Axial Shaft Seals

DIN EN ISO 9001:2000

Catalogue AE 4804

HIRSCHMANN

Introduction

Production range:
In addition to the axial shaft seals in production since 1970, rod ends and spherical bearings, clamping and handling systems for sinking and wire edm are produced by HIRSCHMANN. Crucial to the successful expansion of this comprehensive range of products is the use of up-to-date development and production methods. This is the case at HIRSCHMANN, and great care is taken to ensure on going development.

General information:
This catalogue is based on the latest in development and production. Diverging information in older documents no longer applies. We reserve the right to make modifications in the interests of continuous development of our products. Reprints and extracts shall only be permitted with our approval. Particular care was taken when compiling this catalolgue to ensure clarity of layout and above all for suitalility for the needs of the designer.

Standard designs:
The axial shaft seals shown and described in this catalogue are made of Perbunan® in their standard version and are held in stock. Viton® fluoroelastomers seals are made to order, so that short delays might occur before delivery.

Special designs:
In addition to standard design, we produce – regardless of the quantity – special sizes of up to 540 mm diameter as well as tailor – made ones.

Warranty:
All the information contained in this catalogue is the result of years of experience in the manufacture and use of axial shaft seals. Nevertheless, unknown parameters and practical conditions of use can considerably reduce the validity of these general statements, so that the user must conduct practical tests. The multitude of applications for axial shaft seals mean that we cannot accept any liability for the correctness of our recommendations in individual instances.

Quality according to DIN EN ISO 9001:
All HIRSCHMANN GMBH axial shaft seals are produced using the latest and most reliable production methods, and are subject to quality assurance measures as per DIN EN ISO 9001 both during production and in the product stage.

Advisory service and sales:
Our staff and the sales engineers at our agencies and dealers in Germany and abroad (Page 15), all of whom have their own stocks, would be pleased to assist you at any time.

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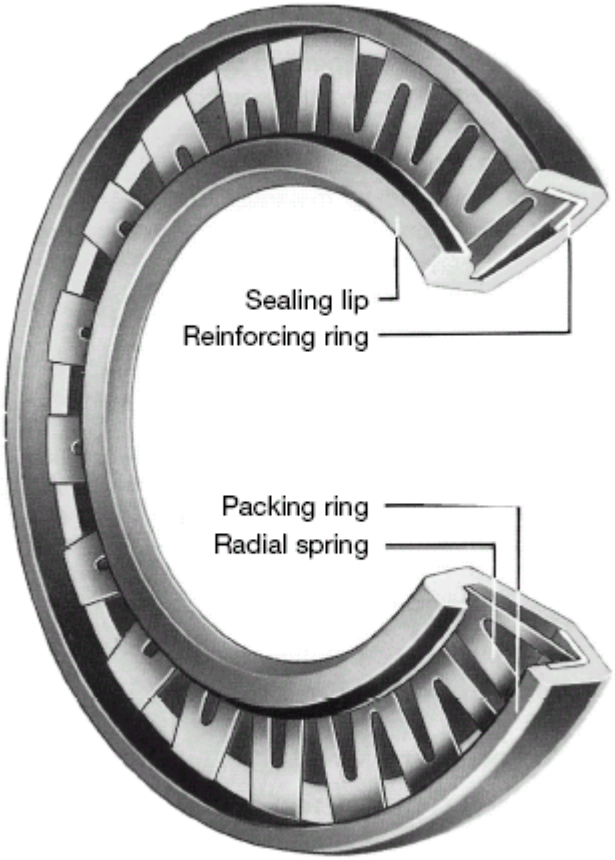
HIRSCHMANN GMBH

Guide to selection



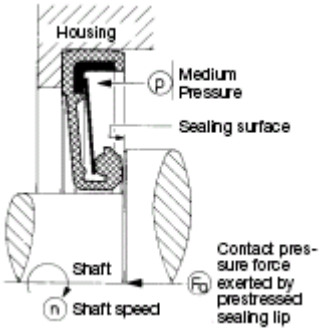
- **Minimum friction**
- **Minimum heat-up**
- **Minimum space requirement**
- **Easy installation**
- **High heat resistance**
- **High chemical resistance**
- **High rubbing speed**
- **Long life**

Axial shaft seals do not seal radially on the shaft, but are installed on the shaft or in a bearing seat and provide their sealing effect on any hardened and ground, axial mating surface. For this reason, there is no shaft wear.

Hardened and ground shaft collars or ends, as well as counter-rotating washers or the unstamped faces of antifriction bearings, are especially well suited as the mating surface.

The sealing lip is of tapered design in order to keep heatup, wear and friction to a minimum. Its sturdy configuration ensures proper contact.

The packing ring and the radial spring acting against the rear of the sealing lip ensure uniform, vibrationfree pressure.



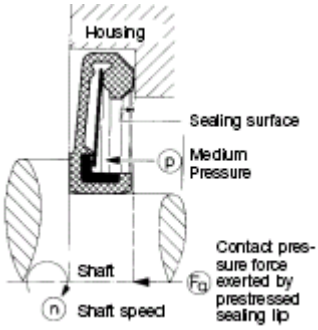
Type VI

Axial shaft seal with internal sealing lip, mainly for use with liquids.

The seal usually employed in a stationery manner, i.e. with a rotating shaft. Care should be taken to ensure that the sealing lip does not run dry. Should this be unavoidable, please contact us.

This limits for speed n, as well as for the pressure p of the medium and the contact pressure force Fa of the sealing lip, with full utilization of the sealing lip prestressing effect, are contained on pages 8 and 10.

By increasing the spring force, it is possible to raise the medium pressure by up to 50%, however this can result in greater friction and heat-up, and consequently in faster wear.



