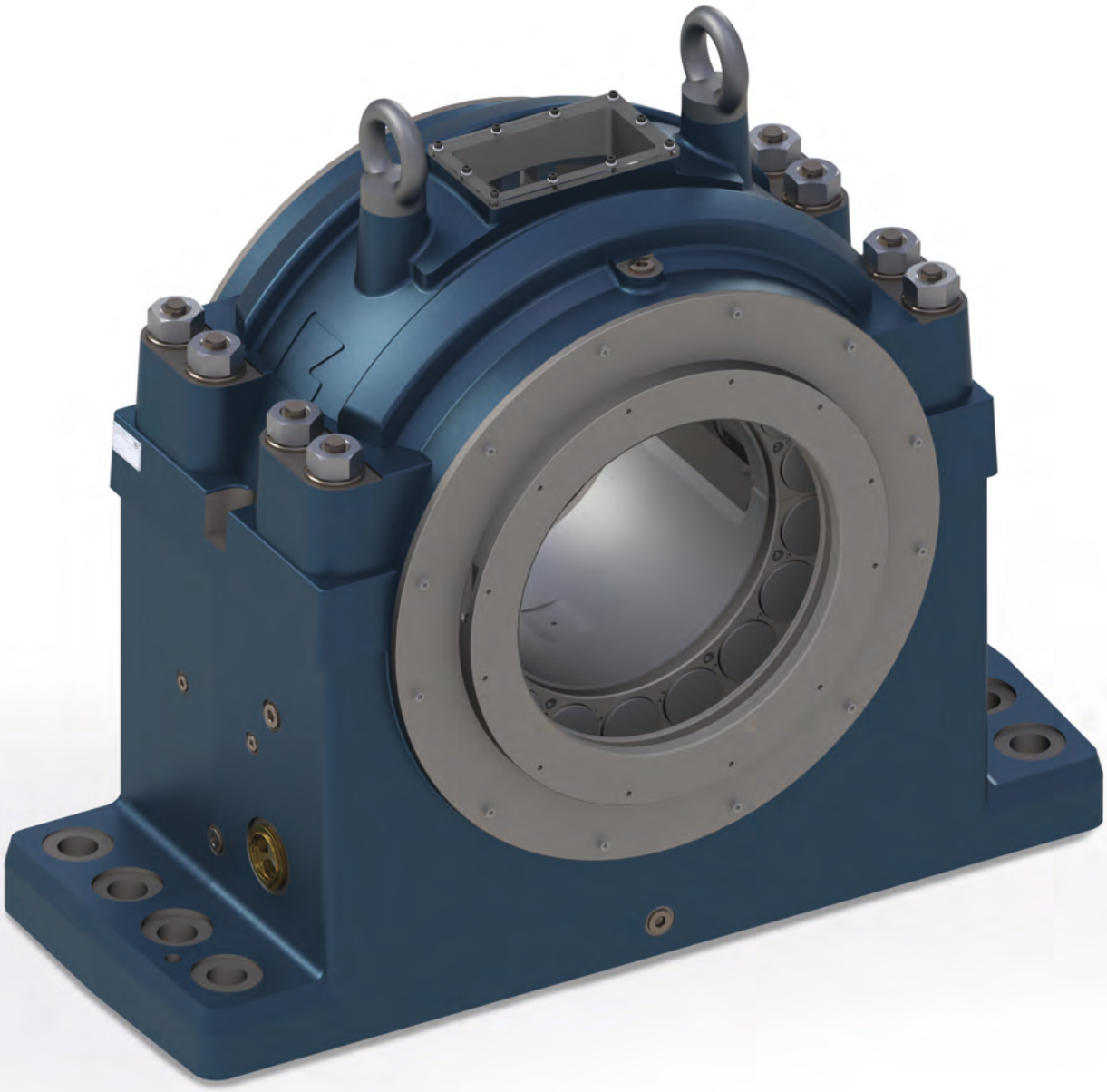
Innovation in Motion

Miba Industrial Bearings
Pedestal Bearing ZR / ZG



Miba Industrial Bearings

The Industrial Bearing Branch of the Miba Bearing Group produces hydrodynamic bearings and labyrinth seals for use in mechanical and plant engineering which are used in a wide range of high-performance applications.
Our highly inspired teams, work diligently to serve our customers the best bearing solutions for each and every application.

Content

Description of the pedestal bearing

The Miba pedestal horizontal bearing (type ZR and ZG) is designed according to DIN 31690 norm specifications for a wide range of heavy duty applications (electrical machines, turbines, blowers and test rigs). The modular system applies to the different types of bearings (pedestal, end flange and center flange), i.e. it is always possible to combine different modules of this system such as shell, lubricating ring and other equipment. Thus, assembly is simple and mistakes due to the positioning of screws and pins are avoided during installation, commissioning and maintenance procedures.

