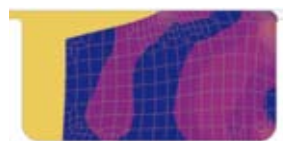


Figure 03: Cover seal at 40 Ma

Pressure

The radial deformation of the sealing element inside the housing is an indicator for the sealing effect. Whereas insufficient pressure reduces both the initial sealing effect in pressureless condition and the suitability for short pressure build-up periods, excessive pressure may lead to a shorter service life as a result of material fatigue.

The tolerances for metallic components and the seal exert a profound influence on Profile overlapping. Whereas tolerance dimensions for metallic components are selected according to the nominal diameter involved, the cord thickness for an O-ring is given a constant tolerance regardless of the O-ring diameter. The larger the nominal diameter with the same cord thickness, the larger possible deviations from ideal pressure conditions will be. The sealing effect and/or the functional reliability of an O-ring will decline in proportion to nominal diameter increases.

The cover seal Profile is adapted to the housing respectively involved, i.e. by taking the nominal diameter into consideration, too, on the basis of a design program and in view of the pressing conditions. Consequently, the diameter has no impact on the sealing effect and functional reliability.

The cover seal is designed individually in line with the metallic housing used. A continuously high degree of functional reliability is set regardless of the tolerances of the metallic components and of the nominal diameter involved. It is possible to apply application experiences gathered with one scope of diameters directly to another scope of diameters, when designing series.

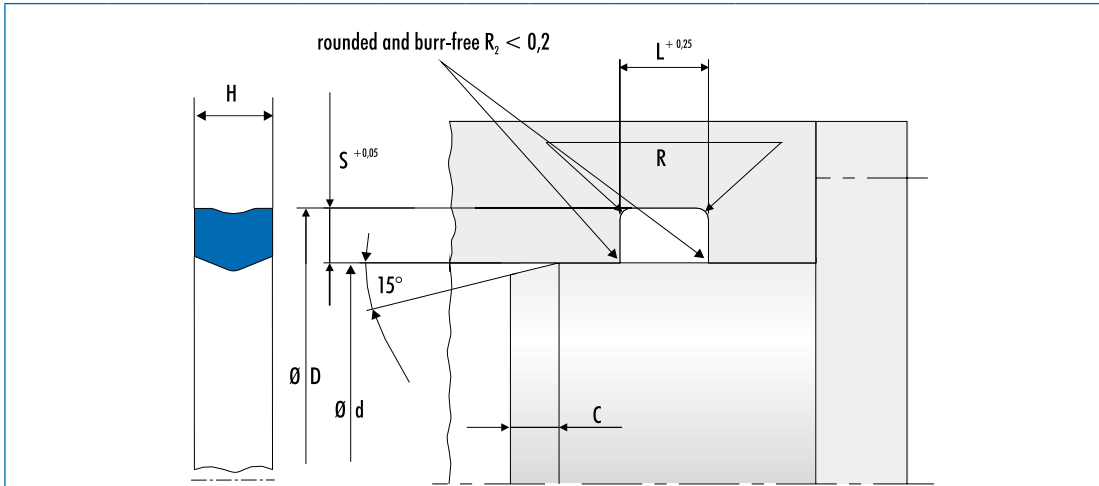
A high degree of functional reliability is attained under any operating conditions due to a great resistance to extrusion and a favorable mold release behavior, on the one hand, and to the high line force around the sealing edge even in pressureless condition, on the other.

The Profile ring of the cover seal is clearly preferred due to the stable support provided in the groove bottom. Any squeezing and rotary movements occurring inside the sealing ring under changing pressure as well as a helical distortion of the sealing ring during assembly are precluded, thus providing enhanced functional reliability.

The single-piece symmetrical cover seal design precludes any faulty installation due to twisting or confusion.

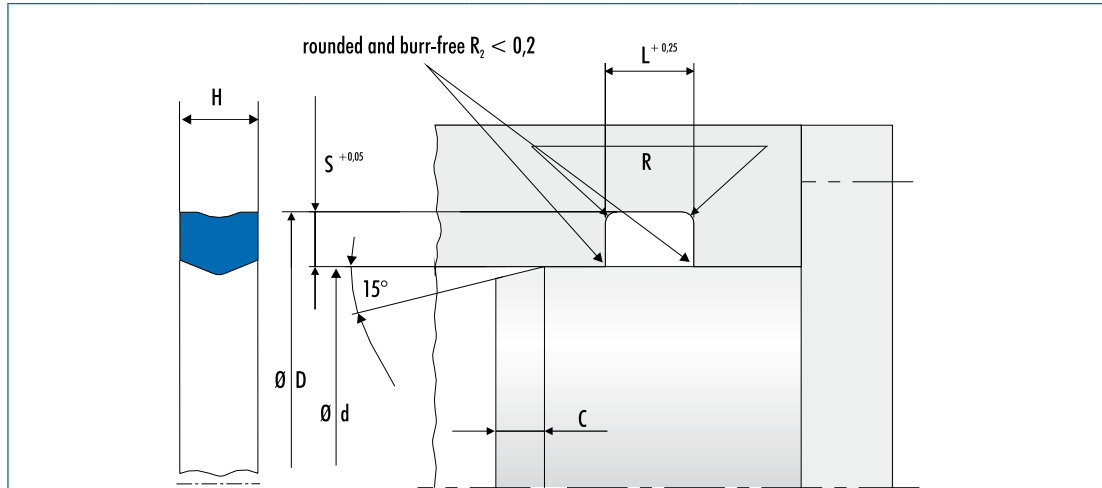
Procurement and storing are simplified by the use of the single-piece cover seal.

The use of the cover seal makes a vital contribution to the functional reliability and dependability of hydraulic cylinders.



d	D	S	H	L	C	R	O-Ring Housing	Material	Article No.
60	65,6	2,75	4,4	5,2	3	0,4	--	95 AU V142	24368756*
70	75,6	2,8	5,3	6,2	3	0,4	--	95 AU V142	49004012
70	78,6	4,3	7,8	9	4	0,6	5,33	95 AU V142	49067956
75	80,6	2,8	5,3	6,2	3	0,4	--	95 AU V142	49025339
80	88,6	4,3	7,8	9	4	0,6	5,33	95 AU V142	49067955
90	98,6	4,3	7,7	9	4	0,6	5,33	95 AU V142	49066165
95	103,6	4,3	7,7	9	4	0,6	5,33	95 AU V142	49067960
105	112,8	3,9	5	5,8	3,5	0,4	--	95 AU V142	24354748*
117	123,1	3,05	4,9	5,8	3,5	0,4	--	95 AU V142	24245387*
120	128,6	4,3	7,8	9	4	0,6	5,33	94 AU 925	49054893
136	141,9	2,95	4,9	5,8	3,5	0,4	--	95 AU V142	24250882*
145	153,6	4,3	7,7	9	4	0,6	5,33	95 AU V142	49064059*
160	168,6	4,3	7,8	9	4	0,6	5,33	95 AU V142	24370625
165	173,6	4,3	7,7	9	4	0,6	5,33	95 AU V142	49063598
170	176,3	3,15	4,9	5,8	3,5	0,4	--	95 AU V142	24250879*
175	183,6	4,3	7,8	9	4	0,6	5,33	94 AU 925	49023882
180	188,6	4,3	7,8	9	4	0,6	5,33	95 AU V142	49002910
190	201,6	5,8	10,7	12,3	5	0,6	7	94 AU 925	49003461
195	203,6	4,3	7,8	9	4	0,6	5,33	94 AU 925	49023883
200	208,6	4,3	7,8	9	4	0,6	5,33	95 AU V142	533208
210	221,6	5,8	10,7	12,3	5	0,6	7	94 AU 925	24379224
215	226,6	5,8	10,7	12,3	5	0,6	7	95 AU V142	49068967
250	258,6	4,3	7,8	9	4	0,6	5,33	95 AU V142	49004491
270	278,2	4,1	7,4	8,5	3,5	0,4	5	95 AU V142	24360461
270	278,6	4,3	7,8	9	4	0,6	5,33	94 AU 925	49016834
300	311,6	5,8	10,7	12,3	5	0,6	7	95 AU V142	49006854

