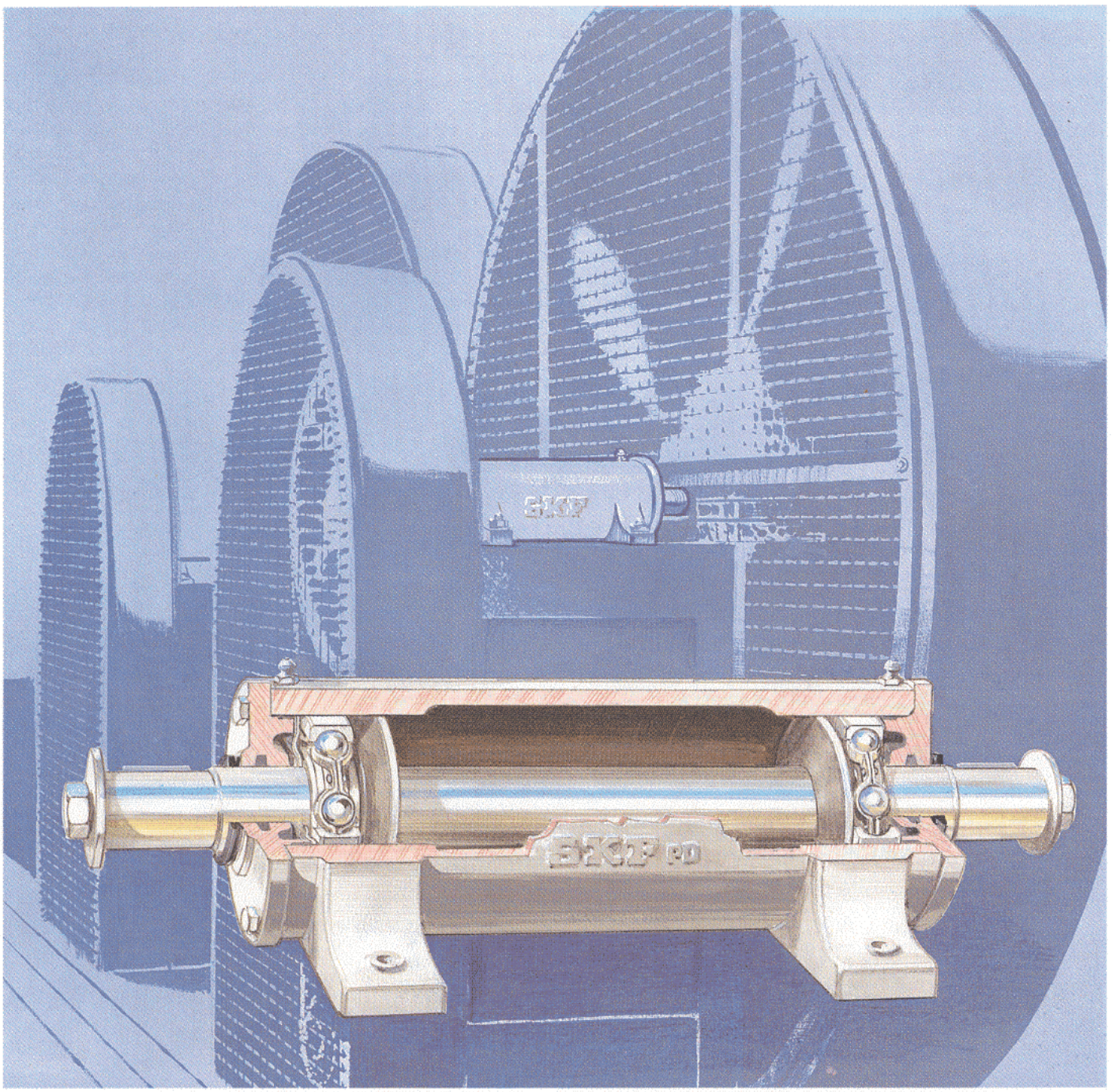
Two-bearing units



Contents

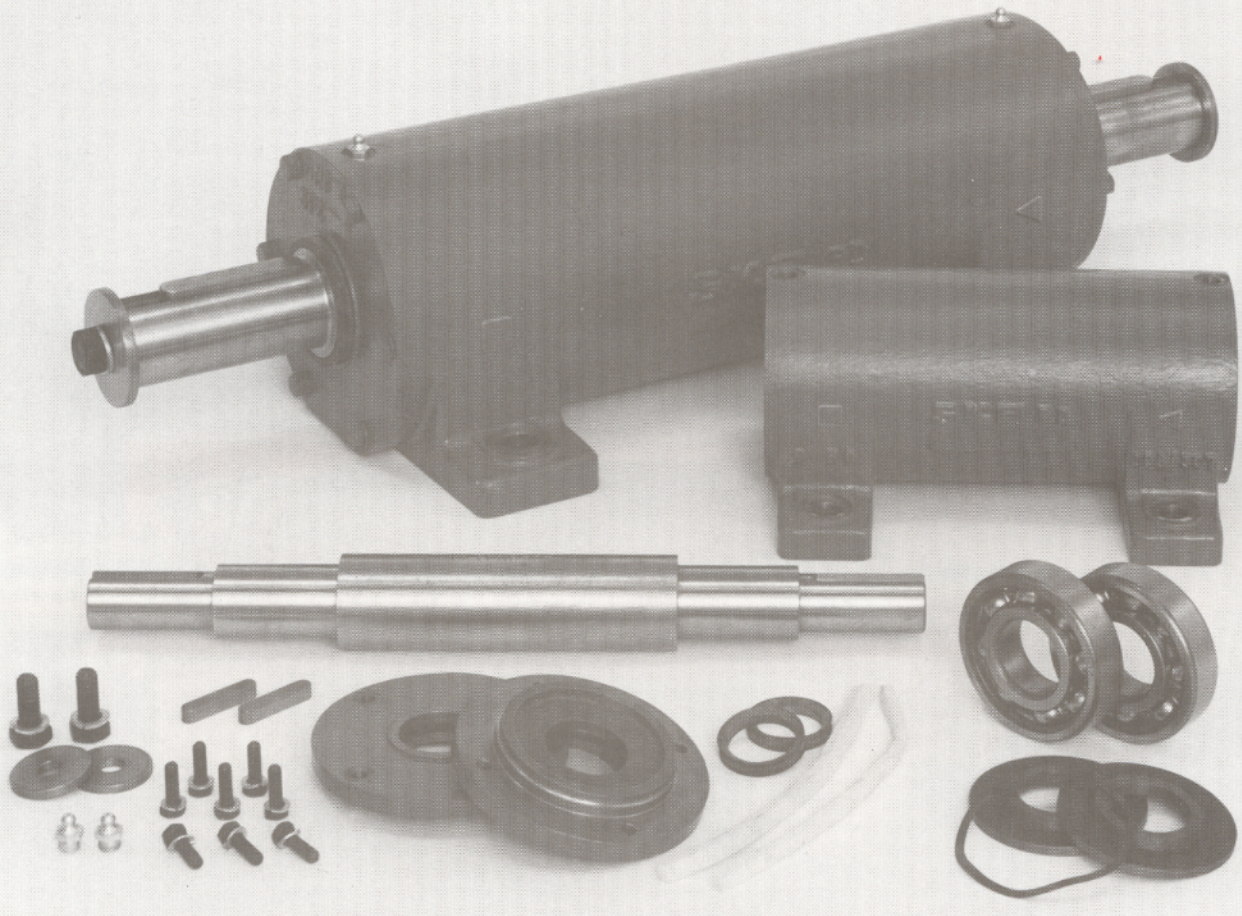
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SKF two-bearing units