Type VA

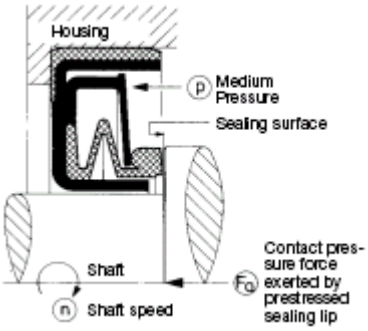
Axial shaft seal with external sealing lip, for use with grease. At low peripheral speeds and very good – if possible, lapped – mating surfaces, it can also be used with liquids.

This seal can be employed in either a stationery or rotating manner.

The limit for speed n, as well as for the pressure p of the medium and the contact pressure force Fa of the sealing lip, with full utilization of the sealing lip prestressing effect, are contained on pages 9 and 11.

For use with liquids, the maximum permissible speed must be reduced to 1/3 of the figure indicated in the table.

By increasing the spring force, it is possible to raise the medium pressure by up to 50%, however this can result in greater friction and heat-up, and consequently in faster wear.



Type DI

Axial shaft seal with internal sealing lip, for use with liquids under high pressure. This seal operates in accordance with the “knuckle action” principle, i.e. the pressure build-up on the medium side is partly reversed by the appropriately designed packing ring, thereby pressing the sealing lip against the mating surface.

The limits for speed, pressure and contact pressure force, with full utilization of the prestressed sealing lip, are contained on page 12.

Technical notes

Material:

Materials are selected on the basis of their chemical and thermal stability relative to the medium to the sealed.
The table of resistance on page 5 schedules the elastomers customarily employed by us. In most applications, PERBUNAN seals are employed. Care should also be taken to determine whether the anti-corrosive properties of the metallic components are sufficient.

Protection against corrosion:

In the standard models, the reinforcing ring is of phosphatised deep-drawn sheet and the radial spring from size 111 or 211 upward of bright-drawn spring strip steel. Seal sizes 100 to 110 and 200 to 210 are equipped with radial springs of stainless spring strip steel as standard.
From size 111 or 211 upward, the seals can also be equipped with stainless radial springs upon request.
Radial springs of spring-hard brass sheet are frequently employed for special sizes and designs.

Dependability of seal:

In order to ensure a dependable sealing effect, the pressureexerted by the medium to the sealed may not lift thesealing lip up off the mating surface. The maximum permissiblepressure per seal size can be seen from the tables on pages 8 to 12. It is only permissible to increase the sealing lip prestress by increasing the spring force if a dependable seal cannot be ensured in any other manner. Otherwise, an increase in the sealing lip prestress would result in unnecessary friction and heat-up, leading to unnecessary wear.

Peripheral and rotational speed:

In order to avoid unnecessary heat-up and wear of the sealing lip, it is necessary to limit the peripheral speed at the sealing lip in accordance with the selected seal material.
The permissible values are contained on page 5. The permissible rotational speeds for Perbunan® and Viton®, by seal size, can be seen from the tables on pages 8 to 12. The diagram on page 6 provides a rapid overview for Perbunan®.

Friction and dissipated output:
In order to determine the required drive output, information is necessary regarding the coefficient of friction at start-up and the dissipated output under normal operating conditions. During start-up, static friction is initially encountered, followed by dynamic friction. The coefficient for static friction is assumed to be μo = 0.48, the coefficient for dynamic friction a maximum of p = 0.24 (0.12–0.24). These figures apply for lubricated steel/PERBUNAN
and steel/VITON sealing surfaces.

Friction	$M_{RO} = 5 \cdot 10^{-4} \cdot F_a \cdot d_m \cdot \mu_o$	[J]
Dissipated output	$P_R = 52.5 \cdot 10^{-6} \; F_a \cdot d_m \cdot n \cdot \mu$	[W]

Fa = contact pressure force of the sealing lip [N]
dm = mean diameter of sealing lip [mm]
n = speed [min-1]
μo = Coefficient of friction, static
μ = Coefficient of friction, dynamic

Permissible peripheral speed:

The peripheral speed at the sealing lip may not exceed the following values:

Type VI:	Perbunan®	20 m/s
	Viton®	30 m/s
Type VA:	Perbunan®	10 m/s
	Viton®	15 m/s
Type DI:	Perbunan®	9 m/s
	Viton®	13 m/s

These values assume sufficient lubrication and heat dissipation at the sealing surface. Should these conditions not be provided, the limits shown at the left must be appropriately reduced, in accordance with the specific application.

Designations employed, with the corresponding SI units:

Peripheral speed:	v	m/s
Speed:	n	min-1
Axial force:	Fa	N
Pressure:	p	Pa
Moment of friction:	MRO	J
Dissipated output:	PR	W
Width/length, Diameter:	b, l, d	mm
Coefficient of friction, static:	μo	—
Coefficient of friction, dynamic	μ	—

Conversion of units: 1 N = 0,102 kp
1 Pa = 0,102 mmWG = 10-5 bar
1 J = 0,102 kpm = 1 Nm
1 W = 1,36 · 10-3 PS

Table of resistances

Material	Perbunan®	Viton®
Composition	NBR Aerylonitrile-butadiene rubber	FKM Fluorelastomer rubber
Colour	VI black/VA anthracite	Anthracite
Distinguishing mark	— White	Yellow dot
Temperature range in °C (at the sealing lip)	–30° to +120° C	–25° to +250° C
Shore hardness	75 ± 5 Shore A 75	75 ± 5 Shore A
Abrasion resistance to DIN 53516	very good	good
Flame resistant	no	yes
Gas permeability	—	xxx
Weather (light, ozone)	x	xxxx
Water below 100° C	xxx	xxxx
Lubrication oils	xxxx	xxxx
Hydraulic oils	x to xxxx	xxxx
Fuel oils	xx	xxxx
Silicon oils and greases	xx	xxxx
Animal and vegetable fats	xxxx	xxxx
Brake fluidsn	—	x
Petrol	xxx	xxxx
High-octane petrol	xx	xxxx
Kerosene	xxx	xxxx
Alcohols x to	xxxx	x to xxxx
Aromatic hydrocarbons	x	xxxx
Aliphatic hydrocarbons	xxx	xxxx
Chlorinated hydrocarbons	x	xxxx
Acids (organic)	—	—
Acids (inorganic)	— to xxx	— to xxx
Alkalis	x to xx	x to xx

