the **precision** benchmark

Axial Shaft Seals

Less space required, less friction , easy to install

CARL HIRSCH MANN

EN2317

Carl Hirschmann GmbH

Precision as passion

Highest precision is the distinctive trademark of our axial shaft seals. With great passion and deep special know how we develop and manufacture trend-setting products for your ambitious requirements – since decades and with increasing enthusiasm.

Carl Hirschmann – the precision benchmark

For more than 60 years Carl Hirschmann GmbH develops and manufactures trendsetting products amongst others for vehicle construction, motor sport, aerospace, railed vehicles, mechanical and medical engineering, naval architecture and wind power plants. Core competences lie in the three product lines Rod Ends and Spherical Bearings, Rotary Indexing Tables and Clamping Systems and Axial Shaft Seals. In these sectors Carl Hirschmann has extensive expert knowledge as well as experience for decades and can offer customer-specific solutions in addition to a wide range of standard products. The medium-sized enterprise located in Baden-Württemberg with sales companies in US and China currently employs about 200 people.

Contents

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.

Standard Designs

The axial shaft seals shown and described in this catalogue are made of Perbunan®. FKM fluoroelastomers seals are made to oder 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 460 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 means that we cannot accept any liability for the correctness of our recommendations in individual instances.

Quality according to ISO 9001 and EN 9100

All Carl Hirschmann axial shaft seals are produced using the latest and most reliable production methods, and are subject to quality assurance measures as per ISO 9001 and EN 9100 (air and space industry standard) both during production and in the product stage.

Service and sales

Our staff and the sales engineers at our agencies and dealers in Germany and abroad, would be pleased to assist you at any time.

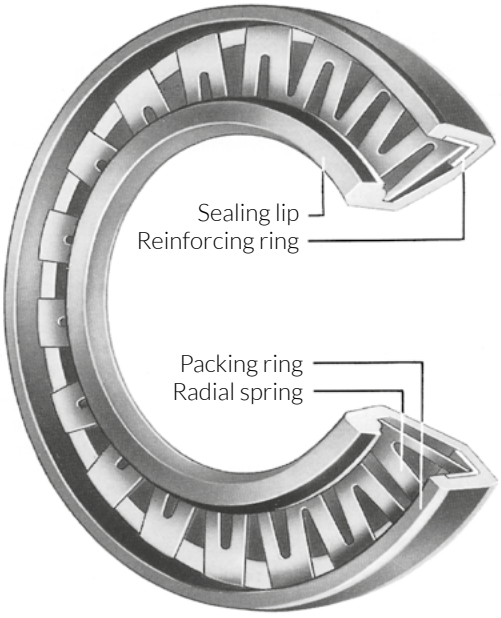
Axial shaft seals

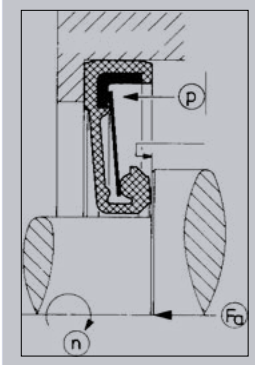
Introduction

Carl Hirschmann 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, vibration-free pressure.

Characteristics

- Minimum friction and heat-up
- Less space required
- Easy installation
- High heat and chemical resistance
- High rubbing speed
- Long life

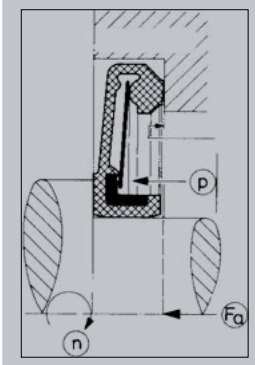




Type VI..

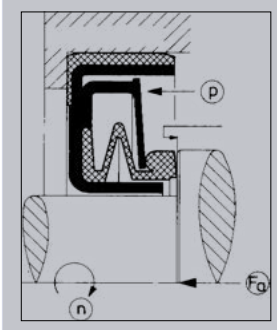
Axial shaft seal with internal sealing lip, mainly for use with liquids.
The seal usually employed in a stationery manner, i.e. with a rotating shaft. Care should be taken to ensure that the sealing lip does not run dry. Should this be unavoidable, please contact us.

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.
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.

P = Pressure
Fa = Contact pressure force of sealing lip
n = Speed

Application examples

Applications:

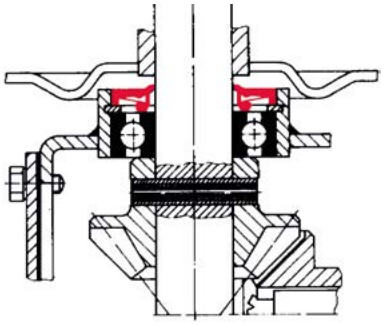
- Motor and gear manufacturing
- Agricultural machinery
- Machine tools
- Track construction machines
- Construction machines
- Medical technology