SKF two-bearing units have been designed primarily for the support of overhanging shafts carrying the impellers of fans, but they can also be applied successfully elsewhere, for example, on centrifugal pumps, grinding spindles, circular saws and transmissions.

The two-bearing units have certain advantages over the more conventional alternative where two self-aligning ball bearings or two spherical roller bearings are mounted in separate plummer block housings. Although such bearings can accommodate a certain amount of shaft bending because of their inherent self-aligning property, the use of rigid bearings gives more accurate running, particularly in a two-bearing housing, and this is favourable from a noise-reduction point of view. A unit with a common housing is also easier to align when mounting than two separate housings. Moreover, there is a trend towards increased fan pressures. This generally calls for higher rotational speeds and leads to heavier axial loads. Two of the four standard series of SKF two-bearing units are in fact fitted with three bearings, to enable the axial load to be adequately accommodated.

It is also possible to purchase the housings and bearings separately, if users prefer to machine their own shafts, or if combinations of bearings not covered by the standard units are required. A section dealing with the separate components will be found on pages 18 to 25 and includes tables showing shaft dimensions.

Design

The housings of SKF two-bearing units are externally of the same design but, depending on the series, they are fitted with different bearings, covers and seals. The larger housings are provided with two eye bolts to facilitate handling. Four bolt holes are provided in the base to take the attachment bolts. The covers are held in position by four screws on the smaller units and six screws on the larger units.

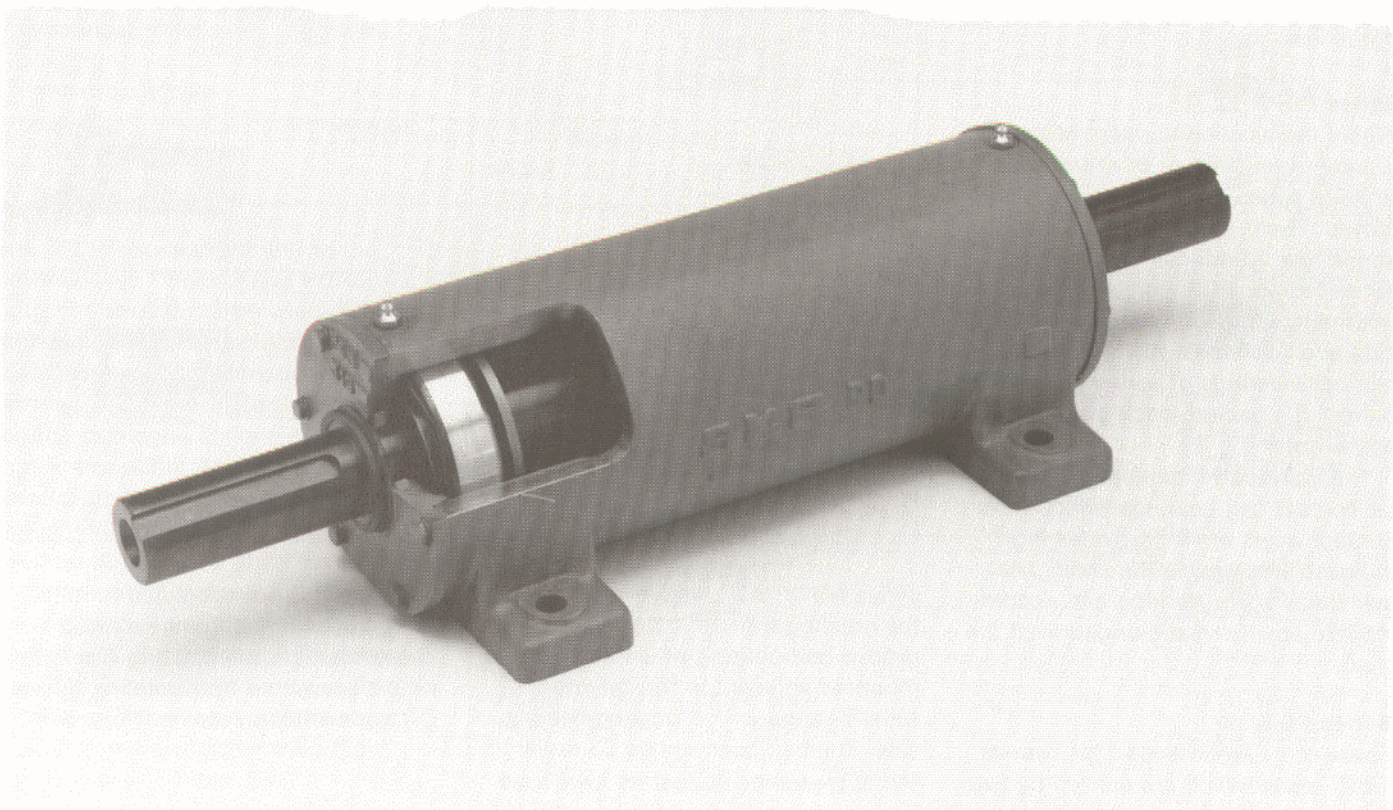
The housing body and covers are made from grey cast iron. A grease nipple is fitted at each end. The two bearing seatings are strictly concentric, being accurately machined at one setting. The accuracy of form meets the IT6 specification. All housings carry a square marking on their sides to show the position of the wider of the two housing seatings. An arrowhead marking at the other end of the housing indicates, when appearing, the direction in which the axial load produced in operation must act.