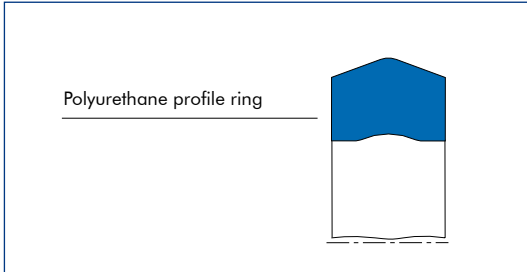
* Tools available
 Further dimensions are available on request.



d	D	S	H	L	C	R	O-Ring Housing	Material	Article No.
310	321,6	5,8	10,9	12,3	4,5	0,6	7	94 AU 925	49023886
330	341,6	5,8	10,7	12,3	5	0,6	7	94 AU 925	532554
340	351,6	5,8	10,7	12,3	5,5	0,6	7	95 AU V142	49064722
360	371,6	5,8	10,7	12,3	5	0,6	7	94 AU 925	49005757
400	411,6	5,8	10,7	12,3	5	0,6	7	94 AU 925	49014554
440	451,6	5,8	10,7	12,3	5	0,6	7	94 AU 925	531798
450	461,6	5,8	10,7	12,3	5,5	0,6	7	94 AU 925	49063601
480	491,6	5,8	10,7	12,3	5,5	0,6	7	94 AU 925	49060834
510	523,4	6,7	11,8	13,6	6	0,6	8	94 AU 925	49035523
680	691,6	5,8	10,6	12,3	5,5	0,6	7	94 AU 925	49063666
1120	1137	8,5	14,4	16,3	7	0,6	10	94 AU 925	533599
1320	1337	8,5	14,4	16,3	7	0,6	10	94 AU 925	49001112

Further dimensions are available on request.

Merkel Cover Seal PU 83



Product description

Single-piece, double-acting compact seal made of polyurethane for static sealing, external sealing.

Product advantages

- Interchangeable with housings for O-ring and O-ring with back-up ring
- High degree of functional reliability provided by the sturdy profile ring made of polyurethane
- Great resistance to extrusion (dimensional stability)
- Simple and safe assembly (single-piece element)
- Simplified inventory
- Gastight

Material

Material	Designation	Color
Polyurethane	95 AU V142	dark blue
Polyurethane	94 AU 925	light blue

The material is determined on the basis of the nominal diameter and the manufacturing process.

Applications

- High operating pressure (up to 60 MPa)
- Breathing gap (cylinder expansion)
- Short pressure build-up time (end-of-travel damping)
- Reciprocal operating pressure
- Nominal diameter up to 2,000mm

Field of application

Material	95 AU V142/94 AU 925
Hydraulic oils, HL, HLP	-30 ... +110 °C
HFA fluids	+5 ... +50 °C
HFB fluids	+5 ... +50 °C
HFC fluids	-30 ... +40 °C
HFD fluids	-
Water	+5 ... +40 °C
HETG (rape-seed oil)	-30 ... +60 °C
HEES (synth. ester)	-30 ... +60 °C
HEPG (glycol)	-30 ... +40 °C
Mineral greases	-30 ... +110 °C
Pressure	60 MPa

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R_a	R_{max}
Sliding surface	<0,8 μm	<3,2 μm
Groove base	<1,6 μm	<6,3 μm
Groove sides	<6,3 μm	<20 μm
Lead-in chamfer*	<0,8 μm	<3,2 μm

* burr-free transition

Gap dimension

The maximum permissible extrusion gap for a piston rod arranged on one side, while taking tube expansion into account, is determined, to a large extent, by the maximum operating pressure and the dimensional stability of the sealing material, depending on the temperature involved.

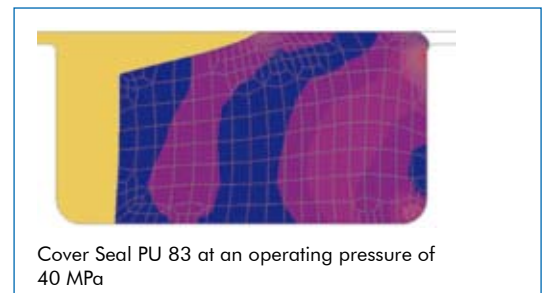
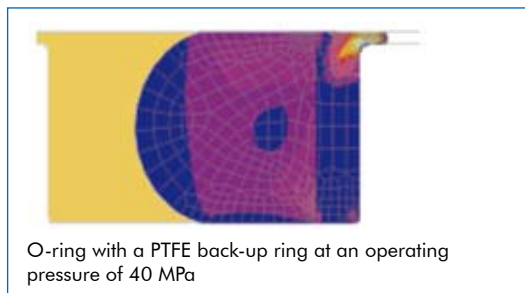
Section*	Max. perm. gap dimension				
	16 MPa	26 MPa	32 MPa	40 MPa	60 MPa
L					
1,78	0,2	0,2	0,15	0,1	0,1
2,62	0,35	0,3	0,25	0,15	0,1
3,5/3,53	0,5	0,4	0,35	0,25	0,2
5,33	0,5	0,4	0,35	0,25	0,2
6,99/7,0	0,55	0,45	0,35	0,35	0,25
8,0	0,55	0,45	0,4	0,35	0,25
8,4	0,55	0,45	0,4	0,35	0,25
10,0	0,6	0,5	0,45	0,4	0,3
12,0	0,6	0,5	0,45	0,4	0,3

* Cord thickness for housing recommendation O-ring with a back-up ring

Tolerances

Diameter D	Tolerance
≤ 800	H7/f7
> 800	+0,1 /-0,15/-0,05

Operating principle



Design notes

Please note our general remarks on design in the *Merkel Technical Manual*.

Installation & assembly

Please note our general remarks on the installation of hydraulic seals in the *Merkel Technical Manual*.



Additional product description – Cover Seal PU 83



O-ring and back-up ring

Static sealing is usually achieved by combining an O-ring and a back-up ring for operation at a pressure exceeding 15 MPa and for pressurization on one side. At higher operating pressures, the back-up ring function is restricted by the resulting tube expansion. This causes damage to the O-ring as well as the back-up ring, as a result of gap extrusion.

Two back-up rings are required in the event of alternate pressurization. Under such operating conditions, O-rings are frequently twisted inside the groove until the sealing element fails. A series of possible defects likely to jeopardize the lasting functionality of the sealing element also arise during installation and operation of the combined O-ring and back-up ring.