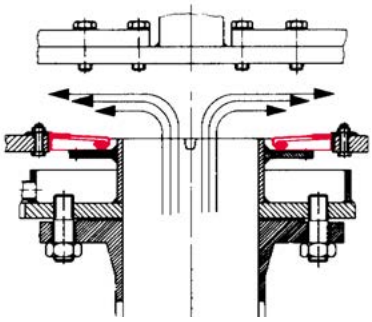
Track construction machine

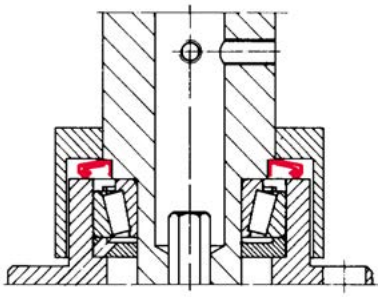

Turbine

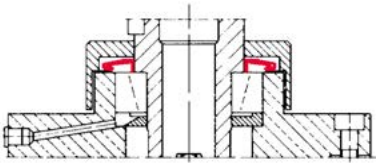

Encoder

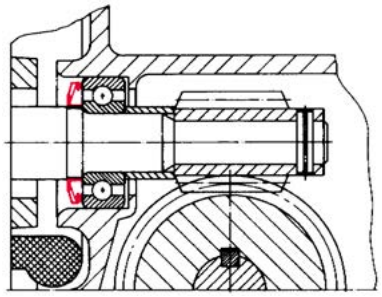
Installation examples

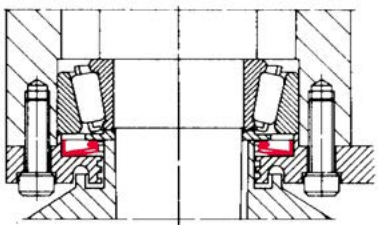

Fertilizer spreader


Clarification plants


Push-fit shafts


Fitting polishing machine


Worm drive


Vertikal cutter

Axial shaft seals

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 phosphorated 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 pressure exerted by the medium to the sealed may not lift these a ling lip up off the mating surface. The maximum permissible pressure per seal size can be seen in the tables on the type pages. 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 rotational speeds for Perbunan® and FKM, by seal size, can be seen from the tables in the seal sizes. The diagram on page 7 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 $\mu_o = 0.48$, the coefficient for dynamic friction a maximum of p = 0.24 (0.12–0.24). These figures apply for lubricated steel/ PERBUNAN and steel/ FKM 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]

F_a = contact pressure force of the sealing lip [N]
d_m = mean diameter of sealing lip [mm]
n = speed [min^{-1}]
μ_o = 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
	FKM	30 m/s
Type VA:	Perbunan	10 m/s
	FKM	15 m/s
Type DI:	Perbunan	9 m/s
	FKM	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

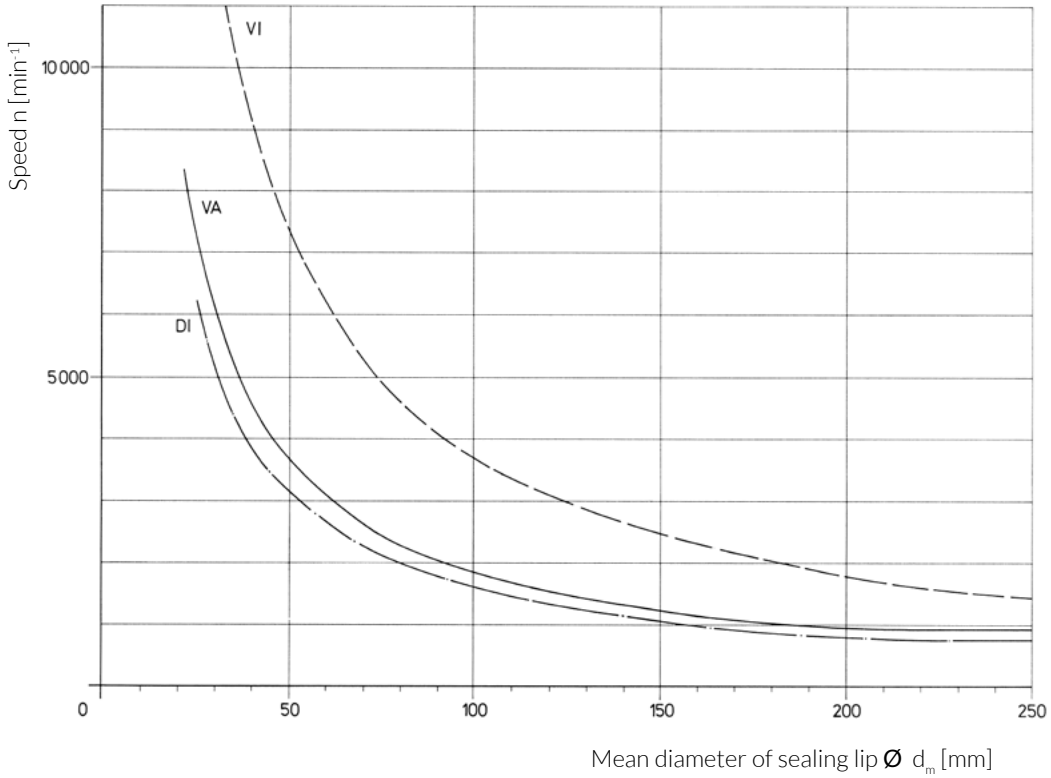
Peripheral speed:	v	m/s
Speed:	n	min^{-1}
Axial force:	Fa	N
Pressure:	p	Pa
Moment of friction:	M_{RO}	J
Dissipated output:	P_R	W
Width/lenght, diameter:	b, l, d	mm
Coefficient of friction, static:	μ_o	—
Coefficient of friction, dynamic:	μ	—

Conversion of units:

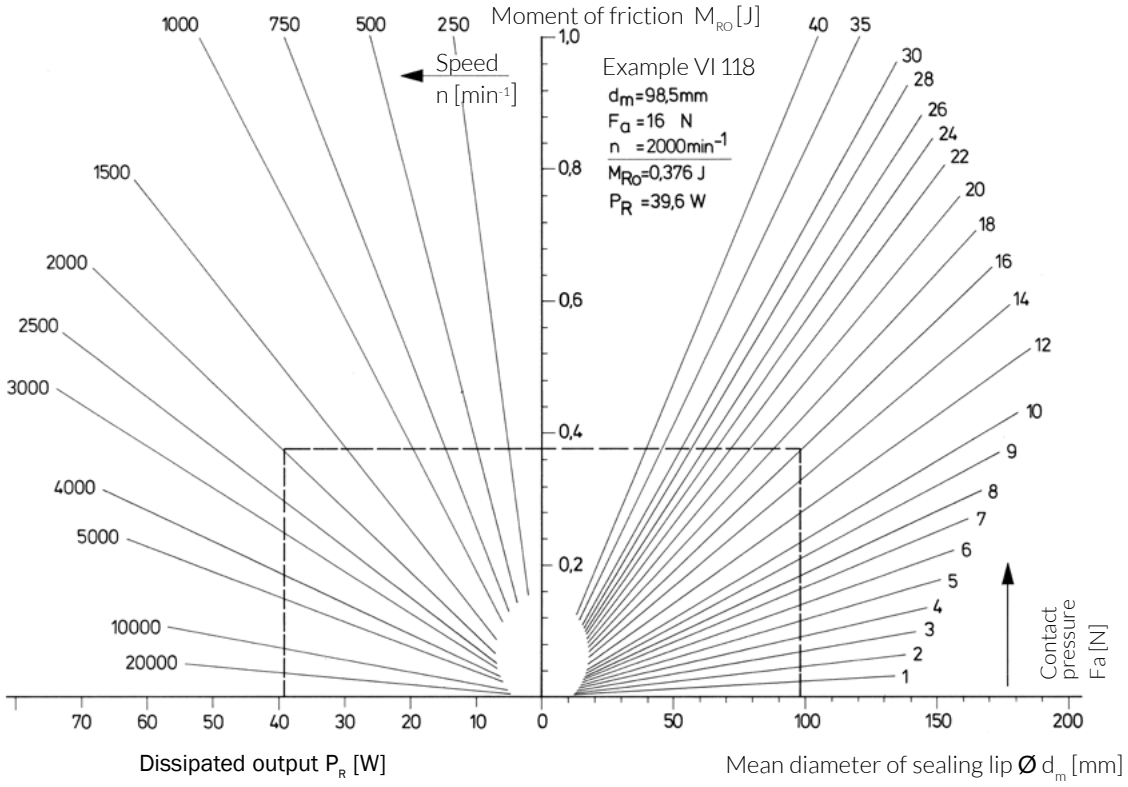
1 N = 0,102 kp
1 Pa = 0,102 mmWS = 10^{-5} PSI
1 J = 0,102 kpm = 1 Nm
1 W = 1,36 · 10^{-3} PSI