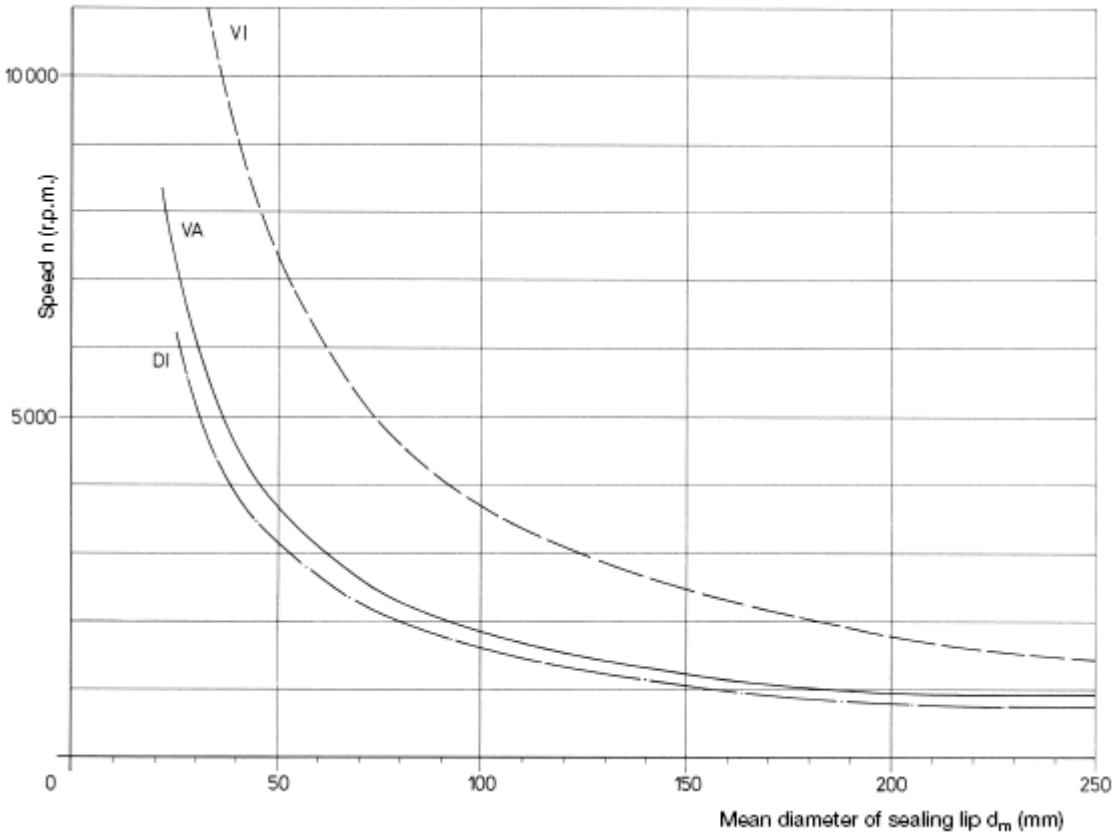
Explanation of symbols:

xxxx	Very good
xxx	Good
xx	Average
x	Limited
—	Unsuitable

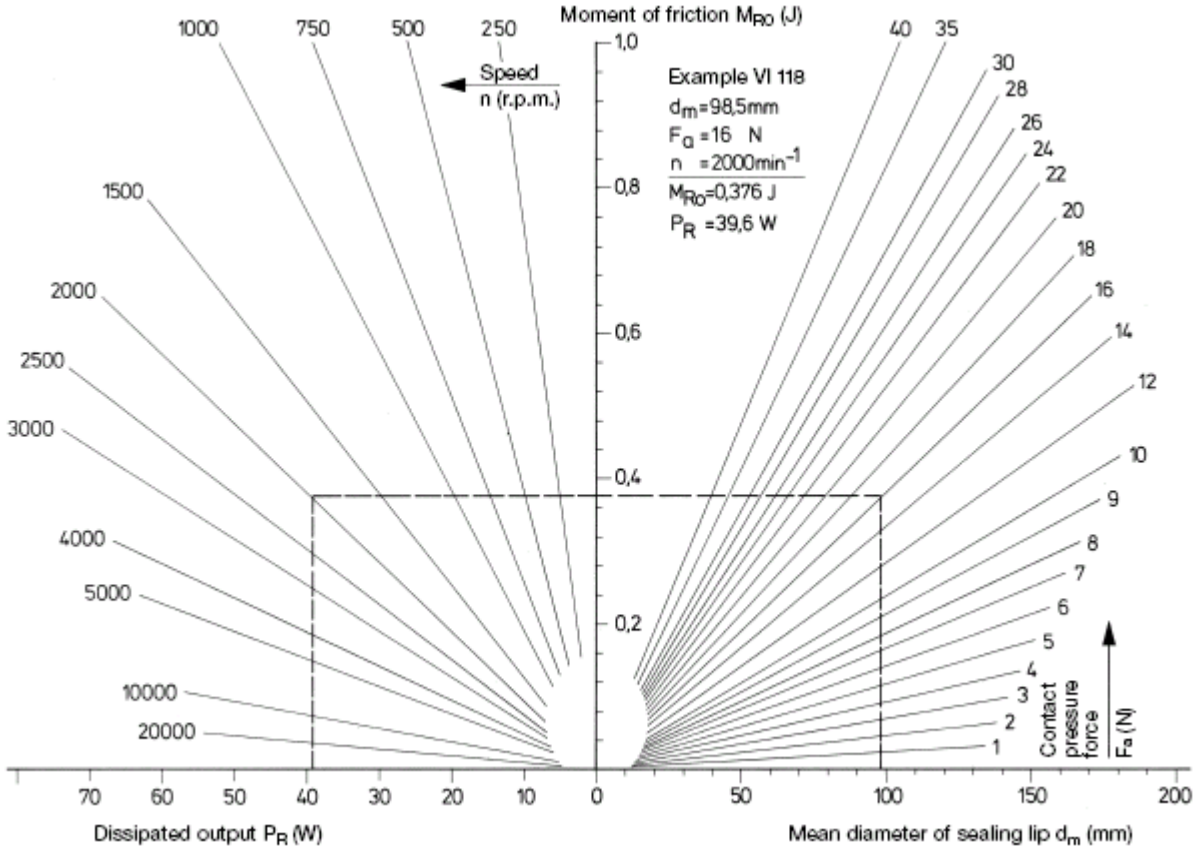
Registrated Trademarks:
Viton® is a registered trademark of DuPont Dow Elastomers.
Perbunan® is a registered trademark of Bayer AG Leverkusen