Housing
The bearing housings are finned (size 35) or smooth (sizes 45, 56, 71) and manufactured from nodular cast iron EN-GJS-400-15 (formerly GGG 40) giving high strength. Upon request, they can be supplied in gray cast iron EN-GJL-300 (formerly GG 30) or in nodular cast iron EN-GJS-400-18-LT (formerly GGG 40.3). The spherical seat in the housing ensures easy alignment during assembly and the loads are evenly distributed into the lower part of the housing. Therefore, these bearings are designed for high-stress applications. Thread holes for monitoring the temperature, for oil inlet and outlet, as well as for oil level, are provided on both sides of the housing as standard. The housing comes with an oil sight glass on one side. The opposite side is supplied plugged and may be used as an oil outlet. If needed, their positions can be exchanged by reversing these parts. In the top half of the housing, a sight glass, which permits the loose oil ring to be viewed, and a plugged manual oil feeder are provided. The basic design can be easily amended, if required, to incorporate water cooling tubes, oil sump heater, vibration detectors (angled at 45°), horizontal, vertical and axial vibration sensors and earthing devices. Upon equest, thread holes can be provided in the ZR housing to meet all 541 and 546 requirements for API norms.

Bearing shells
The shell is supplied in halves and spherically seated in the housing, ensuring easy self-alignment during assembly. The material is low carbon steel, lined with high tin-based white metal. This construction ensures na easy assembly and a long life cycle. Bearing shells with plain cylindrical bore and loose oil ring are used in most cases, but other shapes of bore are possible. When the specific load on start-up is too high, or for very slow speed applications, a hydrostatic jacking system can be incorporated. Bearing shells can be provided with or without thrust faces.

Q-type shells have no thrust capability for non-locating bearings.

B-type shells with plain white metal lined shoulders with oil grooves are suitable for small, temporary thrust loads.

K-type shells have taper land faces for medium thrust loads and both directions of rotation.

D-type shells, with taper land faces suitable for only one direction of rotation, are capable of absorbing higher thrust loads.

A-type shells, for the highest loads, are equipped with thrust tilting pads.

Oil supply
Fully self-contained lubrication is achieved by using a loose oil ring. Alternatively, where bearings are lubricated by an external oil circulation system, this loose oil ring can be used to permit an emergency shutdown without damage in case an oil system failure occurs. Z-bearings can be used for marine applications, where an oil ring guide assures proper lubrication even if extreme vessel motions occur.

Electrical insulation
To prevent stray currents conducted by the shaft, Z-bearings can optionally be supplied electrically insulated. In this case, the spherical seat of the housing is coated with a wearresistant and temperature-resistant synthetic material. Upon request, a grounding wire is provided to short out this insulation, passing through a thread hole (Pg 7) in the housing.

Sealing
The seals are selected for the different operation conditions, environments and requested protection level. It can be a floating labyrinth seal (IP 44)made of high heat resistant fiber reinforced synthetic material or with adjustable rigid seals (IP 44) made of aluminum alloy. Both types of seals can be equipped with bolt-on baffles (IP 55) or dust flingers (IP 54) if the bearing is operating in a dusty or a wet environment, or if rotating parts (clutches, couplings, fans etc.) are fitted close to the bearing. Special seals offering higher protection, or pressurized seals etc., can be supplied for special applications upon request. An end cover is used when the end of the shaft is inside the bearing housing.

Temperature control
Provisions for the fitting of thermo sensors in the journal bush and oil sump are provided as standard. The type of sensor used depends on the type required by the readout equipment used (direct reading, centralized control system, recording instrument, etc.). For bearings with high thrust loads, additional thermometers for the thrust part can be integrated.

Selection of oil
It is recommended that any branded mineral oil which is inhibited against foaming, ageing and oxidation is used as lubricant. The viscosity is suggested by Miba Industrial Bearings if the customer doesn`t have preferences.

Bearing calculation
Miba Industrial Bearings uses a state of the art calculation program which can provide the following outputs:

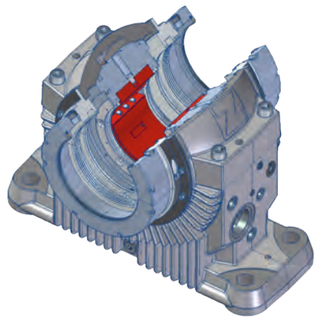
- Minimum oil film thickness
- Maximum hydrodynamic pressure
- Maximum bearing temperature
- Oil outlet temperature
- Minimum permissible oil flow
- Frictional power loss
- Stiffness and damping coefficients
- Clearance for bearing / shaft seat

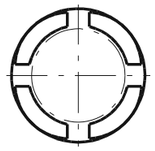
Radial bore profile selection

The radial bore profile type selection depends on several conditions. Among them we have the circumferential speed and the specific pressure. The following table should help in a preliminary selection.