Diagrams

Permissible speed for Perbunan



Coefficient of friction dissipated output



Axial shaft seals
Table of resistances

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

Installations guide

Sealing surface - mating surface

The unstamped, hardened and factory-ground faces of anti-friction bearings or appropriately machined shaft collars and ends as well as support washers, thrust needle bearing 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 0.05 mm for use with grease or up to 0.03 mm for use with oil.

Installation tolerances

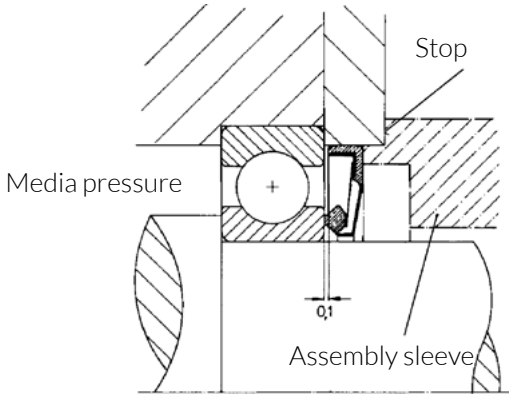
The reception holes of Types VI and DI should be fabricated in accordance with ISO H9 and the shaft diameter for Type VA in accordance with ISO h9.

The reception hole and the shaft must be chamfered approx. 15° for at least 1 mm.

The tolerances for the functional dimensions of the seals are shown in the tables.

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 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 deforms the seal or damages vital areas of it.

Seal storage

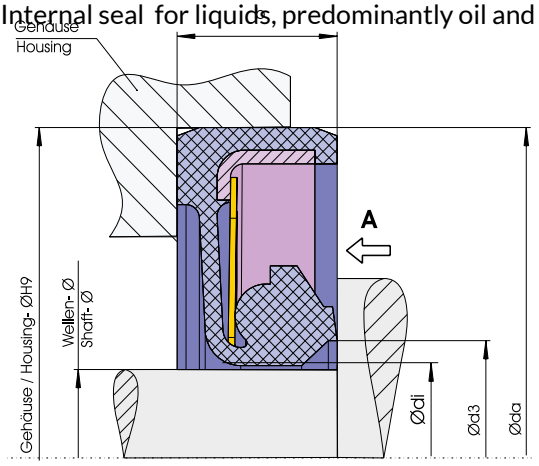
Until being installed, the axial shaft seal should be stored in a dry area, in the original packaging if possible. Under no circumstances may they be lined up on wire ring or stored in a similar manner, as this could damage or deform the sensitive sealing lips. When staking axial shaft seals, care should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

Axial shaft seals

Type VI.. (Standard sizes)

Internal seal for liquids, predominantly oil and grease



A=contact pressure

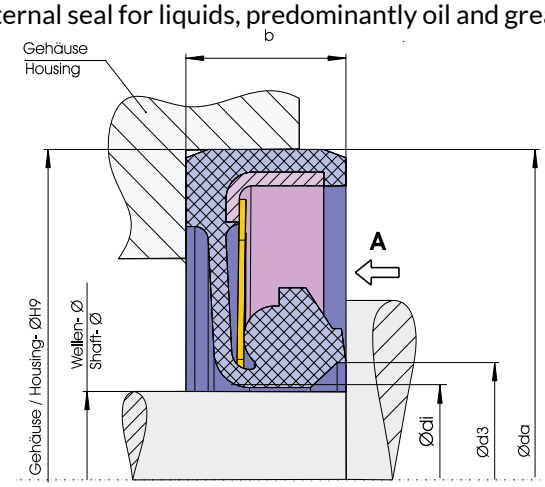
Type VI..