Diagramm

Permissible speed for Perbunan:



Coefficient of friction dissipated output:



Installation guide

Sealing surface – mating surface

The unstamped, hardened and factory-ground faces of antifriction bearings or appropriately machined shaft collars and ends as well as support washers, thrust needlebearing washers or washers stamped from spring sheet or other economical solutions are suitable as the sealing surface. Steel, brass, bronze, aluminium alloys and ceramic can be employed as the materials.

Properties of the sealing surface:

The sealing surface must be perfectly smooth and hard and may not contain any spiral grooves or scratches. Surface hardness for steel, greater than HRC = 40, or less for other materials.

Maximum surface roughness for use with oil Rt = 4 µm, or Rt = 10 µm for use with grease.

The radial out-of-true of the sealing surface has no effect on the sealing properties, the permissible axial out-oftrue can – referred to the permissible speed – be up to 0.05mm for use with grease or up to 0.03 mm for use with oil.

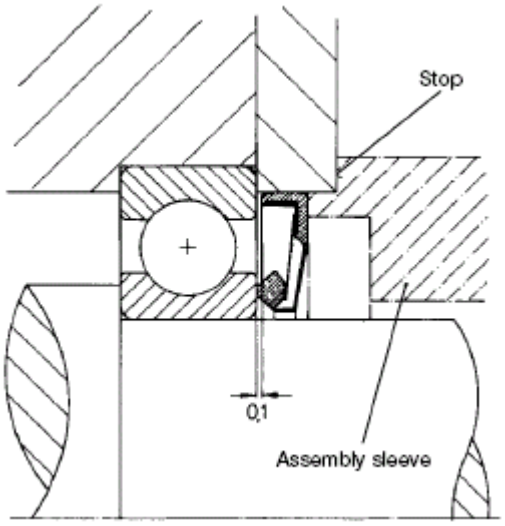
Installation tolerances:

The reception holes of Types VI and DI should be fabricatedin accordance with ISA H 9 and the shaft diameterfor Type VA in accordance with ISA h 9.
The reception hole and the shaft must be chamfered approx. 150 for at least 1 mm. The tolerances for the functional dimensions of the seals ares shown in the tables pages 8 to 12.

Installation/assembly:

In most cases “blind installation” is unavoidable, i.e. uniform seating of the sealing lip on the mating surface cannot be checked visually.

Proper installation and assembly can be ensured if the axial shaft seal is inserted flat with the aid of an assembly sleeve or washer, so as to insure that the sealing lip cannot be damaged or distorted. Prior to inserting the seal, clean and lightly lubricate the sealing surface in order to keep wear to a minimum during in running-in-phase.



The best seal is obtained when the pre-stressed sealing lip is located on the same plane as the end fase of the seal, or does not protrude more than 0.1 mm.

When using a mating washer, insure that the medium to be sealed cannot egress between washer and shaft.

Seals should not be reused after having been removed, as removal usually deform the seal or damages vital areas of it.

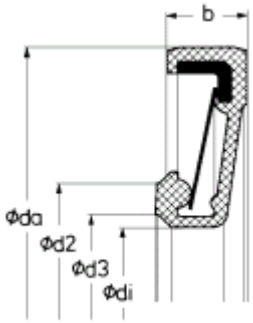
Seal storage:

Until being installed, the axial shaft seal should be stored in a dry area, in the original packaging if possible. Under no circumstances may they be lined up on wire ring or stored in a similar manner, as this could damage or deform the sensitive sealing lips. When staking axial shaft seals, care should be taken to ensure that they are stacked sealing lip to sealing lip or packing ring back to back.

Improper handling of the axial shaft seal prior to installation can result in premature failure.

Standard sizes, Type VI..

Internal seal for oil and grease



Tolerances for functional dimensions di, d2, d3

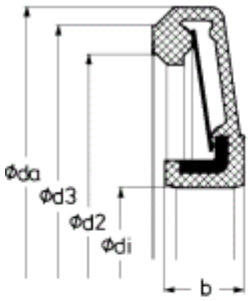
Perbunan	Ø d	bis 40	40–70	70–110	110–150	150–250	250–400
	△ d	– 0,2	– 0,3	– 0,4	– 0,6	– 0,8	– 1,2

Viton	Ø d	bis 30	30–40	40–60	60–90	90–110	110–140	140–180	180–250
	△ d	– 0,2	– 0,3	– 0,4	– 0,5	– 0,7	– 0,8	– 1,0	– 1,5