Cylinder expansion

A conventional back-up ring fills the gap to the main functional surface in pressureless condition. Back-up rings are made either of virgin PTFE or more dimensionally stable materials like PA, for example. Pure PTFE tends to creep under the effects of lengthy stresses. The back-up ring adapts itself to the housing, while filling the gap. At high pressure, the surfaces to be sealed are moved as a result of cylinder expansion. The PTFE back-up ring penetrates into the sealing gap and is squeezed when relieved (Figure 01). Dimensionally stable PA back-up rings are only slightly distorted under pressure and fail, therefore, to adapt their shape to the housing. The O-ring may penetrate

into the sealing gap arising under pressure. If the pressure drops suddenly, the extrusion lug may be sheared off as a result. In this case, the elastic deformation of the metal (cylinder expansion) is reduced within a shorter period of time than that required by the O-ring to get out of the gap.

The gap resulting from the manufacturing to-tolerances of the back-up ring on the side facing the groove bottom represents a further source of defects in terms of damage caused by extrusion to the O-ring (Figure 02).

The cover seal is subject to comparatively moderate deformations only at high operating pressures (Figure 03). The element bridges the extrusion gap, but does not penetrate into it. The deformation is entirely reversible.

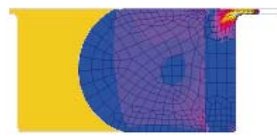


Figure 01: PTFE back-up ring at 40 MPa

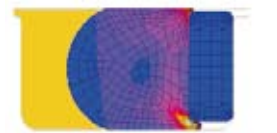


Figure 02: PA back-up ring at 20 MPa



Figure 03: Cover seal at 40 Ma

Pressure

The radial deformation of the sealing element inside the housing is an indicator for the sealing effect. Whereas insufficient pressure reduces both the initial sealing effect in pressureless condition and the suitability for short pressure build-up periods, excessive pressure may lead to a shorter service life as a result of material fatigue.

The tolerances for metallic components and the seal exert a profound influence on Profile overlapping. Whereas tolerance dimensions for metallic components are selected according to the nominal diameter involved, the cord thickness for an O-ring is given a constant tolerance regardless of the O-ring diameter. The larger the nominal diameter with the same cord thickness, the larger possible deviations from ideal pressure conditions will be. The sealing effect and/or the functional reliability of an O-ring will decline in proportion to nominal diameter increases.

The cover seal Profile is adapted to the housing respectively involved, i.e. by taking the nominal diameter into consideration, too, on the basis of a design program and in view of the pressing conditions. Consequently, the diameter has no impact on the sealing effect and functional reliability.

The cover seal is designed individually in line with the metallic housing used. A continuously high degree of functional reliability is set regardless of the tolerances of the metallic components and of the nominal diameter involved. It is possible to apply application experiences gathered with one scope of diameters directly to another scope of diameters, when designing series.

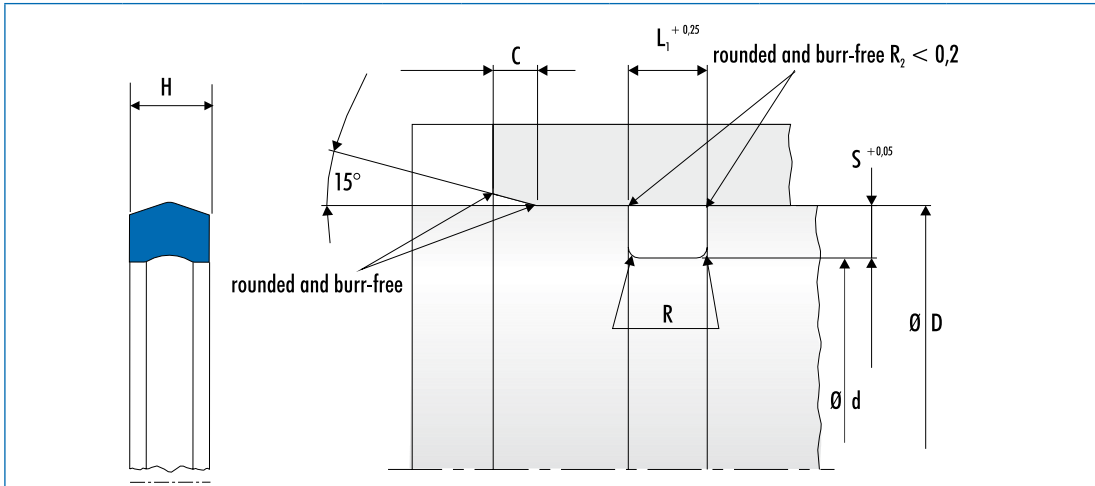
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The Profile ring of the cover seal is clearly preferred due to the stable support provided in the groove bottom. Any squeezing and rotary movements occurring inside the sealing ring under changing pressure as well as a helical distortion of the sealing ring during assembly are precluded, thus providing enhanced functional reliability.

The single-piece symmetrical cover seal design precludes any faulty installation due to twisting or confusion.

Procurement and storing are simplified by the use of the single-piece cover seal.

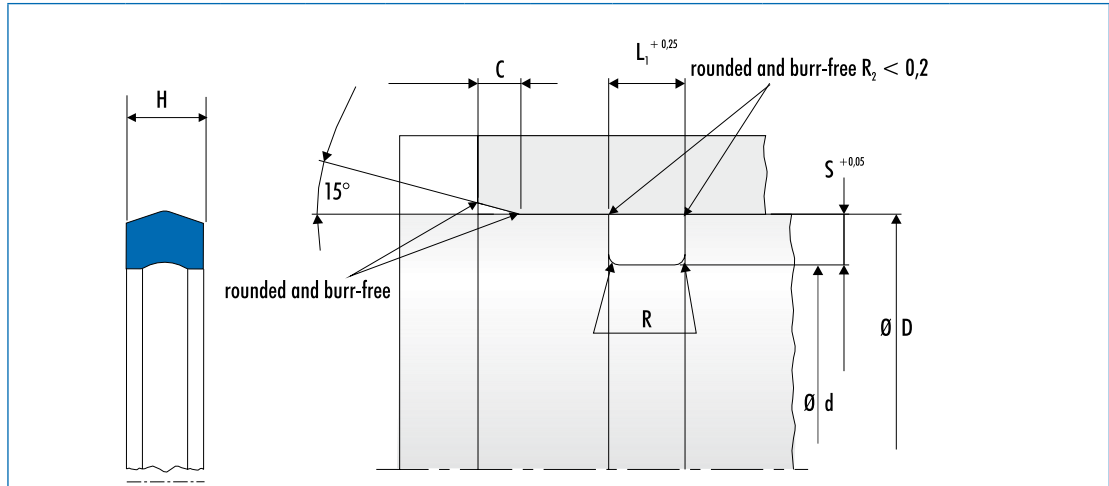
The use of the cover seal makes a vital contribution to the functional reliability and dependability of hydraulic cylinders.