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. 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	Shaft Ø	di	da	d3	b	Perm. speed		A	Perm. pressure	Match-up to antifriction bearing series				
						Perbunan	FKM			6000 6200	6300	6400	4200	4300
	[mm]	[mm]	[mm]	[mm]	[mm]	[min^{-1}]	[min^{-1}]	[N]	[Pa]					
VI 100	10	11,0 ±0,6	24 +0,15/+0,30	12,5 ±1,0	4,0 +0,25/ -0,20	25400	38000	3,0	9000	6000	6300	---	---	---
VI 101	12	13,0 ±0,6	26 +0,15/+0,30	14,7 ±1,0	4,0 +0,25/ -0,20	23800	35700	3,5	9400	6001	---	---	4200A	---
VI 102	15	16,0 ±0,6	30 +0,15/+0,30	17,5 ±1,0	4,5 +0,25/ -0,20	19200	28800	4,0	9500	6002	---	---	---	4301A
VI 103	17	18,0 ±0,6	33 +0,15/+0,30	19,5 ±1,0	4,5 +0,25/ -0,20	17500	26200	2,5	8800	6003	6302	---	---	---
VI 104	20	22,0 ±1,0	39 +0,15/+0,30	24,0 ±1,0	4,5 +0,25/ -0,20	14700	22000	4,5	6900	6004	6304	6403	---	---
VI 105	25	27,0 ±1,0	44 +0,15/+0,30	28,0 ±1,0	4,5 +0,25/ -0,20	13000	19500	7,5	6150	6005	---	6404	----	---
VI 106	30	32,0 ±1,0	50 +0,15/+0,30	33,9 ±1,0	5,0 +0,25/ -0,20	10600	15900	11,0	5800	6006	---	6405	---	---
VI 107	35	37,0 ±1,0	56 +0,20/+0,35	39,0 ±1,0	5,0 +0,25/ -0,20	9300	13900	7,0	6100	6007	6306	6406	4206A	---
VI 108	40	42,0 ±1,0	62 +0,20/+0,35	44,8 ±1,0	5,5 +0,25/ -0,20	8100	12000	7,0	6550	6008	6307	6407	4207A	---
VI 109	45	47,0 ±1,0	70 +0,20/+0,35	48,5 ±1,0	5,5 +0,25/ -0,20	7200	10800	15,5	5200	6009	6308	6408	4208A	---
VI 110	50	52,0 ±1,0	75 +0,20/+0,35	55,0 ±1,0	6,0 +0,25/ -0,20	6600	9900	7,0	4750	6010	6309	6409	4209A	---
VI 111	55	58,0 ±1,0	83 +0,20/+0,35	61,4 ±1,0	6,0 +0,25/ -0,20	6000	9000	10,5	4450	6011	6310	---	4210A	---
VI 112	60	61,5 ±1,0	89 +0,20/+0,35	65,0 ±1,0	6,5 +0,25/ -0,20	5500	8200	18,0	3800	6012	6311	6410	4211A	---
VI 113	65	67,0 ±1,0	94 +0,20/+0,35	71,4 ±2,0	7,0 +0,25/ -0,20	5200	7800	13,0	4600	6013	6312	6411	4212A	---
VI 114	70	73,0 ±1,5	104 +0,20/+0,35	76,3 ±2,0	7,5 +0,25/ -0,20	4800	7200	17,5	3800	6014	6313	6412	4213	---
VI 115	75	78,0 ±1,5	109 +0,20/+0,35	81,0 ±2,0	7,5 +0,25/ -0,20	4500	6700	16,0	4350	6015	6314	6413	4214	---
VI 116	80	83,0 ±2,0	119 +0,20/+0,35	85,3 ±2,0	8,0 +0,25/ -0,20	4300	6400	17,5	2900	6016	6315	6414	4215	---
VI 118	90	93,0 ±2,0	132 +0,25/+0,45	95,8 ±2,0	8,5 +0,25/ -0,20	3800	5700	33,0	3050	6018	6317	6415/ 6416	4217	---
VI 119	95	98,0 ±2,0	137 +0,25/+0,45	101,5 ±2,0	8,5 +0,25/ -0,20	3600	5400	19,0	3250	6019	6318	6415/ 6416	---	---
VI 120	100	101,0 ±2,0	142 +0,25/+0,45	105,4 ±2,0	8,5 +0,25/ -0,20	3400	5100	26,0	3400	6020	6319	6416	4218	---

Type VI.. (Standard sizes)

Internal seal for liquids, predominantly oil and grease



A=contact pressure

Type VI..

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

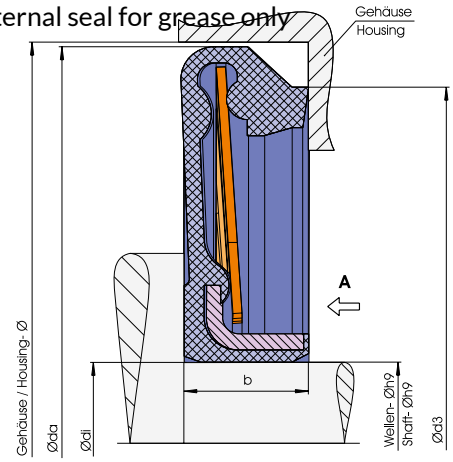
The seal usually employed in a stationery manner, i.e. with a rotating shaft. Care should be taken to ensure that the sealing lip does not run dry. Should this be unavoidable, please contact us. By increasing the spring force, it is possible to raise the medium pressure by up to 50%, however this can result in greater friction and heat-up, and consequently in faster wear.