Type VI...	Shaft dia. Ø	d_i	d_a	d_2	d_3	b	Max. perm. speed (r.p.m.) Perbunan®	Viton®	Cont. press force of sealing lip [N]	Max. perm. pressure [Pa]	Match-up to antifriction bearing series 6000	6200	6300	6400	4200	4300
100	10	11	24	13	12	4	25 400	38 000	1,8	9 000	6000	6200	6300	—	—	—
101	12	13	26	16	14	4	23 800	35 700	2,0	9 400	6001	—	—	—	4200	—
102	15	16	30	20	17	4,5	19 200	28 800	2,5	9 500	6002	—	—	—	—	4301
103	17	18	33	22	19	4,5	17 500	26 200	3,0	8 800	6003	6302	—	—	—	—
104	20	22	39	26	23	4,5	14 700	22 000	3,5	6 900	6004	6304	6403	—	—	—
105	25	27	44	31	27,5	4,5	13 000	19 500	3,8	6 150	6005	—	6404	—	—	—
106	30	32	50	36	33	5	10 600	15 900	4,0	5 800	6006	—	6405	—	—	—
107	35	37	56	41	38	5	9 300	13 900	4,5	6 100	6007	6306	6406	4206	—	—
108	40	42	62	47	44	5,5	8 100	12 000	5,5	6 550	6008	6307	6407	4207	—	—
109	45	47	70	53	49	5,5	7 200	10 800	6,5	5 200	6009	6308	6408	4208	—	—
110	50	52	75	59	55,5	6	6 600	9 900	7,0	4 750	6010	6309	6409	4209	—	—
111	55	58	83	65,5	61,5	6	6 000	9 000	7,5	4 450	6011	6310	—	4210	—	—
112	60	61	89	69	65	6,5	5 500	8 200	8,0	3 800	6012	6311	6410	4211	—	—
113	65	67	94	74	70	7	5 200	7 800	9,0	4 600	6013	6312	6411	4212	—	—
114	70	73	104	78	74	7,5	4 800	7 200	11,0	3 800	6014	6313	6412	4213	—	—
115	75	78	109	84	80	7,5	4 500	6 700	12,0	4 350	6015	6314	6413	4214	—	—
116	80	82	119	89	85	8	4 300	6 400	13,0	2 900	6016	6315	6414	4215	—	—
117	85	87	124	94	90	8	4 000	6 000	14,5	3 500	6017	6316	6414	4216	—	—
118	90	93	132	101	96	8,5	3 800	5 700	16,0	3 050	6018	6317	6415/16	4217	—	—
119	95	98	137	104,5	100	8,5	3 600	5 400	17,0	3 250	6019	6318	6415/16	—	—	—
120	100	101	142	110	105	8,5	3 400	5 100	18,0	3 400	6020	6319	6416	4218/19	—	—
200	10	11	26	15,5	13	4,5	24 600	36 900	1,8	9 700	6200	—	—	—	—	—
201	12	13	28	17,5	15	4,5	22 200	33 300	2,0	10 700	6201	6300/01	—	4201	4300	—
202	15	16	31	21	18	4,5	18 200	27 300	3,0	12 800	6202	6302	—	4202	—	—
203	17	18	36	23	21	5	16 600	24 900	3,8	8 100	6203	6303	—	4203	4302	—
204	20	21	41	26	23	5,5	14 700	22 000	4,2	7 400	6204	6304	6403	4204	4303	—
205	25	26	46	30	28	5,5	12 700	19 000	4,3	6 400	6205	—	6403	—	4304	—
206	30	32	56	37,5	34,5	6	10 300	15 400	4,6	4 900	6206	—	6405	—	4305	—
207	35	37	65	44	41	6,5	8 900	13 300	5,0	3 300	6207	6306/07	6405/06	—	4306	—
208	40	42	73	50	46,5	6,5	7 600	11 400	6,0	3 200	6208	6308	6407	—	4307	—
209	45	47	78	56	51,5	6,5	7 000	10 500	6,5	3 000	6209	6308/09	6407/08	—	4308	—
210	50	53	83	59,5	56,5	6,5	6 400	9 600	7,0	3 000	6210	6309	6408/09	—	4309	—
211	55	58	90	65	61	7	5 900	8 800	7,5	2 750	6211	6310	6409/10	—	4310	—
212	60	63	100	69	65,5	8	5 500	8 200	8,0	2 100	6212	6311	16410/11	—	4311	—
213	65	68	110	77	72	8,5	5 000	7 500	9,0	2 000	6213	6312	6411/12	—	—	—
214	70	72	115	79	74	8,5	4 800	7 200	10,5	2 000	6214	6313	6411/12	—	4312	—
215	75	78	120	88	83	8,5	4 400	6 600	11,0	2 100	6215	6313/14	6413/14	—	4313	—
216	80	84	128	94	90	9	4 100	6 100	13,0	2 400	6216	6314/15	6414	—	4314	—
217	85	87	138	96	91	9,5	3 900	5 800	14,5	2 100	6217	6315/16	6414/15	—	4315	—
218	90	94	148	101,5	96,5	10	3 700	5 500	16,5	2 000	6218	6316	6415/16	—	—	—
219	95	98	158	108	103	16	3 500	5 200	17,0	2 000	6219	6317/18	6415/16	—	6416/17	—
220	100	104	168	114	109	10,5	3 300	4 900	19,0	2 100	6220	6318/19	6416	—	4318/19	—

Standard sizes, Type VA..