D	d	S	H	L	C	R	O-Ring Housing	Material	Artikel Nr
70	64,4	2,8	5,2	6,2	3,5	0,4	3,53	95 AU V142	532201
75	69,4	2,8	5,2	6,2	3,5	0,4	3,53	95 AU V142	49055316
75	69,6	2,7	5,5	6,5	3,5	0,4	--	95 AU V142	24380803*
85	80,8	2,1	4,2	5	3	0,3	2,62	95 AU V142	24269861*
90	80,1	4,95	6,7	7,8	4	0,6	--	95 AU V142	24362668*
95	86,4	4,3	7,8	9	4	0,6	5,33	94 AU 925	49018330
100	90,1	4,95	6,7	7,8	4	0,6	--	95 AU V142	24362292*
100	91,4	4,3	7,8	9	4	0,6	5,33	95 AU V142	24379356
100	94,4	2,8	5,2	6,2	3,5	0,4	3,53	95 AU V142	532202
105	95,1	4,95	6,7	7,8	4	0,6	--	95 AU V142	24359847*
110	101,4	4,3	7,8	9	4	0,6	5,33	95 AU V142	24380871
115	105,1	4,95	6,7	7,8	4	0,6	--	95 AU V142	24355287*
120	111,4	4,3	7,8	9	4	0,6	5,33	94 AU 925	49017805
122	115,6	3,2	5,7	6,8	4	0,4	4	95 AU V142	49001025*
125	115	4,95	6,7	7,8	4	0,6	--	95 AU V142	24355288*
125	116,4	4,3	7,8	9	4	0,6	5,33	94 AU 925	49026670
130	121,4	4,3	7,8	9	4	0,6	5,33	95 AU V142	528353
140	131,4	4,3	7,8	9	4	0,6	5,33	95 AU V142	49036033
140	134,1	2,95	4,9	5,9	3,5	0,4	--	95 AU V142	24245392*
145	136,4	4,3	7,8	9	4	0,6	5,33	94 AU 925	49017813
150	140,4	4,8	6,6	7,7	4	0,6	--	95 AU V142	24367348*
150	141,4	4,3	7,7	9	4	0,6	5,33	94 AU 925	49054649
160	151,4	4,3	7,8	9	4	0,6	5,33	95 AU V142	49036034
170	161,4	4,3	7,7	9	4	0,6	5,33	94 AU 925	49054650
175	166,4	4,3	7,7	9	4	0,6	5,33	95 AU V142	49067959

* Tools available

Further dimensions are available on request.



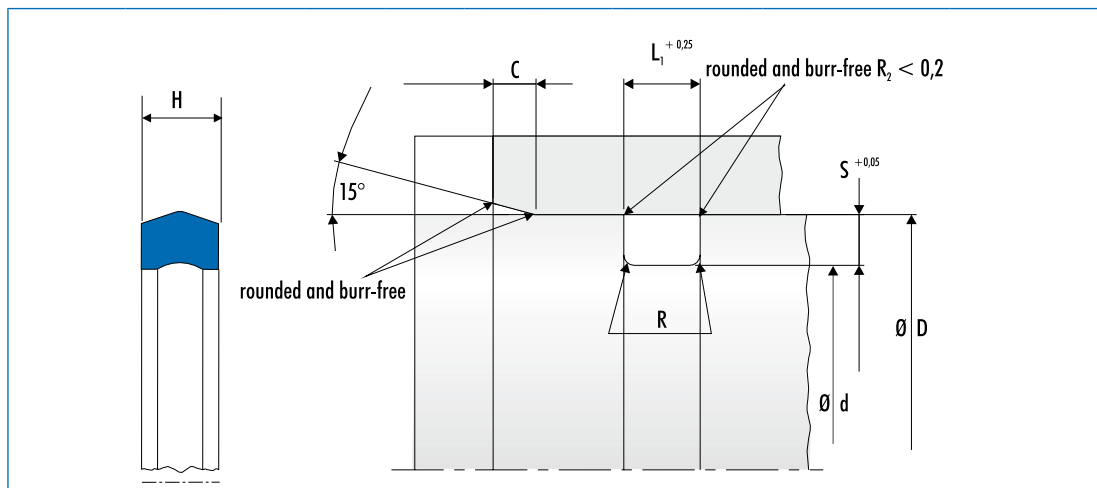
D	d	S	H	L	C	R	O-Ring Housing	Material	Artikel Nr
180	168,4	5,8	10,7	12,3	5	0,6	7	95 AU V142	49041906
180	174,4	2,8	5,2	6,2	3,5	0,4	3,53	95 AU V142	49001429
200	188,4	5,8	10,7	12,3	5	0,6	7	95 AU V142	49041905
200	191,4	4,3	7,8	9	4	0,6	5,33	95 AU V142	49004492
210	201,4	4,3	7,8	9	4	0,6	5,33	94 AU 925	49035972
220	211,4	4,3	7,8	9	4	0,6	5,33	94 AU 925	49017816
225	213,4	5,8	10,7	12,3	5	0,6	7	95 AU V142	49065793
225	216,4	4,3	7,8	9	4	0,6	5,33	95 AU V142	531563
235	226,4	4,3	7,7	9	4	0,6	5,33	94 AU 925	49055809
240	228,4	5,8	10,7	12,3	5	0,6	7	95 AU V142	24375294
240	231,4	4,3	7,8	9	4	0,6	5,33	95 AU V142	24360083
245	236,4	4,3	7,8	9	4	0,6	5,33	94 AU 925	49017817
250	238,4	5,8	10,9	12,3	4,5	0,6	7	94 AU 925	49035973
250	241,4	4,3	7,8	9	4	0,6	5,33	95 AU V142	49022154
260	248,4	5,8	10,7	12,3	5,5	0,6	7	95 AU V142	49055270
265	256,4	4,3	7,6	9	4,5	0,6	5,33	95 AU V142	49055269
270	258,4	5,8	10,7	12,3	5,5	0,6	7	94 AU 925	49004128
270	261,4	4,3	7,7	9	4	0,6	5,33	94 AU 925	49017087
280	268,4	5,8	10,9	12,3	4,5	0,6	7	95 AU V142	49033375
300	288,4	5,8	10,9	12,3	4,5	0,6	7	94 AU 925	49035974
300	294,4	2,8	5,1	6,2	3,5	0,4	3,53	94 AU 925	49057759
310	298,4	5,8	10,7	12,3	5,5	0,6	7	94 AU 925	49038888
310	304,4	2,8	5,1	6,2	4	0,4	3,53	94 AU 925	49065610
320	308,4	5,8	10,7	12,3	5,5	0,6	7	95 AU V142	24369049
330	318,4	5,8	10,9	12,3	4,5	0,6	7	94 AU 925	49027154

Further dimensions are available on request.