Type	Shaft Ø	di	da	d3	b	Perm. speed		A	Perm. pressure	Match-up antifriction bearing series				
						Perbunan	FKM			6000 6200	6300	6400	4200	4300
	[mm]	[mm]	[mm]	[mm]	[mm]	[min^{-1}]	[min^{-1}]	[N]	[Pa]					
VI 200	10	11,5 ±1,0	26 +0,15/+0,30	13,5 ±1,0	4,5 +0,25/ -0,20	24600	36900	2,0	9700	6200	---	---	---	---
VI 201	12	13,3 ±1,0	28 +0,15/+0,30	15,6 ±1,0	4,5 +0,25/ -0,20	22200	33300	4,0	10700	6201	6300/ 6301		4201	---
VI 202	15	16,3 ±1,0	31 +0,15/+0,30	18,6 ±1,0	4,5 +0,25/ -0,20	18200	27300	4,0	12800	6202	6302		4202	---
VI 203	17	18,3 ±1,0	36 +0,15/+0,30	21,0 ±1,0	5,0 +0,25/ -0,20	16600	24900	5,5	8100	6203	6303		4203	4302
VI 204	20	21,3 ±1,0	41 +0,15/+0,30	23,8 ±1,0	5,5 +0,25/ -0,20	14700	22000	4,0	7400	6204	6304	6403	4204	4303
VI 205	25	26,3 ±1,0	46 +0,15/+0,30	28,3 ±1,0	5,5 +0,25/ -0,20	12700	19000	9,0	6400	6205	---	6403	---	4304
VI 206	30	32,0 ±1,0	56 +0,2/+0,35	34,7 ±1,0	6,0 +0,25/ -0,20	10300	15400	8,0	4900	6206	---	6405	---	4305
VI 207	35	37,0 ±1,0	65 +0,20/+0,35	41,0 ±1,0	6,5 +0,25/ -0,20	8900	13300	6,0	3300	6207	6306/ 6307	6405/ 6406	---	4306
VI 208	40	41,5 ±1,0	73 +0,20/+0,35	46,3 ±1,0	6,5 +0,25/ -0,20	7600	11400	12,0	3200	6208	6308	6407	---	4307
VI 209	45	47,0 ±1,0	78 +0,20/+0,35	52,0 ±1,0	6,5 +0,25/ -0,20	7000	10500	12,0	3000	6209	6308/ 6309	6407/ 6408	---	4308
VI 210	50	53,0 ±1,0	83 +0,20/+0,35	57,0 ±2,0	6,5 +0,25/ -0,20	6400	9600	9,0	3000	6210	6309	6408/ 6409	---	4309
VI 211	55	58,0 ±1,0	90 +0,20/+0,35	63,0 ±2,0	7,0 +0,25/ -0,20	5900	8800	10,0	2750	6211	6310	6409/ 6410	---	4310
VI 212	60	63,0 ±1,0	100 +0,20/+0,35	66,0 ±2,0	8,0 +0,25/ -0,20	5500	8200	9,5	2100	6212	6311	6410	---	4311
VI 213	65	68,0 ±1,0	110 +0,20/+0,35	72,0 ±2,0	8,5 +0,25/ -0,20	5000	7500	11,0	2000	6213	6312	6411/ 6412	---	---
VI 214	70	72,0 ±2,0	115 +0,20/+0,35	75,6 ±2,0	8,5 +0,25/ -0,20	4800	7200	9,0	2000	6214	6313	6411/ 6412	--	4312
VI 215	75	78,0 ±2,0	120 +0,20/+0,35	83,2 ±2,0	8,5 +0,25/ -0,20	4400	6600	15,5	2100	6215	6313/ 6314	6413/ 6414	--	4313
VI 216	80	84,0 ±2,0	128 +0,20/+0,35	89,5 ±2,0	9,5 +0,25/ -0,20	4100	6100	14,5	2400	6216	6314/ 6315	6414	---	4314
VI 217	85	87,0 ±2,0	138 +0,25/+0,45	93,0 ±2,0	9,5 +0,25/ -0,20	3900	5800	14,5	2100	6217	6315/ 6316	6414/ 6415	---	4315
VI 220	100	104,0 ±2,0	168 +0,25/+0,45	110,0 ±2,0	10,5 +0,25/ -0,20	3300	4900	21,0	2100	6220	6318/ 6319	6416	---	---

Axial shaft seals

Type VA.. (Standard sizes)

External seal for grease only



A=contcat pressure

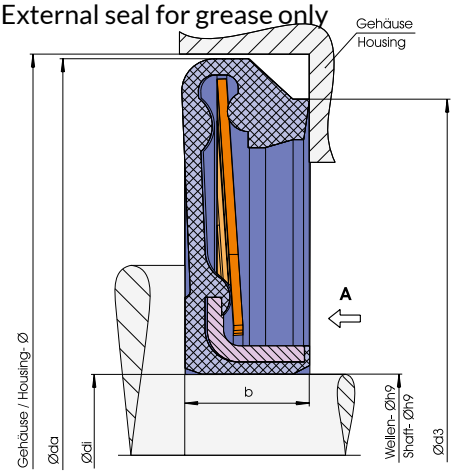
Type VA..

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. 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	Housing Ø	di	da	d3	b	Perm. speed		A	Perm. pres-sure	Match-up to antifriction bearing series				
						Perbu-nan	FKM			6000 6200	6300	6400	4200	4300
	[mm]	[mm]	[mm]	[mm]	[mm]	[min^{-1}]	[min^{-1}]	[N]	[Pa]					
VA 100	26,5	12,0 -0,15/-0,30	25,5 -0,5	24,2 ±0,5	3,5 +0,25/ -0,20	7900	11800	4,0	10000	6000	---	---	---	---
VA 101	29,0	14,0 -0,15/-0,30	27,8 -0,5	26,3 ±0,5	3,5 +0,25/ -0,20	7300	11000	5,0	7500	6001	---	---	---	---
VA 102	32,5	17,0 -0,15/-0,30	31,4 -0,5	29,8 ±0,7	4,0 +0,25/ -0,20	6300	9400	6,0	10000	6002	---	---	---	---
VA 103	35,5	19,0 -0,15/-0,30	34,5 -0,7	32,5 ±0,7	4,0 +0,25/ -0,20	5900	8800	6,0	10000	6003	6300	---	---	---
VA 104	42,0	23,0 -0,15/-0,30	41,0 -0,7	38,6 ±0,7	4,5 +0,25/ -0,20	4900	7300	10,0	6600	6004	6302	---	---	---
VA 105	47,5	28,0 -0,15/-0,30	46,5 -1,0	44,0 ±0,7	4,5 +0,25/ -0,20	4300	6400	11,0	5750	6005	---	---	----	---
VA 106	54,5	35,0 -0,15/-0,30	53,4 -1,0	51,0 ±0,7	4,5 +0,25/ -0,20	3800	5700	5,0	5400	6006	---	---	---	---
VA 107	62,0	40,0 -0,15/-0,30	60,9 -1,0	57,8 ±0,7	4,5 +0,25/ -0,20	3300	4900	10,0	4400	6007	6305	---	---	---
VA 108	67,0	45,0 -0,15/-0,30	66,4 -2,0	63,5 ±1,0	5,0 +0,25/ -0,20	3000	4500	12,0	4000	6008	---	6404	---	---
VA 109	76,5	50,0 -0,15/-0,30	75,5 -2,0	71,5 ±1,0	5,0 +0,25/ -0,20	2700	4000	12,0	3400	6009	6307	6405	---	---
VA 110	78,5	55,0 -0,20/-0,35	77,5 -2,0	75,0 ±1,0	5,5 +0,25/ -0,20	2500	3700	9,5	3650	6010	---	---	---	---
VA 111	88,0	61,0 -0,20/-0,35	87,0 -2,0	84,0 ±1,0	6,0 +0,25/ -0,20	2250	3400	11,5	3100	6011	---	6407	---	---
VA 112	94,0	66,0 -0,20/-0,35	93,0 -2,0	88,5 ±1,0	6,0 +0,25/ -0,20	2150	3200	11,5	3300	6012	6309	---	---	---
VA 113	98,5	71,0 -0,20/-0,35	97,5 -2,0	93,2 ±1,0	6,0 +0,25/ -0,20	2000	3000	15,0	3200	6013	---	6408	---	---
VA 114	107,0	76,0 -0,20/-0,35	106,0 -2,0	103,0 ±2,0	6,5 +0,25/ -0,20	1800	2700	14,5	3000	6014	6310	---	---	---
VA 115	113,0	81,0 -0,20/-0,35	112,0 -2,0	108,5 ±2,0	7,0 +0,25/ -0,20	1700	2550	14,5	3700	6015	6311	6409	---	---
VA 118	137,5	98,0 -0,20/-0,35	136,5 -2,5	131,9 ±2,0	8,0 +0,25/ -0,20	1450	2150	33,0	2750	6018	6314	6412	---	---
VA 119	142,5	103,0 -0,20/-0,35	141,5 -2,5	137,0 ±2,0	7,5 +0,25/ -0,20	1400	2100	24,5	2850	6019	6314	6412	---	---
VA 120	148,0	108,0 -0,20/-0,35	147,0 -2,5	141,5 ±2,0	8,5 +0,25/ -0,20	1350	2000	27,5	2900	6020	6315	6413	---	---