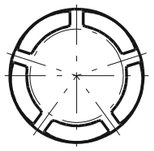
1 // Type of radial bearing bore profile

Type of bore	Circumferential speed U (m/s)	Specific load p (MPa)
C/L/F Cylindrical	0 … 30	0 … 4
Y Two-lobe	25 … 75	0 … 3
V Four-lobe	25 … 100	0 … 2
K Radial tilting pads	15 … 100	0 … 2





4 tilting pads



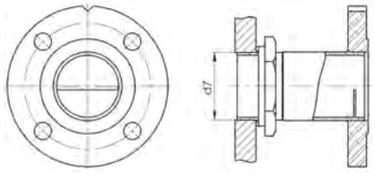
5 tilting pads

- MIBA housing bearings of all sizes 9 - 45 can be provided with tilting pad journal bearings for the highest demands
- Very high load capacity at highest circumferential speeds up to 100 m/s
- Highest stability properties

Oil flow

Z-bearings are supplied without oil inlet or outlet flanges. Upon request, as additional items, Miba Industrial Bearings can supply these flanges according to DIN 2573 or ANSI B16.5 norms. Oil outlet flanges with weir are to be mounted with the weir horizontal at the bottom. The mark on the flange will then be visible in the center of the top side.

Larger oil quantities with special outlets on request.



1 // Oil flow

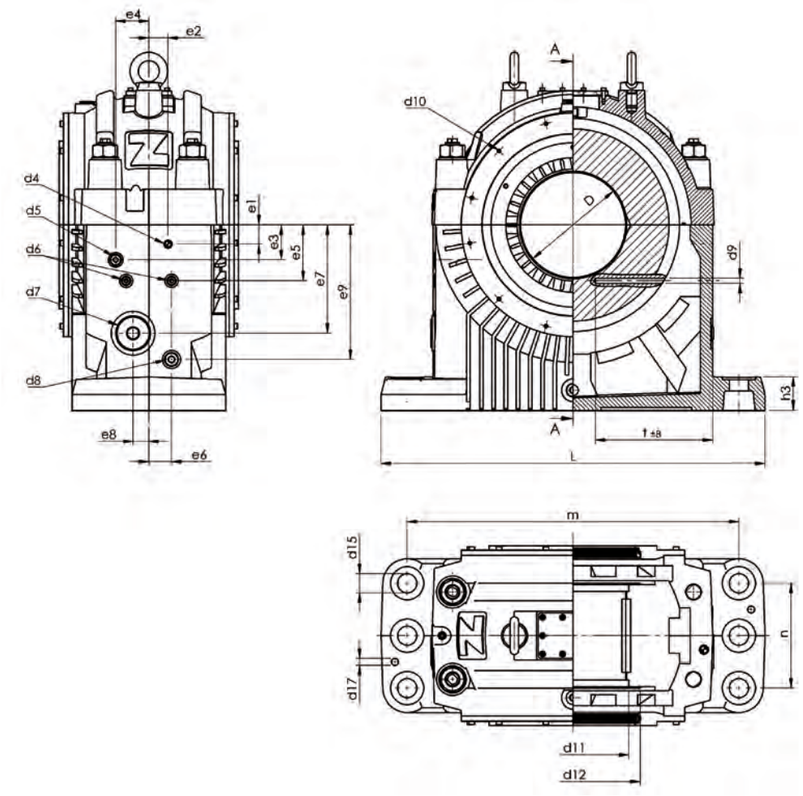
Size	Oil outlet thread Std	Maximum flow for oil ISO VG 32 and 46 at 40°C (l/min)	Maximum flow for oil ISO VG 68 and 100 at 40°C (l/min)	Oil outlet thread enlarged*	Maximum flow for oil ISO VG 32 and 46 at 40°C (l/min)	Maximum flow for oil ISO VG 68 and 100 at 40°C (l/min)
35	G3 (DN 80)	42	35	G4 (DN 100)	53	50
45	G3 (DN 80)	42	35	G4 (DN 100)	53	50
56	G3 (DN 80)	42	35	G4 (DN 100)	53	50
71	G3 (DN 80)	42	35	G4 (DN 100)	53	50

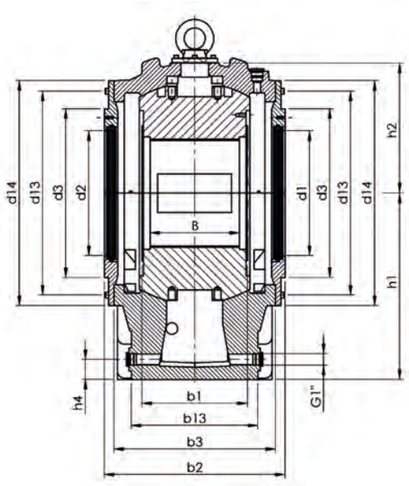
* nonstandard enlarged oil outlet threads for bigger oil quantity applications, upon request. Additional cost will be applied.