External seal for grease only



Tolerances for functional dimensions d_a, d_2, d_3

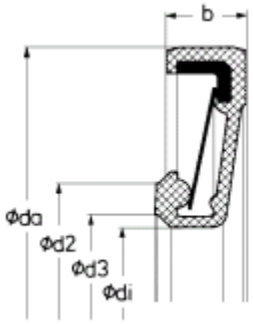
Perbunan	Ø d	Up to 40	40–70	70–110	110–150	150–250	250–400
	Δ d	– 0,2	– 0,3	– 0,4	– 0,6	– 0,8	– 1,2

Viton	Ø d	Up to 30	30–40	40–60	60–90	90–110	110–140	140–180	180–250
	Δ d	– 0,2	– 0,3	– 0,4	– 0,5	– 0,7	– 0,8	– 1,0	– 1,5

Type VA...	d_a	d_i	d_2	d_3	b	Max. perm. speed (r.p.m.) Perbunan®	Viton®	Cont. press force of sealing lip [N]	Max. perm. pressure [Pa]	Match-up to antifriction bearing series 6000	6200	6300	6400	4200	4300
100	25	12	22	24,5	3,5	7 900	11 800	2,0	10 000	6000	—	—	—	—
101	27	14	24	26,5	3,5	7 300	11 000	2,0	7 500	6001	—	—	—	—
102	31	17	27,5	30	4	6 300	9 400	3,0	10 000	6002	—	—	—	—
103	35	19	30	33	4	5 900	8 800	3,5	10 000	6003	6300	—	—	—
104	40,5	23	30,5	38,5	4,5	4 900	7 300	4,0	6 600	6004	6302	—	—	—
105	45,5	28	41,5	44	4,5	4 300	6 400	4,5	5 750	6005	—	—	—	—
106	53	35	47,5	50,5	4,5	3 800	5 700	5,0	5 400	6006	—	—	—	—
107	61	40	54	58	4,5	3 300	4 900	5,5	4 400	6007	6305	—	—	—
108	66,5	45	59,5	63,5	5	3 000	4 500	6,0	4 000	6008	—	6404	—	—
109	74	50	66,5	70,5	5	2 700	4 000	6,5	3 400	6009	6307	6405	—	—
110	77	55	71	75	5,5	2 500	3 700	7,0	3 650	6010	—	—	—	—
111	87	61	80,5	84,5	6	2 250	3 400	8,0	3 100	6011	6309	6407	—	—
112	93	66	85	89	6	2 150	3 200	9,0	3 300	6012	—	—	—	—
113	97	71	90,5	94,5	6	2 000	3 000	10,0	3 200	6013	—	6408	—	—
114	106	76	99	103	6,5	1 800	2 700	11,0	3 000	6014	6310	—	—	—
115	112	81	103	108	7	1 700	2 550	12,5	3 700	6015	6311	6409	—	—
116	122	86	112	117	7,5	1 600	2 400	14,0	2 950	6016	6312	6410	—	—
117	127	91	118	123	7,5	1 550	2 300	15,0	2 900	6017	—	6411	—	—
118	137	98	128	133	8	1 450	2 150	16,0	2 750	6018	6314	6412	—	—
119	142	103	132	137	7,5	1 400	2 100	18,0	2 850	6019	6314	6412	—	—
120	147	108	137	142	8,5	1 350	2 000	19,0	2 900	6020	6315	6413	—	—
200	29,5	14	25	28,5	4	7 000	10 500	2,0	6 000	6200	—	—	4200	—
201	31,5	16	26	29	4	6 500	9 700	2,0	4 700	6201	—	—	4201	4300
202	33	19	29,5	32	4	6 400	9 600	3,0	8 150	6202	6300	—	4202	4301
203	38,5	21	34,5	37	4	4 900	7 300	3,5	5 950	6203	—	—	4203	4302
204	46,5	25	40	43	4,5	4 400	6 600	4,0	4 450	6204	6303	—	4204	4303
205	50,5	31	45,5	48,5	5	3 900	5 800	4,5	4 500	6205	6304	—	4205	—
206	60	36	54	58	5,5	3 300	4 900	5,0	3 400	6206	6305	6404	4206	4305
207	68	42	61,5	65,5	6	2 900	4 300	5,5	2 700	6207	6306	—	4207	4306
208	77	47	69,5	73,5	6	2 600	3 900	6,0	2 200	6208	6307	6405	4208	4307
209	82	52	74,5	78,5	6,5	2 400	3 600	6,5	2 450	6209	6308	6406	4209	4308
210	86	57	79	83	7	2 300	3 400	7,0	2 450	6210	—	6407	4210	—
211	97	64	88	92	7,5	2 100	3 100	8,0	2 300	6211	6309	6408	4211	4309
212	106	69	98	102	8	1 800	2 700	9,0	1 900	6212	6310	6409	4212	4310
213	116	74	105	110	8,5	1 700	2 550	10,0	1 700	6213	6311	6410	4213	4311
214	120,5	80	109	114	8,5	1 650	2 450	11,0	2 000	6214	6312	—	4214	4312
215	126	85	115	120	9	1 600	2 400	12,5	2 100	6215	6312	—	4215	4313
216	136	92	125	130	9	1 450	2 150	14,0	2 050	6216	6313	6411	4216	4314
217	145	97	134	139	9	1 350	2 000	15,0	2 100	6217	6314	6412	4217	4315
218	156	102	144	149	9,5	1 250	1 850	16,0	1 600	6218	6315	6413	4218	4316
219	166	108	154,5	159	9,5	1 200	1 800	18,0	1 600	6219	6316	6415	4219	4317
220	175	114	164	169	10	1 100	1 650	18,5	1 500	6220	6317	6416	4220	4318

Special sizes, Type VI..