There are four standard series of SKF two-bearing units. Series PDNB 2 and PDNB 3 are designed for normal duty, series PDPF 22 and PDRJ 3 for heavier loads.

All units, which are supplied in an assembled condition complete with bearings, shafts and covers, are ready greased. The grease used is a rust inhibiting, mineral oil and lithium base grease of good quality with an operating temperature range of −30 to +110 °C.

The shaft seatings for the bearings are machined to IT5 (up to and including size 12) or IT6 (larger sizes). The shafts are fitted with a locking key and end plate with screw at each end.

All units incorporate two flinger rings, mounted inboard of the bearings, the purpose of which is to regulate the grease quantity at the bearing positions and to prevent over-lubrication. Excess grease collects in the central section of the housing where there is plenty of space available.

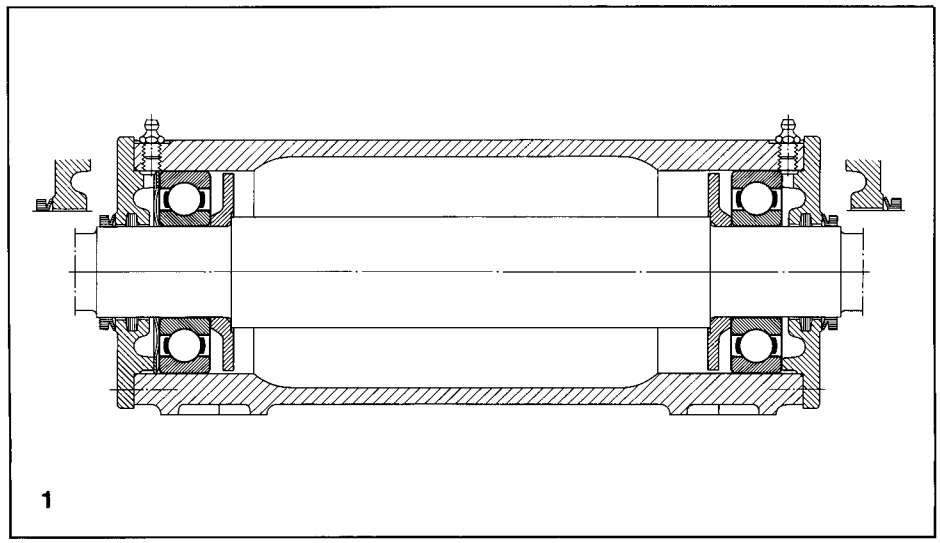


Series PDNB 2 and PDNB 3

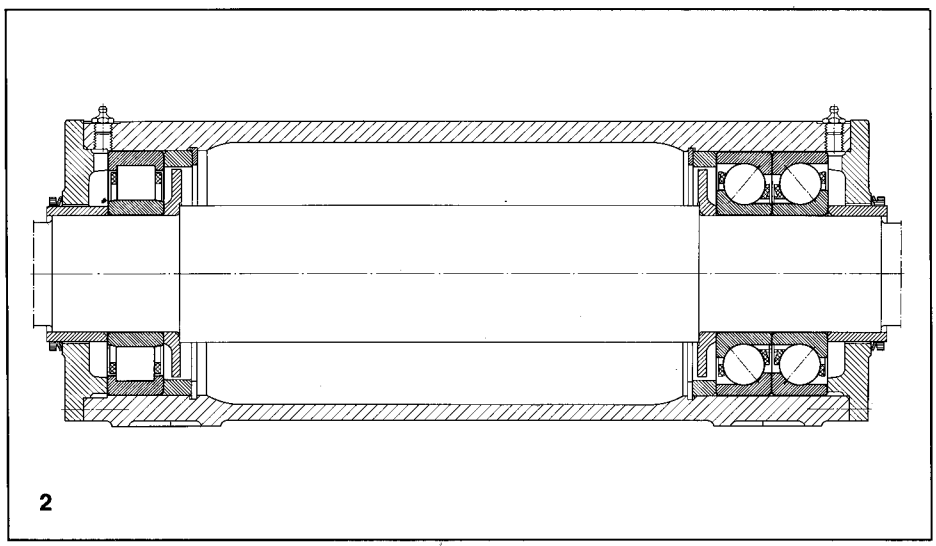
These series are intended for normal duty. Two single row deep groove ball bearings having Normal radial internal clearance are incorporated; bearings of series 62 are used for the PDNB 2 units and the more robust 63 series bearings in the PDNB 3 units (fig 1). The units are suitable for high-speed operation and, with the exception of the sizes specified below, they can accommodate axial loads in both directions in addition to radial loads.

As the applications for which the smaller sizes of these series have been designed often call for quiet operation, the units up to and including sizes PDNB 218 and PDNB 316 incorporate a spring washer. This is fitted between bearing and cover at the side indicated by the arrowhead marking. The washer serves to adjust the bearings to zero clearance (or a slight preload). Because of this, the spring-loaded units can only accommodate axial loads in the direction shown by the arrowhead.