Type VA.. (Standard sizes)

External seal for grease only



A=contact pressure

Type VA..

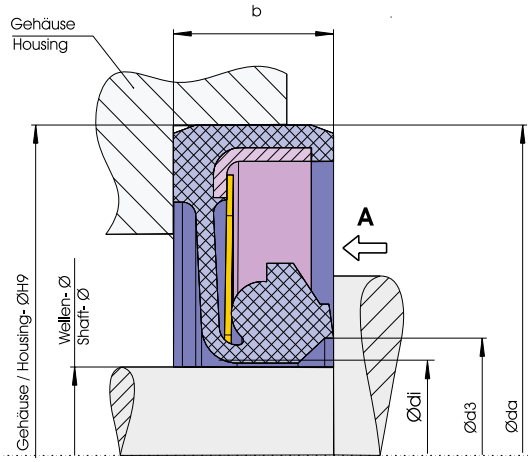
Axial shaft seal with external sealing lip, for use with grease. At low peripheral speeds and very good – if possible, lapped – mating surfaces, it can also be used with liquids.
This seal can be employed in either a stationery or rotating manner. For use with liquids, the maximum permissible speed must 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	Housing Ø	di	da	d3	b	Perm. speed		A	Perm. pressure	Match-up to antifriction bearing series				
						Perbunan	FKM			6000 6200	6300	6400	4200	4300
	[mm]	[mm]	[mm]	[mm]	[mm]	[min^{-1}]	[min^{-1}]	[N]	[Pa]					
VA 200	31,0	14,0 -0,15/-0,30	29,9 -0,5	28,1 ±0,5	4,0 +0,25/ -0,20	7000	10500	4,0	6000	6200	---	---	4200A	---
VA 201	32,5	16,0 -0,15/-0,30	31,5 -0,5	29,1 ±0,5	4,0 +0,25/ -0,20	6500	9700	3,0	4700	6201	---	---	4201A	---
VA 202	34,5	19,0 -0,15/-0,30	33,4 -0,7	32,0 ±0,7	4,0 +0,25/ -0,20	6400	9600	5,5	8150	6202	6300	---	4202A	4301A
VA 203	40,0	21,0 -0,15/-0,30	38,7 -0,7	36,9 ±0,7	4,0 +0,25/ -0,20	4900	7300	5,0	5950	6203	---	---	4203A	4302A
VA 204	47,0	25,0 -0,15/-0,30	46,0 -1,0	42,8 ±0,7	4,5 +0,25/ -0,20	4400	6600	5,0	4450	6204	6303	---	4204A	4303A
VA 206	62,0	36,0 -0,15/-0,30	61,0 -2,0	58,0 ±1,0	5,5 +0,25/ -0,20	3300	4900	7,0	3400	6206	6305	6404	4206A	4305A
VA 208	79,0	47,0 -0,15/-0,30	78,0 -2,0	73,0 ±1,0	6,0 +0,25/ -0,20	2600	3900	8,0	2200	6208	6307	6405	4208A	4307A
VA 209	84.5	52,0 -0,20/-0,35	83,2 -2,0	78,9 ±1,0	6,5 +0,25/ -0,20	2400	3600	9,0	2450	6209	6308	6406	4209A	4308A
VA 210	87,5	57,0 -0,20/-0,35	86,2 -2,0	83,6 ±1,0	7,0 +0,25/ -0,20	2300	3400	9,5	2450	6210	---	6407	4210A	---
VA 211	97,5	64,0 -0,20/-0,35	96,4 -2,0	92,2 ±1,0	7,5 +0,25/ -0,20	2100	3100	11,0	2300	6211	6309	6408	4211A	4309A
VA 212	108,0	69,0 -0,20/-0,35	107,0 -2,0	101,5 ±2,0	8,0 +0,25/ -0,20	1800	2700	9,0	1900	6212	6310	6409	4212A	4310A
VA 214	122,5	80,0 -0,20/-0,35	121,3 -2,5	117,5 ±2,0	8,5 +0,25/ -0,20	1650	2450	17,0	2000	6214	6312	---	4214A	4312A
VA 215	127,5	85,0 -0,20/-0,35	126,3 -2,0	120,0 ±2,0	9,0 +0,25/ -0,20	1600	2400	17,0	2100	6215	6312	---	4215A	4313A
VA 216	137,0	92,0 -0,20/-0,35	136,0 -2,0	129,8 ±2,0	9,0 +0,25/ -0,20	1450	2150	12,0	2050	6216	6313	6411	4216A	4314A
VA 217	147,0	97,0 -0,20/-0,35	145,8 -2,0	138,5 ±2,0	9,0 +0,25/ -0,20	1350	2000	25,0	2100	6217	6314	6412	4217A	4315A
VA 218	157,5	102,0 -0,20/-0,35	156,5 -2,5	149,0 ±2,0	9,5 +0,25/ -0,20	1250	1850	17,0	1600	6218	6315	6413	4218A	---
VA 220	176,5	114,0 -0,20/-0,35	175,5 -2,5	168,8 ±2,0	10,0 +0,25/ -0,20	1100	1650	30,0	1500	6220	6317	6416	4220A	---

Axial shaft seals

Type VI.. (Special sizes)

Internal seal for liquids, predominantly oil and grease



A=contact pressure

Special sizes Type VI..