D	d	S	H	L	C	R	O-Ring Housing	Material	Artikel Nr
340	328,4	5,8	10,7	12,3	5,5	0,6	7	94 AU 925	49042879
340	331,4	4,3	7,7	9	4	0,6	5,33	95 AU V142	525487
350	338,4	5,8	10,7	12,3	5,5	0,6	7	94 AU 925	49038889
370	364,4	2,8	5,1	6,2	4	0,4	3,53	94 AU 925	49055168
380	368,4	5,8	10,9	12,3	4,5	0,6	7	95 AU V142	49033376
400	388,4	5,8	10,7	12,3	5,5	0,6	7	95 AU V142	532306
410	398,4	5,8	10,7	12,3	5,5	0,6	7	95 AU V142	49001342
420	408,4	5,8	10,7	12,3	5,5	0,6	7	95 AU V142	24379139
430	418,4	5,8	10,9	12,3	4,5	0,6	7	94 AU 925	49027155
440	426,6	6,7	11,8	13,6	6	0,6	8	95 AU V142	49064701
440	428,4	5,8	10,9	12,3	4,5	0,6	7	94 AU 925	49030619
460	448,4	5,8	10,9	12,3	4,5	0,6	7	94 AU 925	49023288
470	458,4	5,8	10,7	12,3	5,5	0,6	7	94 AU 925	49021561
480	463	8,5	14,4	16,3	7	0,6	10	94 AU 925	49004706
480	468,4	5,8	10,9	12,3	4,5	0,6	7	94 AU 925	49025771
490	478,4	5,8	10,9	12,3	4,5	0,6	7	95 AU V142	49033377
490	480,2	4,9	9,1	10,8	5	0,6	6	94 AU 925	49063768
500	488,4	5,8	10,7	12,3	5,5	0,6	7	95 AU V142	530849
520	508,4	5,8	10,6	12,3	5,5	0,6	7	95 AU V142	532963
530	516,6	6,7	11,8	13,6	6	0,6	8	94 AU 925	49063665
530	518,4	5,8	10,6	12,3	5,5	0,6	7	94 AU 925	529838
540	528,4	5,8	10,9	12,3	5,5	0,6	7	94 AU 925	49038886
550	536,6	6,7	11,8	13,6	6	0,6	8	94 AU 925	49000360
560	548,4	5,8	10,9	12,3	4,5	0,6	7	94 AU 925	49027156
570	556,6	6,7	11,8	13,6	6	0,6	8	94 AU 925	49007603
580	566,6	6,7	11,8	13,6	6	0,6	8	94 AU 925	531187
620	606,6	6,7	11,8	13,6	6	0,6	8	94 AU 925	49043022
660	643	8,5	14,4	16,3	7	0,6	10	94 AU 925	49012006
660	648,4	5,8	10,6	12,3	5,5	0,6	7	94 AU 925	49061677
670	658,4	5,8	10,6	12,3	5,5	0,6	7	94 AU 925	49044029
680	668,4	5,8	10,6	12,3	5,5	0,6	7	94 AU 925	49038887
690	673	8,5	14,4	16,3	7	0,6	10	94 AU 925	49026186
700	683	8,5	14,4	16,3	7	0,6	10	94 AU 925	49035978
740	723	8,5	14,4	16,3	7	0,6	10	94 AU 925	49026187
800	788,4	5,8	10,6	12,3	5,5	0,6	7	94 AU 925	532200
810	793	8,5	14,4	16,3	7	0,6	10	94 AU 925	49015798
830	813	8,5	15,6	16,3	7	0,6	10	94 AU 925	24361263
860	843	8,5	14,4	16,3	7	0,6	10	94 AU 925	49015799

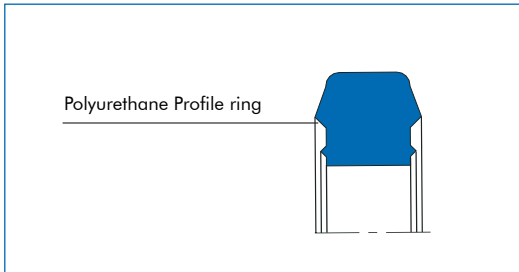
Further dimensions are available on request.



D	d	S	H	L	C	R	O-Ring Housing	Material	Artikel Nr
860	848,4	5,8	10,6	12,3	5,5	0,6	7	94 AU 925	49055913
960	943	8,5	14,4	16,3	7	0,6	10	94 AU 925	49012180
990	973	8,5	14,4	16,3	7	0,6	10	94 AU 925	49041212
1100	1083	8,5	14,4	16,3	7	0,6	10	94 AU 925	49045388
1130	1113	8,5	14,4	16,3	7	0,6	10	94 AU 925	49039216
1240	1223	8,5	14,4	16,3	7	0,6	10	94 AU 925	49067402
1600	1583	8,5	14,4	16,3	7	0,6	10	94 AU 925	49026051
1610	1593	8,5	14,4	16,3	7	0,6	10	94 AU 925	49040363
1620	1603	8,5	14,4	16,3	7	0,6	10	94 AU 925	49062532

Further dimensions are available on request.

Merkel Stircomatic SRC



Product description

Single-piece compact seal made of polyurethane for static sealing, axially sealing component.

Product advantages

- Interchangeable with housings for O-ring and O-ring with back-up ring
- Firm seat inside the housing provided by optimally designed sealing edges (stress distribution)
- High degree of functional reliability provided by the sturdy Profile ring made of polyurethane
- Functional reliability resulting from a great resistance to extrusion (dimensional stability)
- Simple and safe assembly
- Gastight

Material

Material	Designation	Color
Polyurethane	95 AU V142	dark blue
Polyurethane	94 AU 925	light blue

The material is determined on the basis of the nominal diameter and the manufacturing process.

Applications

- Negative pressure (flowing medium)
- Pulsating pressure
- High operating pressure (up to 80 MPa)
- Nominal diameter up to 2,000mm

Operating conditions

Material	95 AU V142/94 AU 925
Hydraulic oils, HL, HLP	-30 ... +110 °C
HFA fluids	+5 ... +50 °C
HFB fluids	+5 ... +50 °C
HFC fluids	-30 ... +40 °C
HFD fluids	-
Water	+5 ... +40 °C
HETG (rape-seed oil)	-30 ... +60 °C
HEES (synth. ester)	-30 ... +60 °C
HEPG (glycol)	-30 ... +40 °C
Mineral greases	-30 ... +110 °C
Pressure	80 MPa

The figures given are maximum values and must not be applied simultaneously.

Surface finish

Peak-to-valley heights	R _a	R _{max}
Sealing surfaces	<1,6 μm	<6,3 μm
Groove sides	<6,3 μm	<20 μm

More accurate values for Ra and Rmax should be set within the sealing surfaces for applications requiring gastight operation.

Tolerances

Diameter	Tolerance
d	h10
D	H9

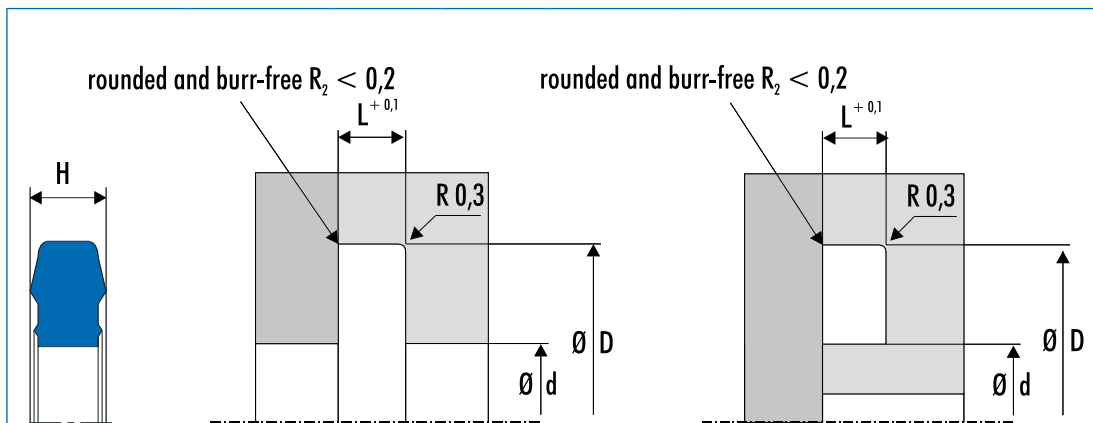
Design notes

The housing for the Stircomatic SRC may be designed with an aperture in inner diameter direction or in the form of an axial recess. Pressure is applied from the interior.