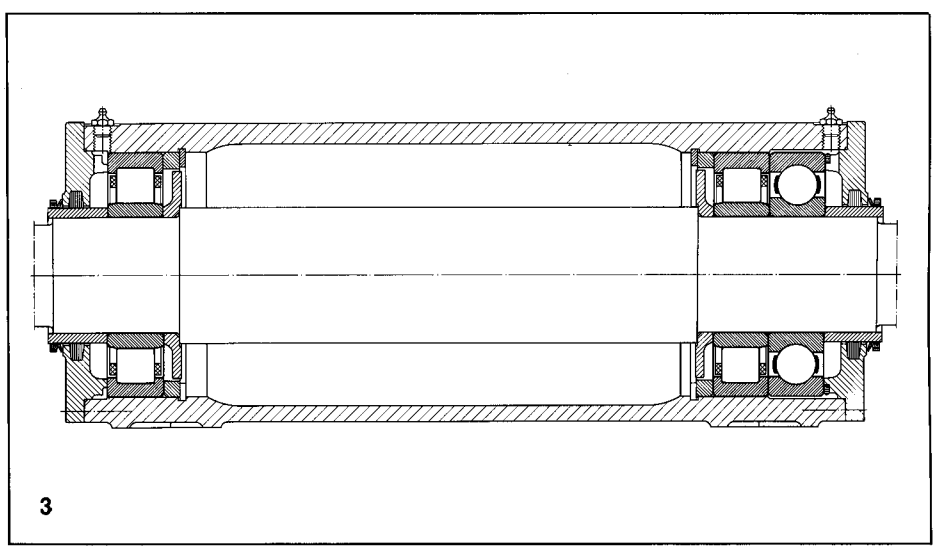
The housings of series PDNB 3 are sealed at both sides by felt strips and V-rings. The covers are recessed to take the felt strip seals, whilst the V-rings are mounted outboard of the housing and seal against the face of the cover. Felt strip seals are not incorporated in the PDNB 2 units and, therefore, the covers of these units are not recessed.



1



2



3

Series PDPF 22

Where the axial component of the load is more dominant, or is alternating, units of series PDPF 22 can be employed. The unit incorporates one single row cylindrical roller bearing of series NU 22 ECP with Normal radial internal clearance at the non-locating side and two single row angular contact ball bearings of series 72 BECBP paired in a back-to-back arrangement at the other (fig 2).

The paired arrangement of the angular contact ball bearings, which have a contact angle of 40°, provides high stiffness and locates the shaft. The cylindrical roller bearing can accommodate any thermal elongation of the shaft.

Series PDRJ 3

These units are intended for heavier radial loads which are carried by two single row cylindrical roller bearings of series NU 3 ECP, one at each end of the housing (fig 3). A single row deep groove ball bearing of series 63 is mounted adjacent to the cylindrical roller bearing at the locating bearing side. The ball bearing has C3 radial internal clearance so that its axial load carrying capacity is enhanced. To ensure that it is not subjected to radial load, the ball bearing has a radial clearance fit in the housing. The outer ring is prevented from rotating by an O-ring inserted in the housing cover.

Other combinations

For special requirements, PDN housings may be fitted with other combinations of deep groove ball bearings, angular contact ball bearings and cylindrical roller bearings or with spherical roller bearings. The various possible arrangements are shown in fig 4.

In cases where the operating speeds rule out the use of grease as a lubricant special two-bearing units designed for oil bath or circulating oil lubrication can be made available. Other special units may be required for vertical shaft arrangements. Details will be supplied on request; the nature of the application should be specified.

Tolerances

The shaft and housing tolerances used for the bearing seatings of the SKF two-bearing units are as follows:

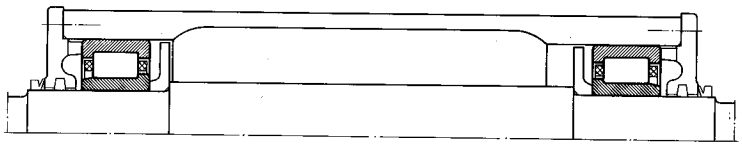
PDNB 2 and PDNB 3	k6/G6
PDPF 22	
cylindrical roller bearing	m6/J6
angular contact ball bearings	k6/J6 for bearings with d ≦ 100 mm m6/J6 for bearings with d > 100 mm
PDRJ 3	
cylindrical roller bearing	m6/J6
deep groove ball bearing	m6/clearance

Seals

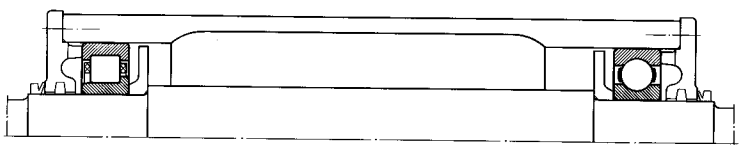
The felt strips incorporated in the covers of the PDNB 3 and PDRJ 3 housings should not be used at peripheral speeds greater than 4 m/s if there is heavy contamination. Under normal conditions, speeds approaching the catalogue limits for the bearings are possible. The seals are suitable for operating temperatures of between −40 and +100 °C. The V-rings used on all standard units have the same operating temperature range but can be used at peripheral speeds of up to 7 m/s. Even higher speeds are possible provided the V-ring seals are located axially. Where speeds and/or temperatures are higher than the above, please contact SKF.