(for which all manufacturing tools are available)



Tolerances for functional dimensions d_i, d_2, d_3

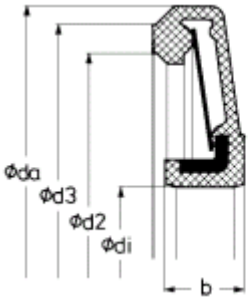
Perbunan	Ø d	Up to 40	40–70	70–110	110–150	150–250	250–400
	△ d	– 0,2	– 0,3	– 0,4	– 0,6	– 0,8	– 1,2

Viton	Ø d	Up to 30	30–40	40–60	60–90	90–110	110–140	140–180	180–250
	△ d	– 0,2	– 0,3	– 0,4	– 0,5	– 0,7	– 0,8	– 1,0	– 1,5

Type VI...	Shaft dia. Ø	d_i	d_a	d_2	d_3	b	Max. perm. speed (r.p.m.) Perbunan®	Max. perm. speed (r.p.m.) Viton®	Cont. press force of sealing lip [N]	Max. perm. pressure [Pa]
6	6	6,5	17	9	7,5	3,5	45 000	67 000	5	43 500
8	8	8,5	20	11,2	9,5	4	35 000	52 000	4	35 600
9	9	9,6	22	13	11	4	30 000	45 000	4,5	27 700
105 S	23	24,5	44	31	24,5	4,5	13 500	20 000	5	9 300
107 S	35	37	56	42	37	5	9 500	14 000	5	8 000
121 S	105	108	150	119	114	9	3 300	5 000	12	2 000
122 S	110	114	160	125	120	9	3 100	4 600	15	2 000
124 S	120	125	170	134	129	9	2 900	4 300	20	3 050
126 S	130	134	190	146	140	9,5	2 600	3 900	19	1 750
128 S	140	143	200	154	148	9,5	2 500	3 700	32	2 850
130 S	150	154	215	166	160	10	2 300	3 400	26	2 000
132 S	160	164	230	181	175	10	2 100	3 100	40	2 700
134 S	170	176	250	186	180	11	2 050	3 000	37	1 900
144 S	220	226	328	240	230	13	1 550	2 300	35	2 200
148 S	240	247	348	257	249	13	1 500	2 250	38	1 000
156 S	285	290	360	298	294	13	1 300	1 950	33	1 350
166 S	330	336	420	344	338	13	1 100	1 650	32	1 000
176 S	380	385	460	398	390	13	950	1 400	30	1 100
205 S1	26	28	52	32,5	28,5	5,5	12 000	18 000	9	3 000
214 S	70	72	115	80	75	8,5	4 700	7 000	12	2 800
215 S	75	77,5	125	86	81	8,5	4 400	6 600	12	2 500
216 S	80	83	130	90	84	9	4 200	6 300	13	2 900
218 S	93	98	150	106	100	10	3 600	5 400	17	2 350
221 S	110	117	190	129	124	9,5	2 900	4 300	20	1 300
306 S	30	32	63	38,5	35,5	5,5	9 800	14 700	16	13 000
309 S	45	46,5	83	54	50	6	7 100	10 600	11	4 300
314 S	72	75,5	128	83,5	78,5	9	4 500	6 700	17	2 800
320 S	110	113	190	126	121	9,5	3 000	4 500	38	5 600
324 S	130	135	200	146	140	9,5	2 600	3 900	35	4 800
328 S	150	155	270	167	160	11	2 200	3 300	30	2 500

Special sizes, Type VA..

(for which all manufacturing tools are available)



Tolerances for functional dimensions d_a, d_2, d_3

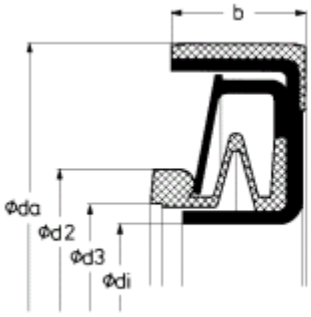
Perbunan	Ø d	Up to 40	40–70	70–110	110–150	150–250	250–400
	Δ d	– 0,2	– 0,3	– 0,4	– 0,6	– 0,8	– 1,2

Viton	Ø d	Up to 30	30–40	40–60	60–90	90–110	110–140	140–180	180–250
	Δ d	– 0,2	– 0,3	– 0,4	– 0,5	– 0,7	– 0,8	– 1,0	– 1,5

Type VA...	d_a	d_i	d_2	d_3	b	Max. perm. speed (r.p.m.) Perbunan®	Viton®	Cont. press force of sealing lip [N]	Max. perm. pressure [Pa]
112 S	93	66	85	93	6	2000	3000	15	7000
115 S	111	85	103	108	7	1700	2550	16	7000
122 S	165	120	153	158	9	1200	1800	16	2000
124 S	160	130	151	157	7	1200	1800	12	3100
124 S1	175	130	165	170	9	1100	1650	16	2000
124 S2	172	130	162	168	9	1100	1650	40	5300
128 S	208	150	195	200	10	950	1400	63	4400
130 S	252	160	236	243	10	750	1100	32	1000
130 S2	253	160	245	250	8	750	1100	36	1500
134 S	214	180	209	213	6	900	1350	30	4000
148 S	348	252	332	340	13	550	800	32	1000
209 S	90	50	83,5	87,5	6,5	2200	3300	6	1500
215 S	142	85	134	140	8	1300	1950	10	1000
219 S									
220 S	155	110	144	149	9	1200	1800	17	2800

Standard sizes, Type DI..

Internal seal for oil and grease



Tolerances for functional dimensions d_2, d_3

Perbunan	Ø d	Up to 40	40–70	70–110	110–150	150–250	250–400
	△ d	– 0,2	– 0,3	– 0,4	– 0,6	– 0,8	– 1,2

Viton	Ø d	Up to 30	30–40	40–60	60–90	90–110	110–140	140–180	180–250
	△ d	– 0,2	– 0,3	– 0,4	– 0,5	– 0,7	– 0,8	– 1,0	– 1,5