Please note our general remarks on design in the *Merkel Technical Manual*.

Installation & assembly

Please note our general remarks on the installation of hydraulic seals in the *Merkel Technical Manual*.



All non-dimensioned edges rounded and burr-free.

D	d	H	L	Profile	Material	Article No.
68	60	3,1	2,5	4	95 AU V142	24367175
70	60	5	4	5	95 AU V142	24374887
71	61	3,8	3	5	95 AU V142	532061
81	72	3,5	2,8	4,5	95 AU V142	24379365
83	75	3,1	2,5	4	95 AU V142	24367176
87	77	3,8	3	5	95 AU V142	532062
94	86	3,1	2,5	4	95 AU V142	24367639
100	90	3,8	3	5	95 AU V142	532063
110	102	3,1	2,5	4	95 AU V142	49031644
126	114	5	4	6	95 AU V142	532065
130	122	3,1	2,5	4	95 AU V142	49031645
140	132	3,1	2,5	4	95 AU V142	49031646
169	157	5	4	6	95 AU V142	532066
234	218	7,5	6	8	95 AU V142	532067
260	235,4	7,25	5,8	12,3	95 AU V142	49043603
287	271	7,5	6	8	95 AU V142	532068
290	265,4	7,25	5,8	12,3	95 AU V142	49017429
313	300	5	4	6,5	95 AU V142	49029021
320	295,4	7,25	5,8	12,3	95 AU V142	49017430
338	322	7,5	6	8	95 AU V142	532069
340	315,4	7,25	5,8	12,3	95 AU V142	49065865
360	335,4	7,25	5,8	12,3	95 AU 925,00	49017431
370	349,4	7,25	5,8	10,3	94 AU 925,00	49031386
370	345	7,1	5,7	12,5	94 AU 925,00	49026142
421	405	7,5	6	8	95 AU V142	532071
430	405	7,05	5,7	12,5	94 AU 925,00	49015833

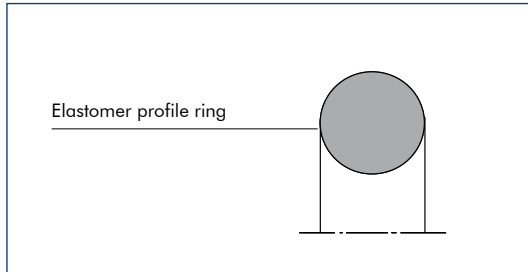
Further dimensions are available on request.



D	d	H	L	Profile	Material	Article No.
440	415,4	7,25	5,8	12,3	95 AU V142	49017432
485	460,4	7,3	5,8	12,3	95 AU V142	49016295
490	469,4	7,25	5,8	10,3	94 AU 925,00	49045102
540	512,8	8,35	6,7	13,6	94 AU 925,00	49017433
570	542,8	8,35	6,7	13,6	94 AU 925,00	49026033
570,5	551,8	7,25	5,8	9,35	94 AU 925,00	49017176
615	587,8	8,35	6,7	13,6	94 AU 925,00	49017434
675	647,8	8,35	6,7	13,6	94 AU 925,00	49017435
750	725	8,95	7,2	12,5	94 AU 925,00	49017436
820	795	8,95	7,2	12,5	94 AU 925,00	49032358
830	809,4	8,85	7,1	10,3	94 AU 925,00	49026599
840	815	8,95	7,2	12,5	94 AU 925,00	49028615
975	955	9,3	7,5	10	94 AU 925,00	49062359
1020	995	8,95	7,2	12,5	94 AU 925,00	49031377
1040	1015	8,95	7,2	12,5	94 AU 925,00	49017437
1050	1025	8,95	7,2	12,5	94 AU 925,00	49022201
1070	1045	8,95	7,2	12,5	94 AU 925,00	49021822
1090	1065	8,95	7,2	12,5	94 AU 925,00	49045105
1140	1115	8,95	7,2	12,5	94 AU 925,00	49017438
1530	1513,2	7,1	5,7	8,4	94 AU 925,00	49043233
1540	1523,2	7,1	5,7	8,4	94 AU 925,00	49040364
1550	1533,2	7,1	5,7	8,4	94 AU 925,00	49026072
1585	1568,2	7,1	5,7	8,4	94 AU 925,00	49062554

Further dimensions are available on request.

O-Rings



Product description

O-rings are multi-purpose seals which are mainly used as static sealing elements.

Product advantages

O-rings suffer permanent deformation (compression set). Since O-rings with a small cord diameter (diameter d2) have a relatively high compression set, use of O-rings with the largest possible cord diameter is to be recommended. The table shows the recommended cord diameter

Material

In order to cover the widest possible range of technical applications, O-rings are supplied in various different material qualities.

Applications

O-rings are mainly used to seal stationary machine components - static seals - against fluid and gaseous media. In certain conditions, they can also be used as a dynamic sealing component for axial, rotating and oscillating movement.

Surface finish

Surface roughness	R_a	R_{max}
Sealing surface	<1,6 μm	<6,3 μm
Groove base	<1,6 μm	<6,3 μm
Sides of groove	<6,3 μm	<10,0 μm
Lead-in chamfer	<0,6 μm	<5,0 μm

Recommended cord diameters

$\varnothing d / \varnothing D$	Cord diameters															
	1,5	1,78	2	2,5	2,62	3	3,5 - 3,53	4	5	5,33	6	6,99 - 7,0	8	8,4	10	13
18	+	x	+	+	+	+	+									
>18 ... 30	+	+	+	+	x	+	+									
>30 ... 35		+	+	+	x	+	+									
>35 ... 45			+	+	x	+	+									
>45 ... 50				+	x	+	+									
>50 ... 63				+	+	+	x									
>63 ... 80						+	x	+								
>80 ... 100						+	+	+	+	x						
>100 ... 200						+	+	+	+	x	+					
>200 ... 250								x	+	x	+	+	+	+	+	
>250 ... 300									+	+	+	x	+	+	+	
>300 ... 400										+	+	x	+	+	+	
>400 ... 500											+	x	+	+	+	
>500											+	+	+	x	x	x

x recommended dimension + other usable dimension

The t and b housing dimensions depend on the O-ring cord diameter d2. If anti-extrusion rings are used, dimension b should be increased accordingly.