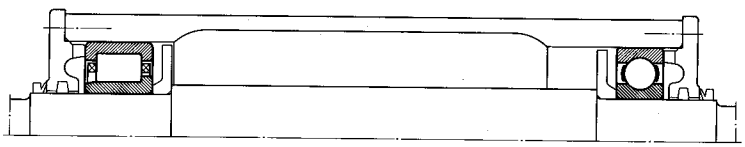
PDND 2	NJ 2 ECP	NJ 2 ECP
PDND 3	NJ 3 ECP	NJ 3 ECP



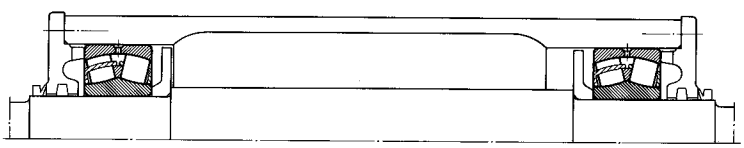
PDND 22	NJ 22 ECP	NJ 22 ECP
PDND 23	NJ 23 ECP	NJ 23 ECP



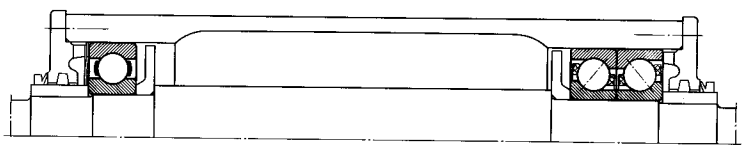
PDNE 2	NJ 2 ECP	62
PDNE 3	NJ 3 ECP	63



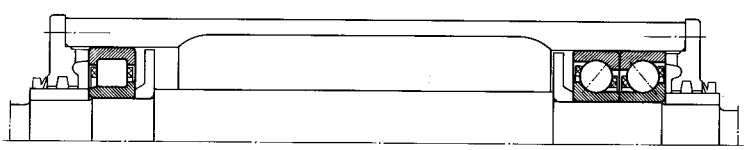
PDNE 22	NJ 22 ECP	62
PDNE 23	NJ 23 ECP	63



PDNL 22	222 CC/W33	222 CC/W33
PDNL 23	223 CC/W33	223 CC/W33



PDNA 2 DD	62	2×72 BECBP
PDNA 3 DD	63	2×73 BECBP



PDNF 2 DD	NJ 2 ECP	2×72 BECBP
PDNF 3 DD	NJ 3 ECP	2×73 BECBP

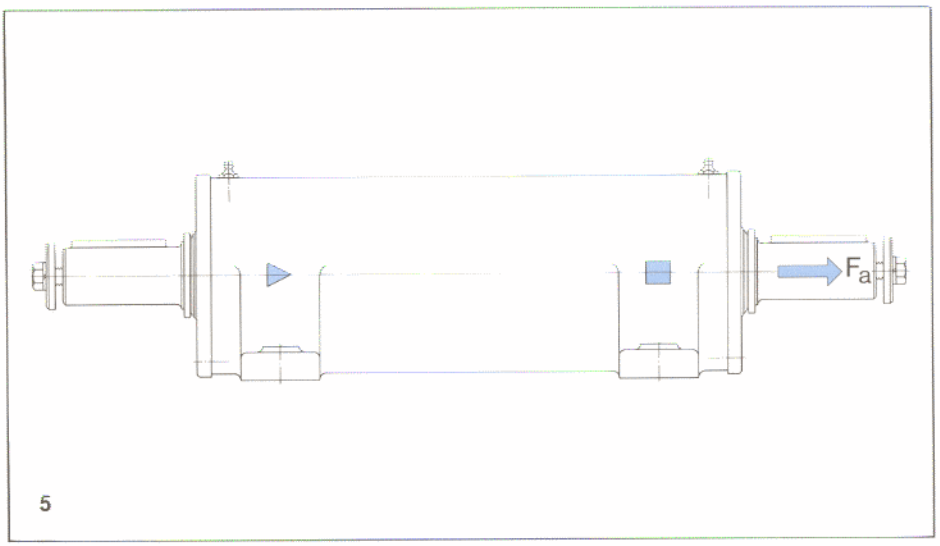
4

Installation

The complete units are very easy to install. It is only necessary to secure the unit to a suitable base, which should be flat, by four bolts. The tolerance for the flatness of the base surface is IT7, the reference length being J_1 (see tables).

The rotary components (e.g. impeller, pulley, coupling etc.) are then mounted on the shaft ends. When mounting PDNB 2 and PDNB 3 units up to and including sizes 18 and 16, respectively, the rotary components must be arranged in such a manner that the axial load F_a produced in operation acts in the direction indicated by the arrowhead marking. The use of some form of press or hydraulic nut is recommended for these mounting operations. If it is necessary to use a hammer, the opposite end of the shaft should rest against a firm support so that the bearings cannot be damaged by hammer blows.

For bearing units where a spacer sleeve is mounted between the bearing and the external component (series PDPF 22 and PDRJ 3) care should be taken to press the bearing inner rings firmly against the shaft shoulders using the sleeves to provide axial location. This also serves to axially locate the V-rings.



5



Relubrication

The complete units are supplied ready greased. In operation they can be relubricated by means of the grease nipples. There is no risk of over-lubrication, as excess grease is thrown by the flingers into the large space in the middle of the housing.