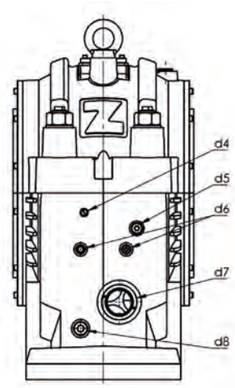
ZR bearing dimensions

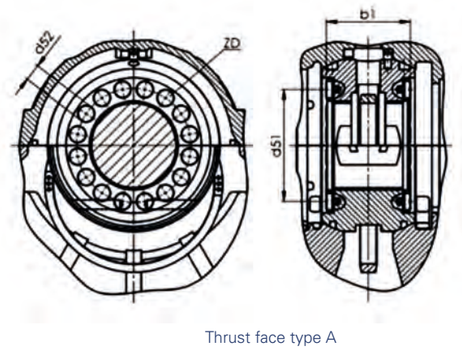
1 // ZR bearing dimensions

Size	D (H7)	B	b1	b2	b3	b13	d1 and d2	d3	d5	d7	d8	d9	d10	d11	d12	d51	d52	d13	d14	d15	d17 [1]		e1	e2	e3	e4	e5	e6	e7	e8	e9	h1	h2	h3	h4	L	m	n	t	ZD tilting Pads per size	appr. weight (kg)	appr. Oil content (l)
35	300	254	300	562	460	360	300; 315 335; 355 375; 400 425; 450	480	G3/4	G3	G1	18	M10 12(x)	320	385	390	63	600	640	55 to M42	20		55	55	120	95	160	65	295	45	385	530	370	95	57	1100	950	300	332	16	1300	33
	315	254						480						335	400	405	63										170		295											18		
	335	254						480						355	425	425	63										180		310											18		
	355	254						480						375	445	445	63										190		310											20		
	375	264						525						395	455	455	50										200		320											24		
	400	264						525						420	470	470	50										210		320											24		
	425	264						525						445	515	-	-										225		320											-		
	450	264						525						-	-	-	-										235		320											-		









Thrust face type A

d4 = Earthing device or plug - Pg[7]
d5 = Oil inlet (oil circulation or recirculating pump)
d6 = Provision for thermometer G 1/2“
d7 = Oil sight glass or oil outlet (oil circulation)
d8 = Plug (connection for heater, oil sump thermometer, water cooler)
t = Depth of thermometer bore