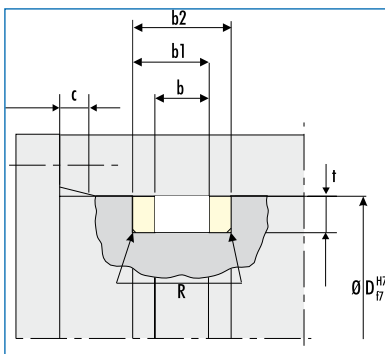
Ø d	Type of installation 1 or 2				Type of installation 3		R		c
	t + 0,05	b + 0,25	b1 + 0,25	b2 + 0,25	t + 0,05	b + 0,25	R'	R''	
1,50	1,20	2,10	3,50	4,90	1,10	2,30	0,30	0,30	1,50
1,78	1,40	2,40	3,80	5,20	1,30	2,60	0,30	0,30	1,50
2,00	1,60	2,60	4,00	6,00	1,50	2,80	0,30	0,30	2,00
2,50	2,00	3,40	4,80	6,20	1,90	3,60	0,30	0,30	2,00
2,62	2,10	3,60	5,00	6,40	2,00	3,80	0,30	0,30	2,00
3,00	2,40	4,00	5,40	6,80	2,30	4,20	0,60	0,40	2,50
3,50	2,80	4,70	6,10	7,50	2,70	4,90	0,60	0,40	2,50
3,53	2,80	4,80	6,20	7,60	2,70	5,00	0,60	0,40	2,50
4,00	3,20	5,40	6,80	8,20	3,10	5,60	0,60	0,40	3,00
5,00	4,10	6,60	8,50	10,40	4,00	6,80	0,60	0,40	3,00
5,33	4,30	7,10	9,00	10,90	4,20	7,30	1,00	0,60	4,00
6,00	4,90	8,00	10,80	13,60	4,70	8,20	1,00	0,60	4,00
6,99	5,80	9,50	12,30	15,10	5,70	9,70	1,00	0,60	4,00
7,00	5,80	9,50	12,30	15,10	5,70	9,70	1,00	0,60	4,00
8,00	6,70	10,80	13,60	16,40	6,50	11,00	1,00	0,60	5,00
8,40	7,10	11,40	14,20	17,00	6,90	11,60	1,00	0,60	5,00
10,00	8,50	13,50	16,30	19,10	8,30	13,70	1,00	0,60	5,00
12,00	10,40	15,80	18,60	21,40	10,20	16,00	1,00	0,60	7,00

R' = without anti-extrusion ring

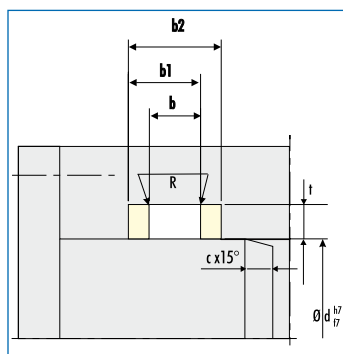
R'' = with anti-extrusion ring

c = lead-in chamfer

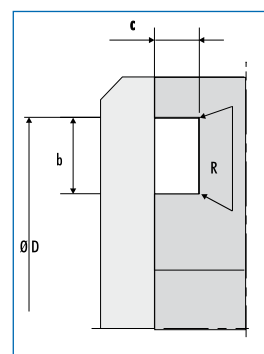
Type of installation 1



Type of installation 2



Type of installation 3



Sectoral solutions

Merkel Freudenberg Fluidtechnic aspires to develop and produce seals and to offer them with comprehensive service in order to fulfill current customer requirements to the greatest extent possible.

In order to live up to this aspiration Merkel has specialised in providing seals and sealing systems for heavy industry. The individual components are optimally matched to each other in terms of material and functionality,

as all individual seals are also developed as integral solutions. Long service lives and high media resistance are ensured by a choice of material and profile design selected to suit the respective industry.



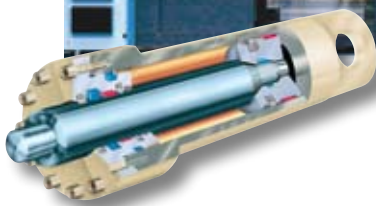
Merkel seals and sealing systems in the steel and non-ferrous metal industry:

the longest service lives, even under the toughest environmental conditions



Merkel seals and sealing systems in the plastics processing industry:

high dependability, even with more than 2.5 million load alternations per year





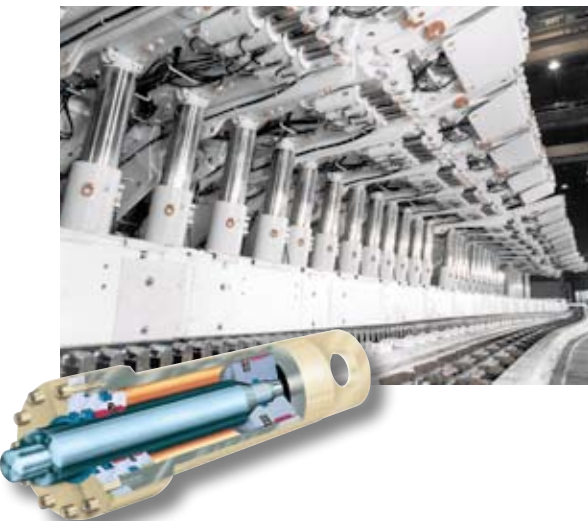
Merkel seals and sealing systems in the paper manufacture:

high dependability under high speeds and abrasive media



Merkel seals and sealing systems in steel hydraulics engineering or shipbuilding:

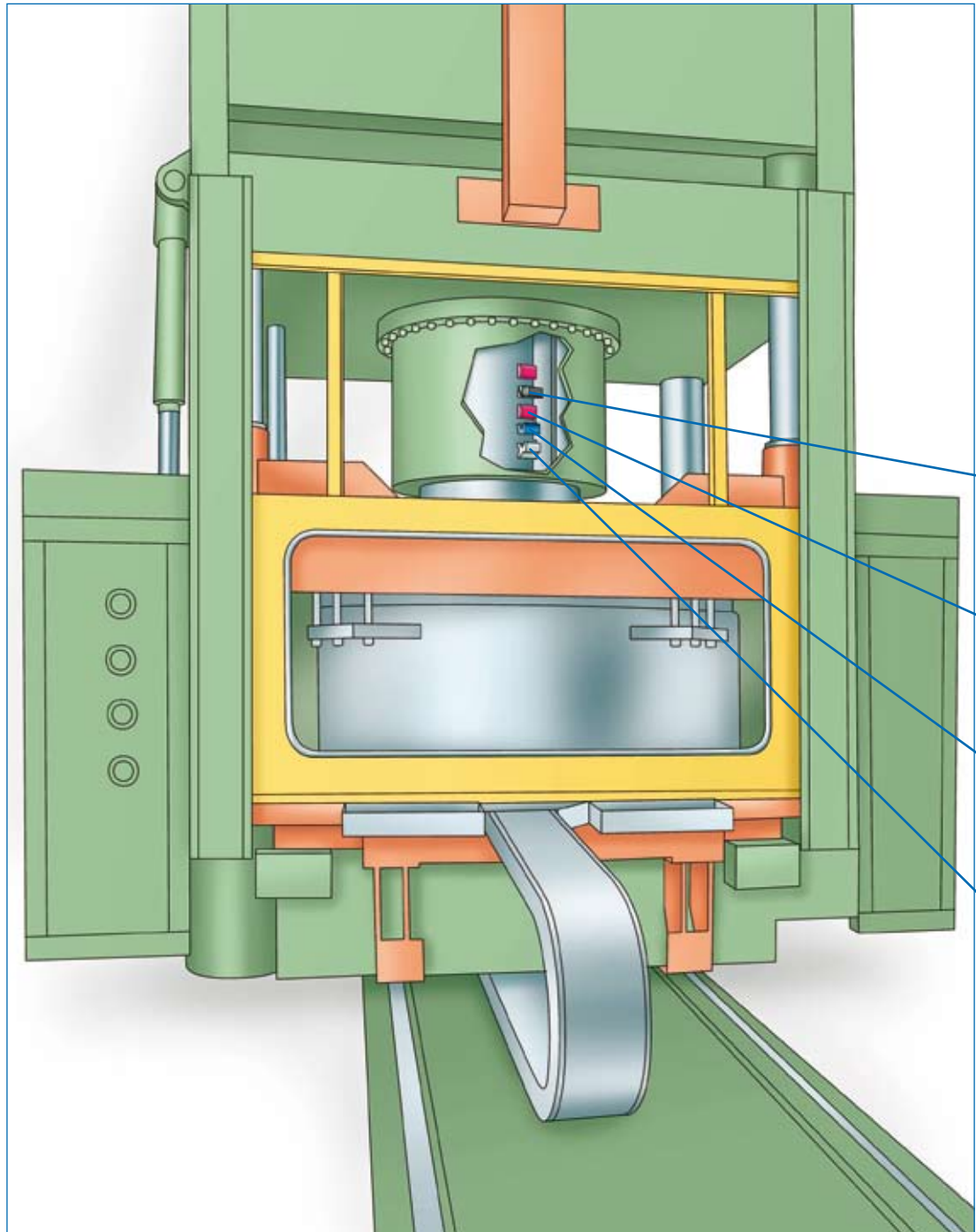
high dependability, even with long maintenance intervals