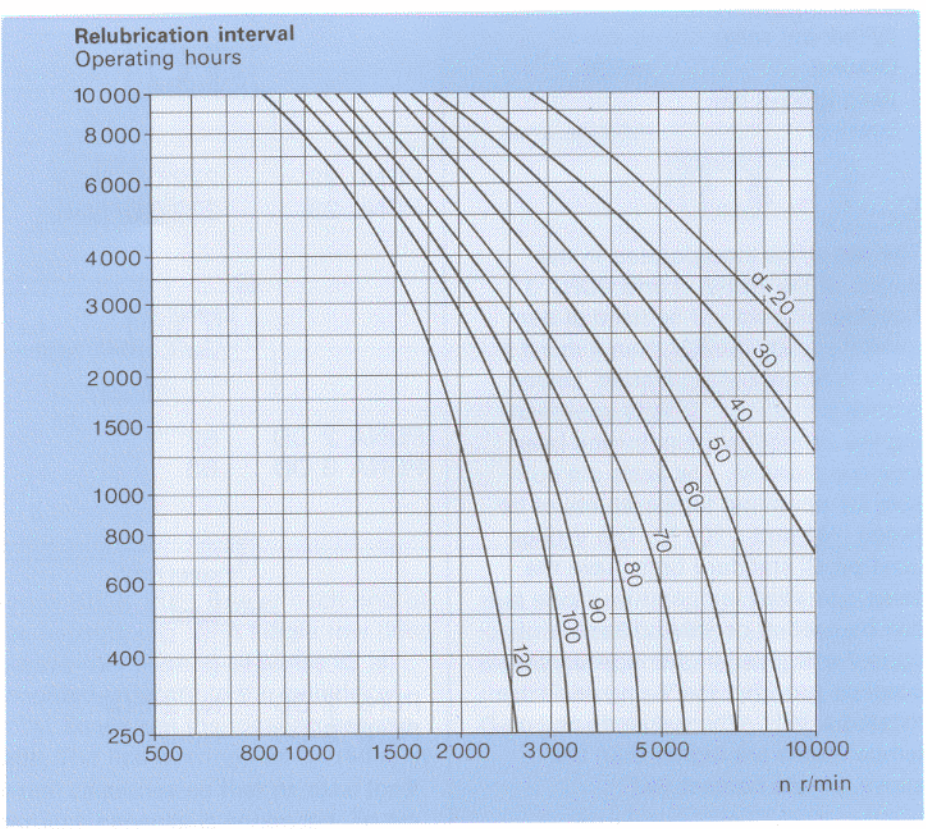
A good quality lithium base grease of consistency 2 or 3 to the NLGI Scale should be used for relubrication. The grease should have rust inhibiting properties. Suitable SKF greases are LGMT 2 and LGMT 3.

The amount of grease needed for relubrication can be determined from

$$G = 0{,}005\ D\ B$$

where
G = grease quantity, g
D = bearing outside diameter, mm
B = bearing width, mm

The period during which a grease lubricated bearing will function satisfac-



SKF

torily without relubrication is dependent on the bearing type, size, speed, operating temperature and the grease used. In the adjacent diagram suitable relubrication intervals are shown as a function of the bearing bore diameter d and the speed n. The diagram is valid for ball bearing applications where loading conditions are normal. For cylindrical roller bearings the diagram value should be divided by 2, and for spherical roller bearings by 10.

The diagram is based on the use of an age-resistant, average quality grease and is valid for bearing temperatures of +70 °C measured on the outer ring. The intervals should be halved for every 15 °C increase above +70 °C, but the maximum permissible operating temperature for the grease should obviously not be exceeded. For bearing temperatures below +70 °C longer relubrication intervals can be applied. Up to twice the values obtained from the diagram may be used for temperatures of +50 °C and below.

Selection of unit size

Normally, the instructions given in the SKF General Catalogue in the section entitled "Selection of bearing size" should be followed. A simple calculation method for the type of arrangement used for fans is presented in the following, this being the most common application for two-bearing units.

1. The load acting on each bearing produced by the masses of the shaft, impeller and pulley or coupling should be calculated.

2a. If a belt drive is used, the tension force should be calculated. First, the tangential force F_t is obtained using the equation

$$F_t = 19{,}1 \times 10^6 \times \frac{P}{n\, d_p}$$

where
F_t = tangential force, N
P = rating, kW
n = rotational speed, r/min
d_p = pitch diameter of pulley, mm

The tangential force F_t is then multiplied by a factor:
= 2 to 2,5 for V-belts
= 4 for flat belts
to obtain the tension force.

Speed r/min	Unbalance % of impeller mass
1 000	30
2 000	60
3 000	90
4 000	125
5 000	150

2b. The radial force F_r produced when a semi-flexible coupling is used can be obtained from

$$F_r = 5\,600 \sqrt{\frac{P}{n}}$$

where
F_r = radial force, N
P = rating, kW
n = rotational speed, r/min

3. The unbalance of the impeller is determined. Guideline values expressed as percentages of the impeller mass are given in the table above.

4. The axial load acting on the locating bearing, F_a, is calculated. For series PDNB 2 and PDNB 3, the bearing at the impeller side is generally assumed to be the bearing subjected to axial load. For series PDPF 22 and PDRJ 3, the ball bearing(s) carry the axial load. The axial load can be obtained from

$$F_a = \frac{\pi\, D_s^2\, H}{4 \times 10^6}$$

where
F_a = axial load, N
D_s = inlet diameter, mm
H = pressure differential, Pa

When calculating vertical shafts, the weight of the rotating parts must be added to or subtracted from the axial force exerted by the impeller, depending on the force direction.