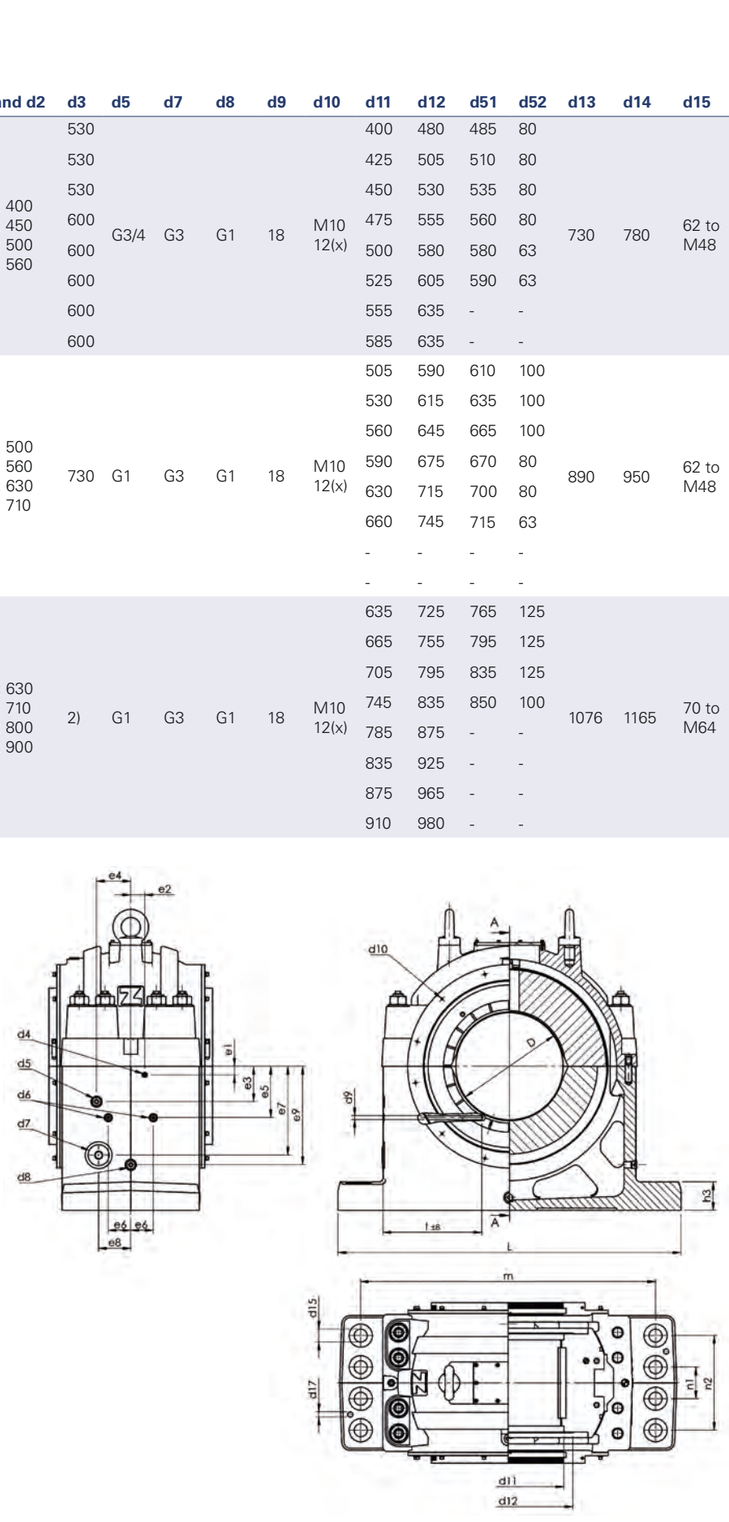
1) bore for dowel pin

Drawings shown here are for reference only. Some fin details, for example, may vary from size to size.

ZG bearing dimensions

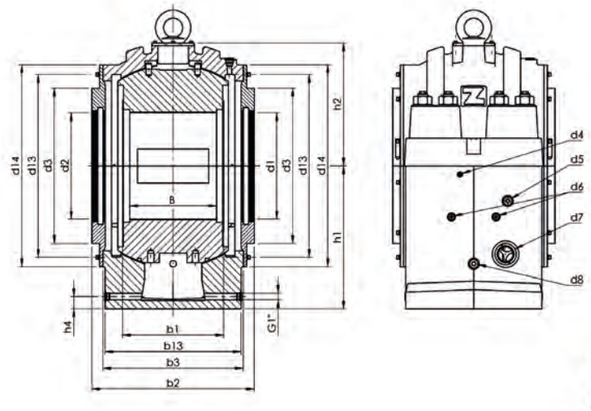
1 // ZG bearing dimensions

Size	D (H7)	B	b1	b2	b3	b13	d1 and d2	d3	d5	d7	d8	d9	d10	d11	d12	d51	d52	d13	d14	d15	d17 [1]		e1	e2	e3	e4	e5	e6	e7	e8	e9	h1	h2	h3	h4	L	m	n1	n2	t	ZD tilting pads per size	appr. weight (kg)	appr. Oil content (l)
45	375	319	375	652	550	530	375; 400 425; 450 475; 500 530; 560	530	G3/4	G3	G1	18	M10 12(x)	400	480	485	80	730	780	62 to M48	20		45	45	130	120	190	75	335	90	420	600	475	120	60	1350	1150	-	355	396	16	2300	63
	400	319						530						425	505	510	80										205		335												18		
	425	319						530						450	530	535	80										215		350												18		
	450	319						600						475	555	560	80										230		350												20		
	475	329						600						500	580	580	63										245		360												26		
	500	329						600						525	605	590	63										255		360												26		
	530	329						600						555	635	-	-										270		360												-		
	560	329						600						585	635	-	-										285		360												-		
56	475	409	475	762	660	640	475; 500 530; 560 600; 630 670; 710	730	G1	G3	G1	18	M10 12(x)	505	590	610	100	890	950	62 to M48	25		105	190	165	160	225	105	415	150	460	670	575	130	58	1600	1400	150	450	450	16	4000	76
	500	409												530	615	635	100										240												18		
	530	409												560	645	665	100										255												18		
	560	419												590	675	670	80										270												22		
	600	419												630	715	700	80										295												24		
	630	429												660	745	715	63										310												30		
	670	429												-	-	-	-										330												-		
	710	429												-	-	-	-										350												-		
71	600	522	600	912	810	780	600; 630 670; 710 750; 800 850; 900	2)	G1	G3	G1	18	M10 12(x)	635	725	765	125	1076	1165	70 to M64	25		125	240	175	200	250	140	500	190	540	750	720	160	62	2000	1800	200	560	560	18	6400	125
	630	522												665	755	795	125										270												18		
	670	522												705	795	835	125										295												18		
	710	534												745	835	850	100										320												24		
	750	534												785	875	-	-										340												-		
	800	549												835	925	-	-										370												-		
	850	549												875	965	-	-										400												-		
	900	549												910	980	-	-										425												-		