Merkel seals and sealing systems in special machine-building:

high reliability under extreme demands and harsh environmental influences

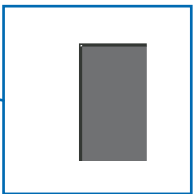
Merkel Sealing Systems for Large Size Presses



Germany's largest vacuum chamber press is reliably performing at Merkel Freudenberg Fluidtechnik in Hamburg. Merkel as the operator is simultaneously also the supplier of the sealing system needed to run the main cylinder of this press. The sealing system perfectly matches with the special re-

quirements involved: long-term and stable holding of the high working pressure, and standing against high temperatures due to the vulcanization process involved. The Merkel sealing system ideally offers an optimum regarding sealing function and lifetime.

The field-proven Merkel rod sealing system for highest functional reliability.



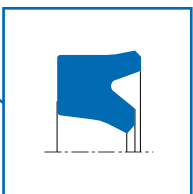
Merkel Omegat OMS-S

- Very high stability under pressure
- Low friction, stick-slip free
- High torsional safety



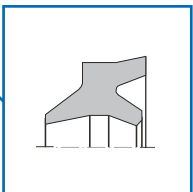
Merkel Guide Bushes Guivex SBK

- Excellent sliding behavior over a short guiding distance (no jamming)
- High radial load capacity
- Reduced propensity for stick-slip



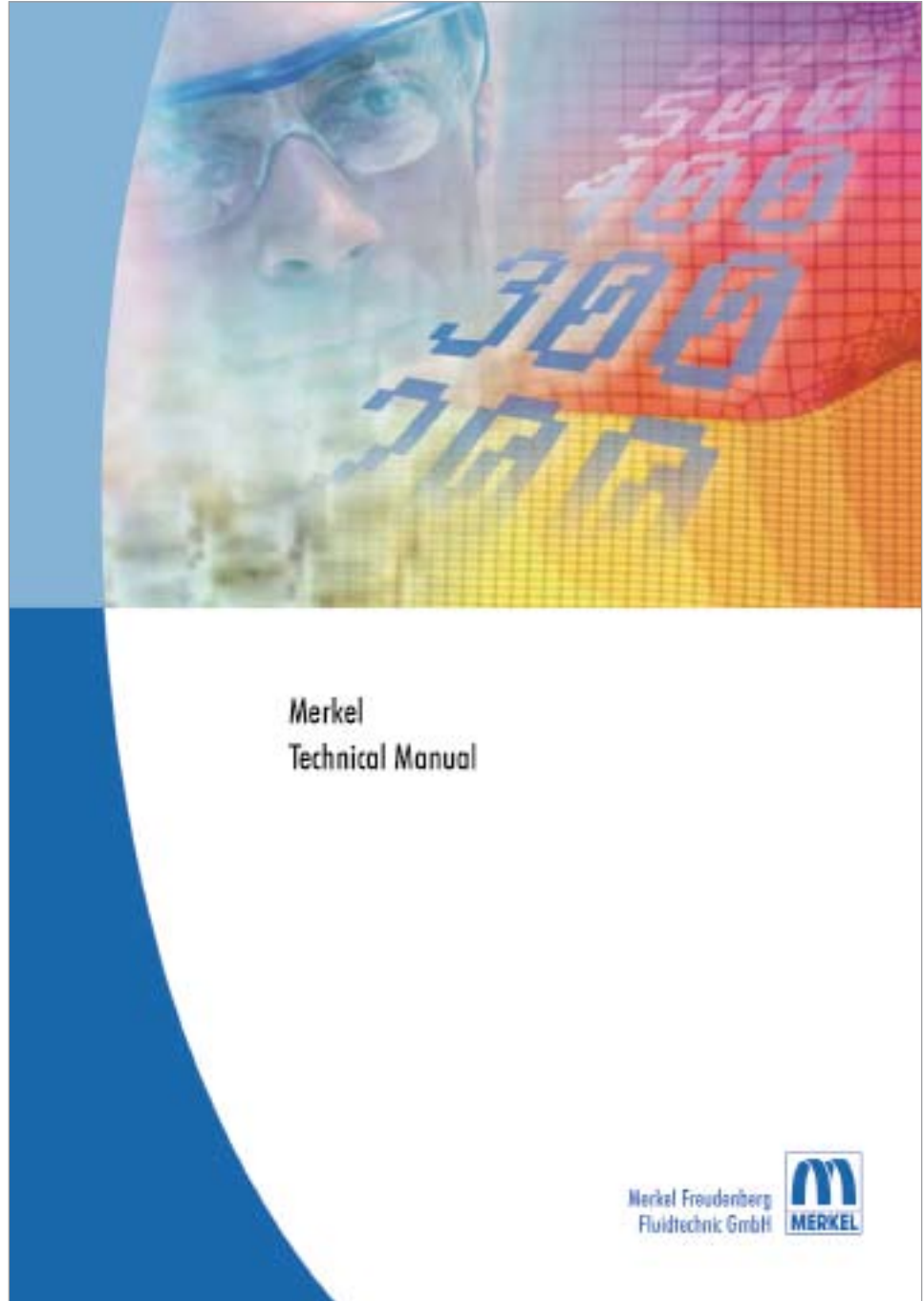
Merkel Polyurethane U-Ring T 20

- Wide operating temperature range
- Dynamic deformation value
- Very good static and dynamic tightness



Merkel Double Wiper P 9

- Wear resistant
- high wiper effect against dirt
- very good sealing effect against residual oil film on



Merkel Technical Manual

The Merkel Technical Manual includes data and descriptions regarding technical fundamental principles, sealing mechanisms and factors of influence, materials and resistance values as well as the installation of hydraulic seals. Please order with No.: 15 DE MHI.

Merkel - by your side around the globe

Merkel Quality & Value

Boost your success with our sealing expertise:

- Perfect sealing technology for top productivity
- Leading material know-how
- Extrusion-proof products with a long service life and extended service intervals
- Absolute functional reliability of the seals under the most diversified and extremely stringent conditions
- Experience gathered in sealing technology since 1899

Merkel Service

Take advantage of our excellent services worldwide:

- 120,000 widely diversified products
- Very high degree of availability, prompt worldwide supplies
- Built-to-order; rapid, tailor-made, economical
- Optimum solutions for challenging special applications
- Individual test series under genuine conditions
- Immediate assistance in the event of repairs

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