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

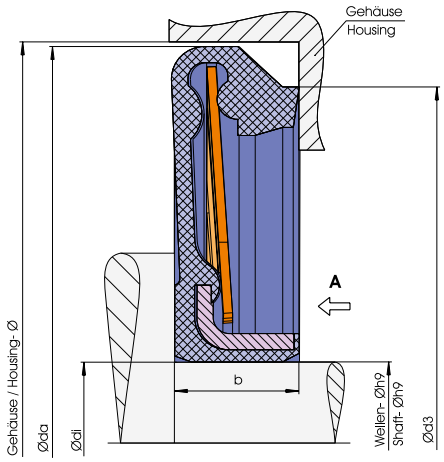
The seal usually employed in a stationery manner, i.e. with a rotating shaft. Care should be taken to ensure that the sealing lip does not run dry. Should this be unavoidable, please contact us.

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	Shaft Ø	di	da	d3	b	Perm. speed		A	Perm. pressure
						Perbunan	FKM		
	[mm]	[mm]	[mm]	[mm]	[mm]	[min^{-1}]	[min^{-1}]	[N]	[Pa]
VI 6	6	6,9 -0,2	17,0 +0,15/ +0,30	7,9 -0,3	3,5 +0,25/ -0,20	45000	67000	2,0	43500
VI 8	8	8,7 -0,3	20,0 +0,15/ +0,30	9,4 -0,3	4,0 +0,25/ -0,20	35000	52000	2,5	35600
VI 122S	110	115,5 -2,0	160,4 +0,25/ +0,45	119,0 ±1,5	9,2 +0,25/ -0,20	3100	4600	25,0	2000
VI 124S	120	127,5 -2,5	170,2 +0,25/ +0,45	130,0 ±1,5	9,0 +0,25/ -0,20	2900	4300	42,0	3050
VI 126S	130	136,5 -2,5	190,0 +0,25/ +0,45	138,0 ±1,5	9,5 +0,25/ -0,20	2600	3900	31,0	1750
VI 128S	140	144,5 -2,5	200,4 +0,25/ +0,45	147,5 ±1,5	9,5 +0,25/ -0,20	2500	3700	50,0	2850
VI 130S	150	155,3 -2,5	214,6 +0,25/ +0,45	159,5 ±1,5	10,0 +0,25/ -0,20	2300	3400	31,5	2000
VI 132S	160	164,5 -3,0	229,9 +0,25/ +0,45	169,3 ±1,5	10,0 +0,25/ -0,20	2100	3100	40,0	2700
VI 134S	170	178,5 -3,0	250,6 +0,25/ +0,45	178,0 ±1,5	10,8 +0,25/ -0,20	2050	3000	32,0	1900
VI 144S	200	229,5 -3,5	327,9 +0,30/ +0,55	230 ±2,0	13,2 +0,25/ -0,20	1550	2300	36,0	2200
VI 148S	240	247,0 -1,3	348,0 +0,30/ +0,55	249,0 ±1,3	13,0 +0,25/ -0,20	1500	2250	38,0	1000
VI 156S	270	280,2 -4,5	360,1 +0,30/ +0,55	291,0 ±2,5	13,0 +0,25/ -0,20	1300	1950	41,0	1350
VI 216S	80	81,9 -1,5	129,9 +0,25/ +0,45	81,0 ±1,0	9,0 +0,25/ -0,20	4200	6300	18,0	2900
VI 324S	130	136,5 -2,5	200,0 +0,25/ +0,45	138,0 ±1,5	9,5 +0,25/ -0,20	2600	3900	43,0	4800

Type VA (Special sizes)

External seal for grease only



A=contact pressure

Special sizes Type VA..