d4 = Earthing device or plug - Pg[7]
d5 = Oil inlet (oil circulation or recirculating pump)
d6 = Provision for thermometer G 1/2“
d7 = Oil sight glass or oil outlet (oil circulation)
d8 = Plug (connection for heater, oil sump thermometer, water cooler)
t = Depth of thermometer bore

1) Bore for dowel pin
2) Details on request



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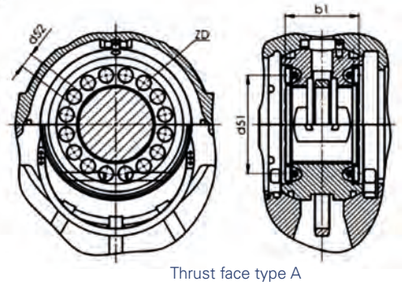
Some details may vary from size to size.



Thrust face type A

Dimensions of shaft

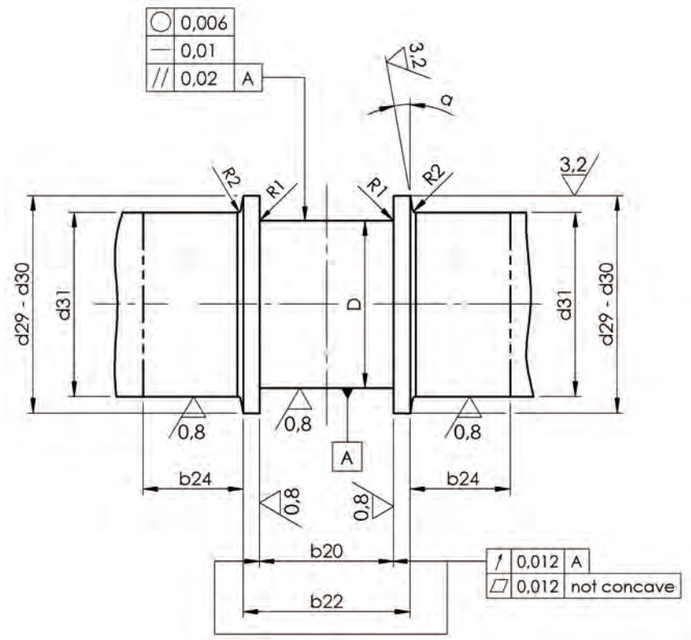
1 // Dimensions of shaft

Size	D [1]	b20 [2]	b21 [3]	b22	b23 [4]	b24	b25	b26	d29	d30	d31 (e8)	d32		d33	R1 [6]	R2 [6]	R3
35	300	300,5	315	360	16	115	335	130	385	458	300	315	335	335	8	12	2,5
	315								400	473	—	300	315	355			
	335								425	493	355	375	400	375			
	355								450	513	335	355	375	400			
	375								470	510	425	450		425			
	400								495	525	400	425		450			
	425								515	-				475			
	450								-	-				500			
45	375	375,5	400	445	16	120	425	130	480	570	375	400	425	425	10	16	4
	400								505	595	—	375	400	450			
	425								530	620	450	475	500	475			
	450								555	645	425	450	475	500			
	475								580	648	530	560		530			
	500								605	658	500	530		560			
	530								645	-				600			
	560								-	-				630			
56	475	475,5	500	555	16	120	530	135	590	715	475	500	530	530	10	16	4
	500								615	740	—	475	500	560			
	530								645	770				600			
	560								675	755	560	600	630	630			
	600								715	785	530	560	600	670			
	630								745	782				710			
	670								-	-	710			740			
	710								-	-	670			780			
71	600	600,5	630	690	20	125	670	135	725	900	600	630	670	670	10	16	6
	630								755	925	—	600	630	710			
	670								795	965				750			
	710								835	955	710	750	800	800			
	750								875	975	670	710	750	850			
	800								925	-				900			
	850								965	-	850			920			
	900								980	-	800			970			