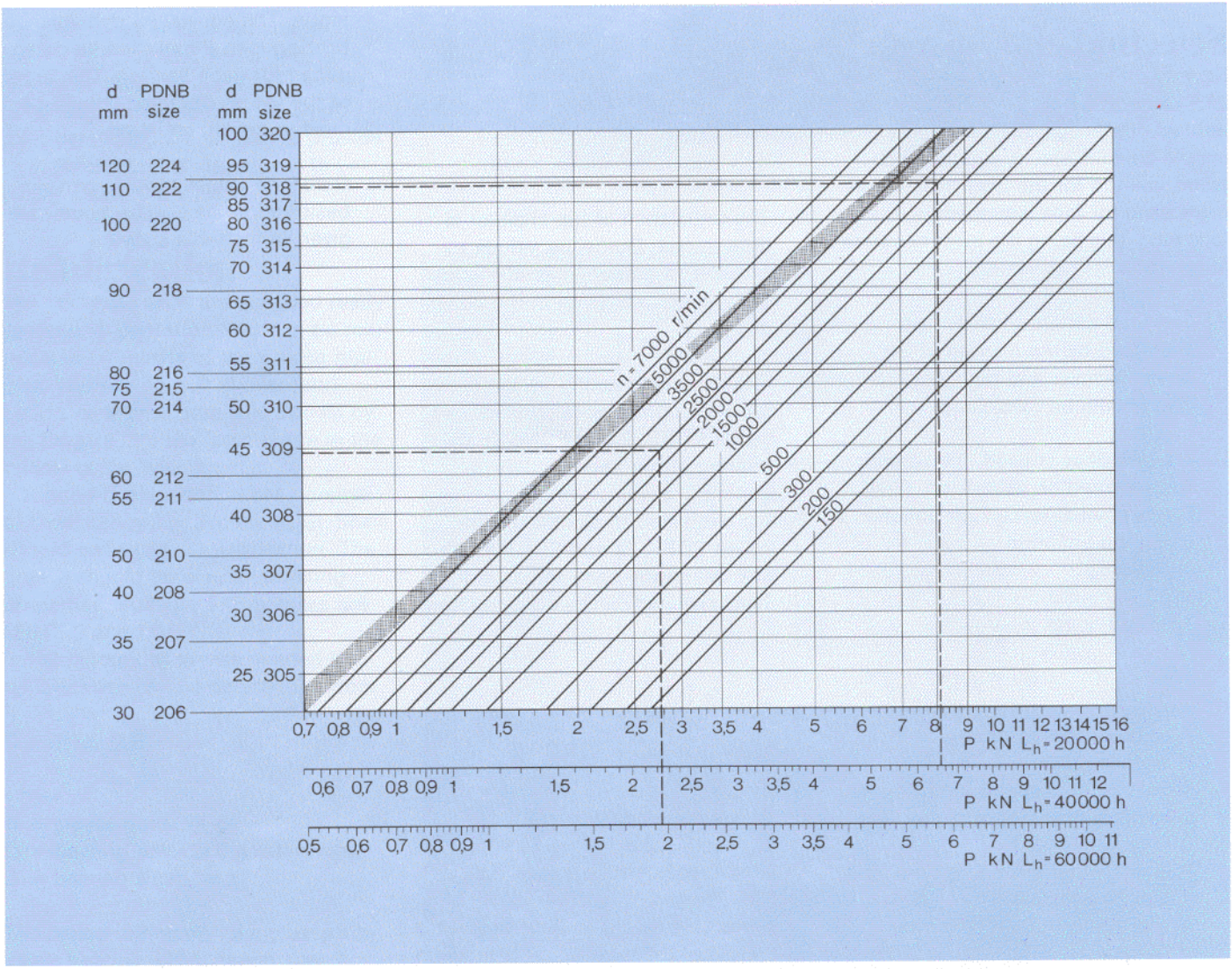
Type of operation	Requisite basic rating life L_{10h} operating hours
Intermittent	≦ 20 000
12 to 16 h/day	40 000
24 h/day with high operational reliability	≧ 60 000

5. The mean load F_m of the radial loads which have constant direction and the radial unbalance force is calculated using the method described in the SKF General Catalogue. The equivalent dynamic bearing load P can then be determined for each bearing. The larger of the values obtained should be used in the life equation.

6. Guideline values for the requisite basic rating life L_{10h} (in hours) are given in the table above.

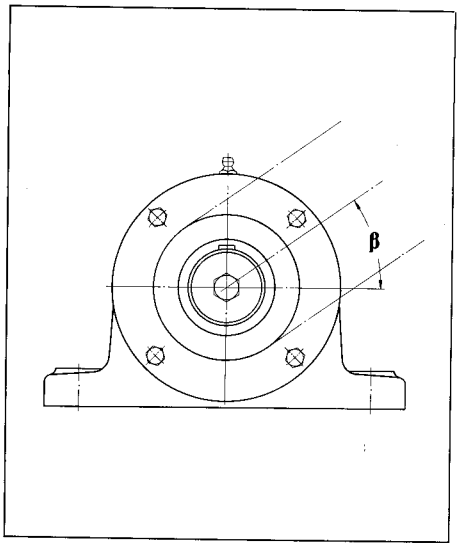
The diagram below has been prepared to enable easy selection of units of series PDNB 2 and PDNB 3, using the requisite life and speed as input. The shaded band in the diagram indicates the limiting speeds for the deep groove ball bearings incorporated in the units. Two examples are indicated in the diagram.

For an equivalent load P of 6,5 kN, a requisite life of 40 000 hours (of operation) and a speed of 2 000 r/min are specified. Two-bearing unit PDNB 318 is the appropriate choice. In the second example, the equivalent load is 1,95 kN, the requisite life is 60 000 operating hours and the speed is 2 500 r/min. Here unit PDNB 309 is suitable, or if a larger-diameter shaft is preferred, unit PDNB 214 can be used instead.



Let SKF join your design team

If required SKF will assist in selecting a suitable unit. Where help is needed, the following information should be supplied. Take a copy of this questionnaire, fill in appropriate data and send it to SKF.



Application (e.g. fan, pump, saw, transmission)		.....
Shaft arrangement		□ horizontal □ vertical
Input or motor rating		..... kW
Speed of shaft (unit shaft)		..... r/min
Requisite shaft diameter at bearing seating		..... mm
Drive side		
– With coupling:	mass of sleeve	..... kg
– With belt drive:	mass of pulley	..... kg
	pitch diameter of pulley	..... mm
	direction of tension of belt β	..... degrees
	belt type	□ V-belt □ flat belt
– For vertical shaft arrangement		□ top drive □ bottom drive
Work side		
– Mass of component at work side		..... kg
– Axial load		..... N
– Direction of axial load		□ from drive to work side □ from work to drive side
– Required shaft end diameter[1)]		..... mm
Requisite basic rating life L_{10h}		..... h
Ambient temperature		..... °C

Other information concerning temperature (e.g. gas temperature), special environments, space limitations etc.

.....