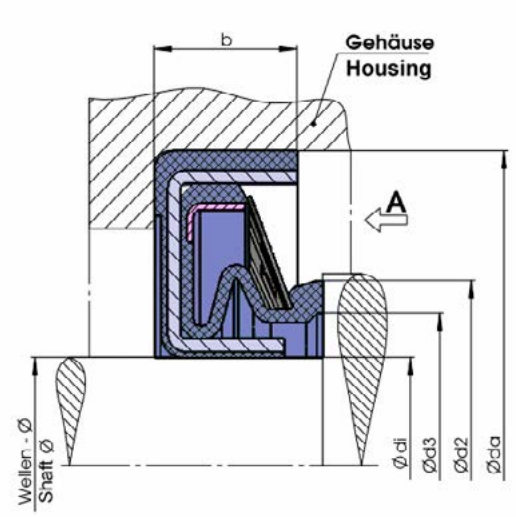
Axial shaft seal with external sealing lip, for use with grease. At low peripheral speeds and very good – if possible, lapped – mating surfaces, it can also be used with liquids.
This seal can be employed in either a stationery or rotating manner. For use with liquids, the maximum permissible speed must 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	Housing Ø	di	da	d3	b	Perm. speed		A	perm. pressure
						Perbunan	FKM		
	[mm]	[mm]	[mm]	[mm]	[mm]	[min^{-1}]	[min^{-1}]	[N]	[Pa]
VA 112S	94,0	66,0 -0,20/-0,35	92,7 -2,0	88,0 ±1,0	6,0 +0,25/ -0,20	2000	3000	28,0	7000
VA 122S	168,0	120,0 -0,25/-0,45	167,0 -3,0	157,8 ±1,5	9,2 +0,25/ -0,20	1200	1800	21,0	2000
VA 124S	162,0	129,8 -0,25/-0,45	161,0 -3,0	156,0 ±1,5	7,2 +0,25/ -0,20	1200	1800	32,0	3100
VA 124S1	177,5	129,8 -0,25/-0,45	176,5 -3,0	169,5 ±1,5	9,2 +0,25/ -0,20	1100	1650	38,0	2000
VA 124S2	172,0	130,2 -0,25/-0,45	171,0 -3,0	164,5 ±1,5	9,0 +0,25/ -0,20	1100	1650	56,0	5300
VA 128S	207,5	150,3 -0,25/-0,45	206,3 -3,5	198,5 ±2,0	9,9 +0,25/ -0,20	950	1400	60,0	4400
VA 130S	251,0	159,9 -0,25/-0,45	250,0 -4,5	240,3 ±2,0	10,0 +0,25/ -0,20	750	1100	52,0	1000
VA 130S2	252,0	160,0 -0,25/-0,45	251,0 -4,5	243,4 ±2,0	8,1 +0,25/ -0,20	750	1100	33,0	1500
VA 134S	214,0	180,4 -0,25/-0,45	213,0 -4,0	207,5 ±2,0	6,0 +0,25/ -0,20	900	1350	76,0	4000
VA 148S	348,5	252,4 -0,25/-0,45	347,5 -5,5	336,5 ±2,5	13,0 +0,25/ -0,20	550	800	74,0	1000
VA 162S	184,0	162,0 -0,25/-0,45	182,7 -3,0	178,7 ±1,5	6,0 +0,25/ -0,20	1000	1500	49,0	6500
VA 209S	92,0	48,6 -0,15/-0,30	90,7 -2,0	86,5 ±1,0	6,5 +0,25/ -0,20	2200	3300	6,0	1500

Axial shaft seals

Type DI..

Internal seal for oil and grease under high pressure

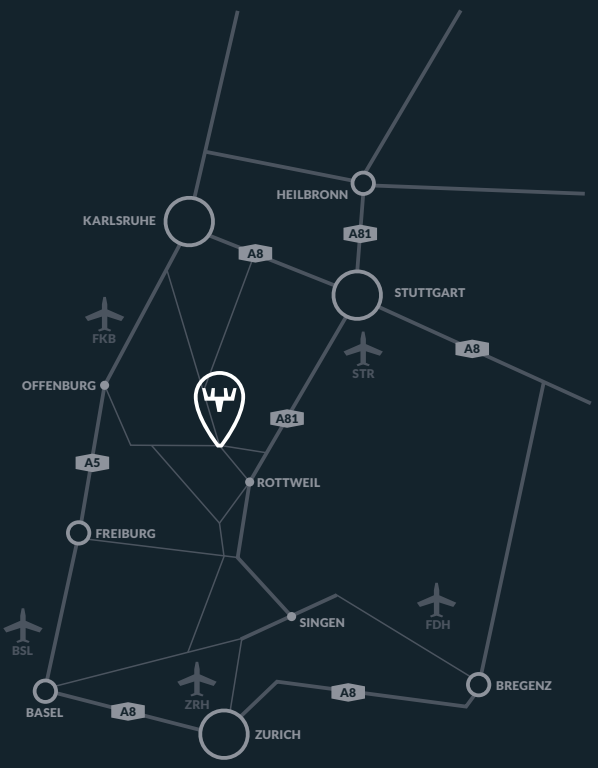


Type DI..

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.

Type	Shaft Ø	di	da	d2	d3	b	Perm. speed		A	Perm. pressure
							Perbunan	FKM		
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[min^{-1}]	[min^{-1}]	[N]	[Pa]
DI 204	20	21,0 ±0,5	41,0 +0,15/+0,30	27,5 ±0,5	24,5 ±0,5	7,5 +0,25/ -0,20	6000	9000	4,5	500000
DI 205	25	26,0 ±0,5	46,0 +0,15/+0,30	33,0 ±0,7	29,0 ±0,7	8,0 +0,25/ -0,20	5000	7500	14,0	500000
DI 206	30	31,0 ±0,5	56,0 +0,20/+0,35	40,0 ±0,7	33,0 ±0,7	9,0 +0,25/ -0,20	4000	6000	7,0	400000
DI 208	40	41,5 ±0,5	73,0 +0,20/+0,35	51,0 ±0,7	46,0 ±0,7	10,0 +0,25/ -0,20	3000	4500	15,0	300000
DI 210	50	51,5 ±1,0	83,0 +0,20/+0,35	62,0 ±0,7	56,5 ±0,7	10,0 +0,25/ -0,20	2000	3900	17,0	260000
DI 211	55	56,5 ±1,0	90,0 +0,20/+0,35	66,0 ±1.0	60,5 ±1,0	11,0 +0,25/ -0,20	2500	3700	15,0	250000
DI 214	70	72,0 ±1,0	115,0 +0,20/+0,35	84,0 ±1.0	78,0 ±1.0	13,0 +0,25/ -0,20	2000	3000	14,5	200000
DI 220	100	102,0 ±1,0	168,0 +0,25/+0,45	119,5 ±2,0	111,0 ±2,0	15,5 +0,25/ -0,20	1400	2100	80,0	140000
DI 228	140	143,0 ±1,0	221,0 +0,25/+0,45	165,0 ±2,0	158,0 ±2,0	20,5 +0,25/ -0,20	1000	1500	56,0	100000

CARL HIRSCH MANN



HEADQUARTER

Carl Hirschmann GmbH
Kirchentannenstraße 9
78737 Fluorn-Winzeln
Germany

T +49 7402 183-0
F +49 7402 183-10
E info@carlhirschmann.de

USA

Carl Hirschmann, Inc.
165 East Commerce Drive Ste 104
Schaumburg, IL 60173
USA

T +1 847 468 9700
F +1 847 468 9701
E info@carlhirschmann.us

CHINA

Carl Hirschmann
Room C528, Block 180,
South Chang Jiang Road
Bao Shan District, Shanghai
P.R. CHINA 200433

T +86 139 16 13 58 45
E info@carlhirschmann.com.cn

carlhirschmann.de