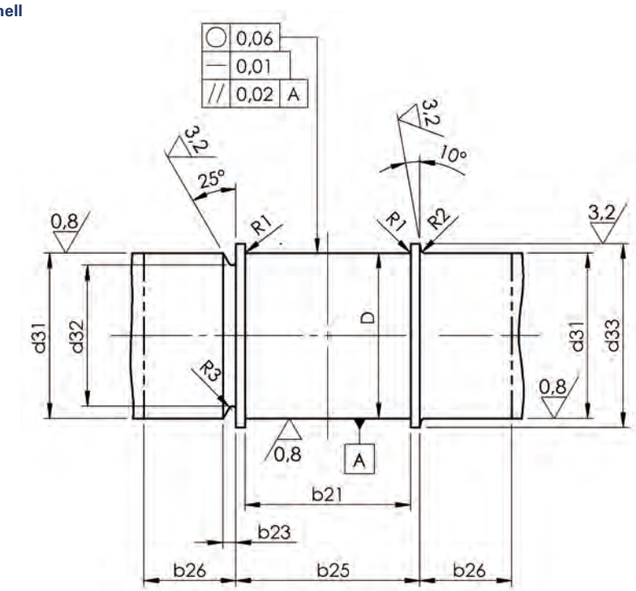
Dimensions in millimeters

[1] Limit dimensions of the shaft acc. DIN 31 698, form and positional tolerance and surfaces roughness acc. to DIN 31 699.
[2] Standard thrust clearance is 0,6 mm. If reversible thrust loads or shock load occur, dimension b20 can be reduced by 0,3 mm. If a locating bearing (shell type B,K) is needed only for test runs, dimension b20 can be enlarged by 4 up to 6 mm.
[3] If the non-locating bearing must allow larger motions (due to heat expansion or to large thrust clearances caused by the unit), dimension b21 can be enlarged.
[4] The plunge cut d32 is dropped, if it is equal or smaller as the shaft diameter D.
[5] Radii R1 and R2 can be replaced by a plunge cut acc. to DIN 509.

For locating bearing shell
Z…B (d29; α=10°)
Z…K (d29; α=10°)
Z…D (d29; α=10°)
Z…A (d30; α=15°)



For non-locating bearing shell
Z...Q

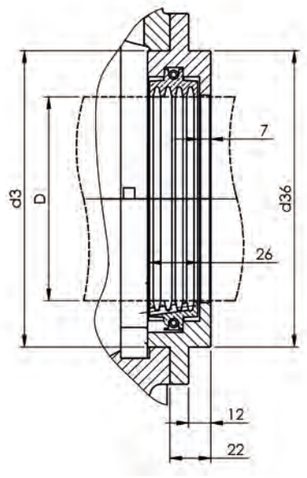


Types and dimensions of seals

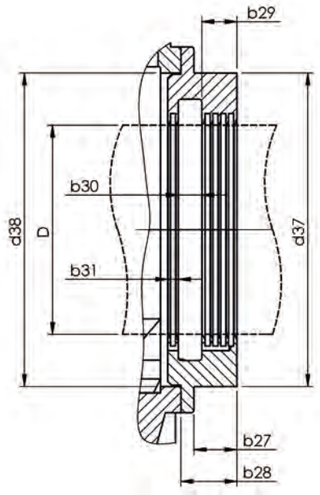
1 // Types and dimensions of seals

Size	D	b27	b28	b29	b30	b31	b32	d3	d14	d36	d37	d38	d39	d40
35	300 [1)] 315 [1)] 335 [1)] 355 [1)] 375 400 425 450	36	51	27	10	10	32	520	640	480	525	520	525	525
45	375 400 425 450 475 500 530 560	36	51	27	10	10	2)	-	780	-	600	657	600	600
56	475 500 530 560 600 630 670 710	36	51	27	10	10	2)	-	950	-	730	797	730	730
71	600 630 670 710 750 800 850 900	36	51	27	10	10	2)	-	1160	-	990	985	990	990

[1)] These sizes of seals can be manufactured in floating labyrinth seal or rigid seal. All other seal sizes can only be manufactured in rigid seal.
[2)] Details on request.