Type DI...	Shaft dia. Ø	d_i	d_a	d_2	d_3	b	Max. perm. speed (r.p.m.) Perbunan®	Max. perm. speed (r.p.m.) Viton®	Cont. press force of sealing lip [N]	Max. perm. pressure [Pa]
204*	20	21	41	27,5	24,5	7,5	6000	9000	4,5	500 000
205*	25	26	46	33	29	8	5000	7500	5,0	500 000
206*	30	30,5	56	40	38	9	4000	6000	6,0	400 000
207	35	36,5	65			9,5				
208*	40	41,5	73	51	46	10	3000	4500	8,0	300 000
209	45	46,5	78			10				
210*	50	52	83	61,5	56,5	10	2000	3900	9,5	260 000
211*	55	56,5	90	67	61,5	11	2500	3700	10,0	250 000
212	60	62	100			11,5				
213	65	67	110			12				
214*	70	72	115	84	78	13	2000	3000	14,5	200 000
215	75	77	120			13				
216	80	83	128			13,5				
217	86	88	138			14				
218	90	93	148			14,5				
219	95	99	158			15				
220*	100	102	168	119,5	111,5	15,5	1400	2100	20,0	140 000
221	105	108	175			16				
222	110	114	180			17				
224	120	124	195			18				
226	130	134	200			19				
228*	140	144,5	200	165	158	20,5	1000	1500	26,0	100 000
230	150	154	240			20,5				
236*	180	184	286	208	200	20,5	800	1200	28,0	80 000

* Sizes presently available for delivery.
Other sizes and/or types can be supplied on special order, approx. 3 months after all details have been clarified.

Advice and Sales

Through our representatives with stock in:

Federal Republic of Germany	BUSAK + SHAMBAN GmbH, Postfach 80 02 06, 70502 Stuttgart, Phone: (0711) 78 64-0, Fax: (0711) 780 3172, BSDeutschland@bsmail.com
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Spain	DIESSA, Distibuciones Especiales S.A., Virgen del Puig 1, 28027 Madrid, Phone: 4 04 5187, Telex: 43762, Fax: 4 04 5194, INFO@DIESSA.ES
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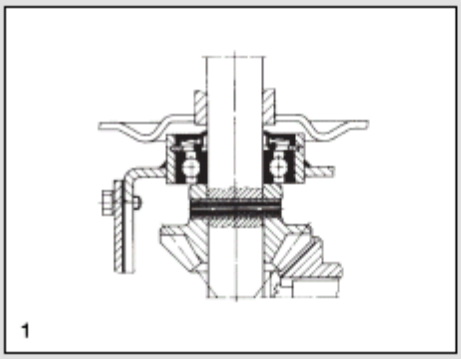
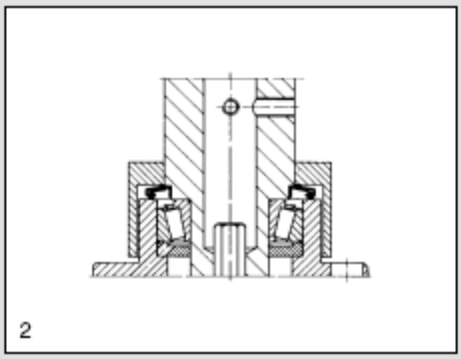
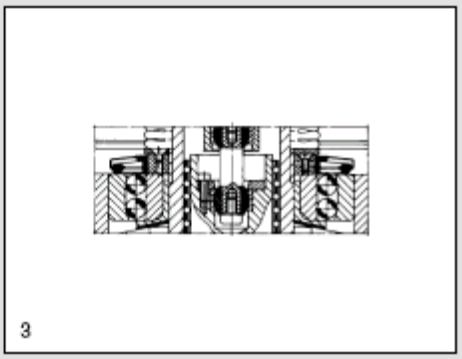
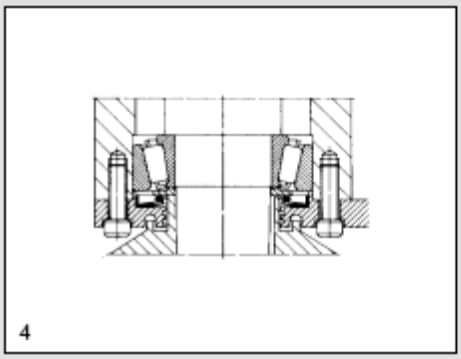
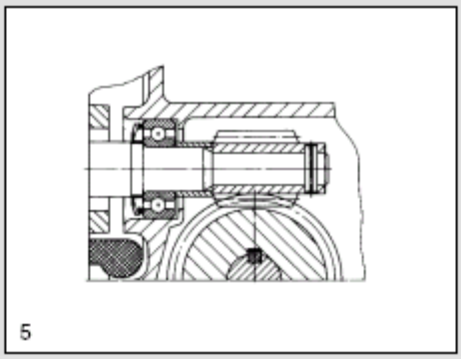
Axial Shaft Seals

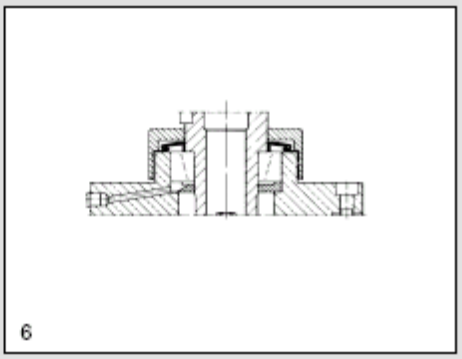




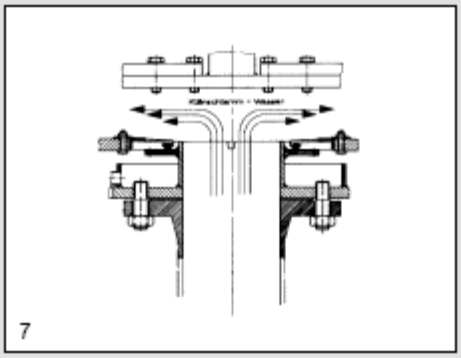








1 Fertilizer spreaders
2 Push-fit shafts
3 Conical erosion machines
4 Vertical cutters
5 Worm drives
6 Fitting polishing machines
7 Clarification plants



These examples represent just some of the applications for our axial shaft seals.
We are always willing to provide advice and suggestions for intended installations.

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