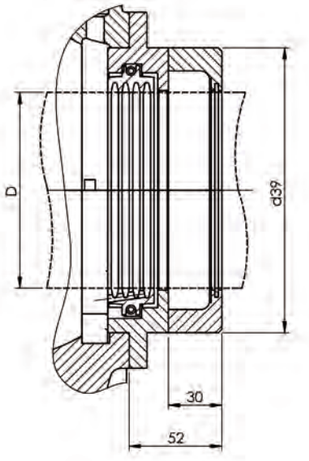


Floating labyrinth seal
(Protection IP 44)

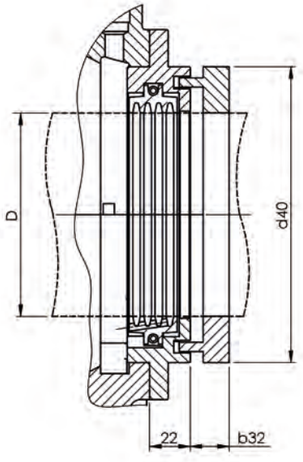


Rigid seal*
(Protection IP 44)

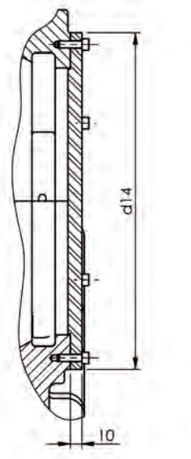
*Can be combined either
with a bolt-on baffle (IP 55)
or with a dust flinger (IP 54)



Floating labyrinth seal
with bolt-on baffle
(Protection IP 55)



Floating labyrinth seal
with dust flinger
(Protection IP 54)



End cover

Special seal designs for specific applications upon request.

Bearing types and designations

Z	R				–		–	
1	2	3	4	5		6		7

1 // Type	
Z	Plain bearing

2 // Housing	
R	Pedestal bearing, finned
G	Pedestal bearing, smooth

3 // Heat dissipation	
N	Naturally cooled by convection
Z	Lubrication by oil circulation with external oil cooling
X	Lubrication by oil circulation with external oil cooling for high oil throughput
W	Finned water cooler in the oil sump
U	Recirculating oil pump and natural cooling
T	Recirculating oil pump and water cooler in the oil sump

4 // Shape of bore and type of lubrication	
C	Plain cylindrical bore without oil ring
L	Plain cylindrical bore with loose oil ring
F	Plain cylindrical bore with oil disk
Y	Two-lobe bore without oil ring
V	Four-lobe bore without oil ring
K	Journal tilting pads without oil ring

5 // Geometry of thrust bearing	
Q	Without thrust capability
B	Plain white metal lined shoulders with oil grooves
K	Tapered land thrust faces for both sense of rotation
D	Tapered land thrust faces for one sense of rotation
A	Round tilting thrust pads, cup spring supported

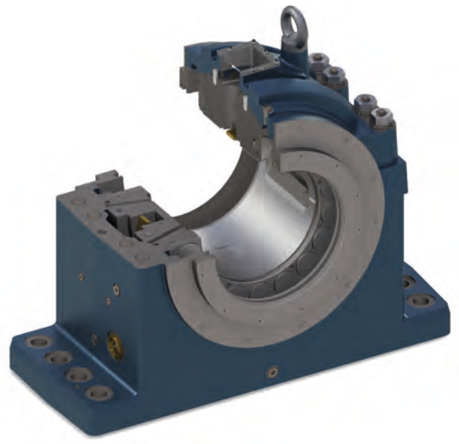
6 // Size

7 // Shaft diameter (mm)

Example of a bearing designation:

Z R N L B - 35 - 300

Pedestal bearing, finned, naturally cooled by convection, plain cylindrical bore with loose oil ring, plain white metal lined shoulders with oil grooves (locating or non-locating bearing), size 35, for shaft diameter 300 mm.



ZF - End flange mounted bearing
The type ZF horizontal bearing is designed acc. to DIN 31693 norm specifications for a wide range of heavy duty applications (electrical machines, turbines and test rigs).

ZM - Center flange bearing
The type ZM horizontal bearing is designed acc. to DIN 31694 norm specifications for a wide range of heavy duty applications (electrical machines, turbines and test rigs).

ZR - Pedestal bearing
The Miba type ZR horizontal bearing is designed acc. to DIN 31 690 norm specifications for a wide range of heavy duty applications (electrical machines, turbines, blowers and test rigs).

Checklist

- ☐ Operating conditions for calculation complete?
- ☐ Certification necessary (Lloyd`s, RINA…)?
- ☐ Atex class?
- ☐ Watercooler required?
- ☐ Hydrostatic oil supply required?
- ☐ Oil inlet or outlet flanges required (flange DIN)?
- ☐ Connecting diagram filled out?
- ☐ Electrical insulation required?
- ☐ Earthing device required?
- ☐ Protection class specified?
- ☐ Sealing type and diameter (outside)?
- ☐ Sealing type and diameter (inside)?
- ☐ Sealing diameter of machine seal?
- ☐ Shaft drawing available?
- ☐ Shaft vibration sensors required (thread…)?
- ☐ Speed sensor required (thread…)?
- ☐ Absolute vibration sensor required (position, thread…)?

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