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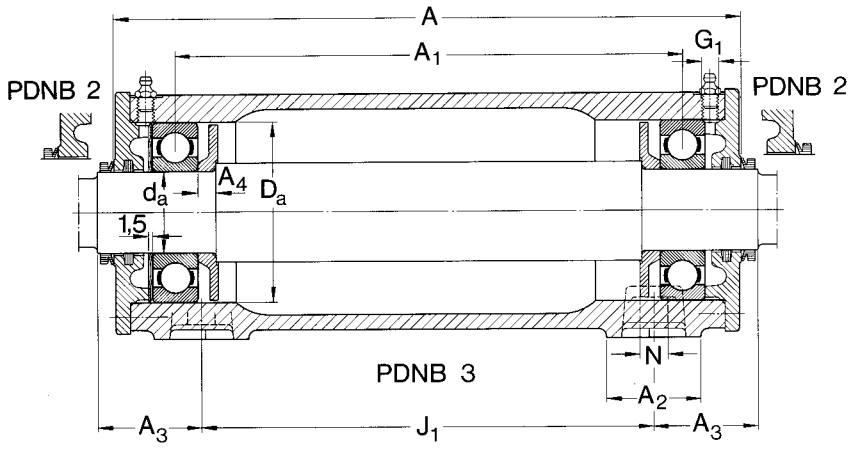
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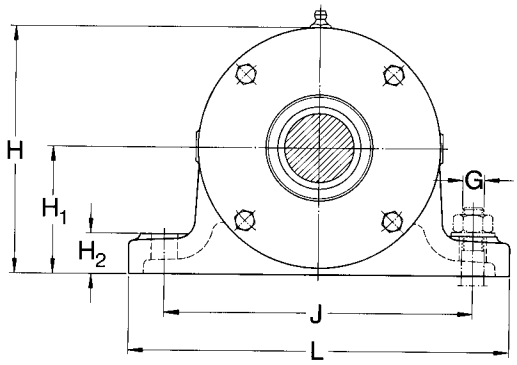
[1)] If a standard shaft (pages 22 to 25) is not appropriate, a dimensioned drawing of the shaft ends required should be included.

PDNB units
d_a **25–95** mm

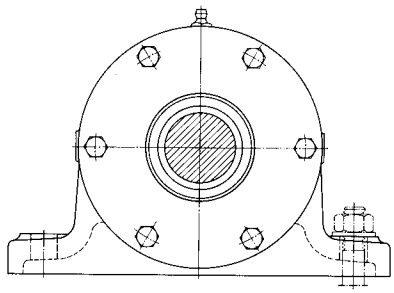


Shaft diameter	Dimensions[1]																Mass	Designation
d_a	A	A_1	A_2	A_3	A_4	D_a	H	H_1	H_2	J	J_1	L	N	G		G_1		
mm	mm														in		kg	–
25	202	146,5	35	40,5	7	62	95	50	16	120	135	155	12	10	3/8	1/8	7,00	**PDNB 305**
30	197	147,5	35	37,5	7	62	95	50	16	120	135	155	12	10	3/8	1/8	7,40	**PDNB 206**
	226	171,5	40	45	7	72	100	50	18	130	150	160	15	12	1/2	1/8	9,60	**PDNB 306**
35	227	173,5	40	45	7	72	100	50	18	130	150	160	15	12	1/2	1/8	10,0	**PDNB 207**
	260	195,5	45	49,5	8	80	116	60	18	150	175	190	15	12	1/2	1/8	13,5	**PDNB 307**
40	259	198,5	45	49,5	8	80	116	60	18	150	175	190	15	12	1/2	1/8	14,5	**PDNB 208**
	315	255,5	52	53	10	90	121	60	20	150	225	190	15	12	1/2	1/8	19,5	**PDNB 308**
45	360	279,5	52	63	10	100	137	70	22	170	250	210	15	12	1/2	1/8	24,3	**PDNB 309**
50	314	258,5	52	52	10	90	121	60	20	150	225	190	15	12	1/2	1/8	22,6	**PDNB 210**
	377	311,5	60	59	10	110	142	70	25	170	275	210	15	12	1/2	1/8	29,7	**PDNB 310**
55	356	283,5	52	60,5	10	100	137	70	22	170	250	210	15	12	1/2	1/8	27,7	**PDNB 211**
	422	335,5	60	69	10	120	158	80	25	210	300	260	19	16	5/8	1/8	39,7	**PDNB 311**
60	376	316,5	60	58	10	110	142	70	25	170	275	210	15	12	1/2	1/8	33,0	**PDNB 212**
	460	383,5	70	68	10	130	165	80	25	210	340	260	19	16	5/8	1/8	52,4	**PDNB 312**
65	492	402,5	70	74	11	140	185	95	25	230	360	280	19	16	5/8	1/4	57,2	**PDNB 313**
70	459	390,5	70	69	10	125	165	80	25	210	340	260	19	16	5/8	1/8	60,7	**PDNB 214**
	512	420,5	70	76	11	150	190	95	25	230	380	290	19	16	5/8	1/4	68,5	**PDNB 314**
75	459	389,5	70	69	10	130	165	80	25	210	340	260	19	16	5/8	1/8	62,0	**PDNB 215**
	547	448,5	80	83,5	12	160	200	100	30	260	400	320	19	16	5/8	1/4	80,5	**PDNB 315**
80	493	409,5	70	76	11	140	185	95	25	230	360	280	19	16	5/8	1/4	66,8	**PDNB 216**
	556	466,5	80	78	12	170	220	112	30	260	420	320	19	16	5/8	1/4	92,2	**PDNB 316**
85	590	486	80	85	12	180	225	112	30	290	440	350	19	16	5/8	1/4	114	**PDNB 317**[2]
90	543	455,5	80	81	12	160	200	100	30	260	400	320	19	16	5/8	1/4	96,3	**PDNB 218**
	605	510	85	82,5	11	190	230	112	30	290	460	350	19	16	5/8	1/4	134	**PDNB 318**[2]
95	648	540	90	94	13	200	253	125	36	320	480	400	24	20	3/4	1/4	156	**PDNB 319**[2]

[1] For shaft end dimensions please refer to pages 22 and 23
[2] No spring washer



Sizes up to and including PDNB 211 and PDNB 309



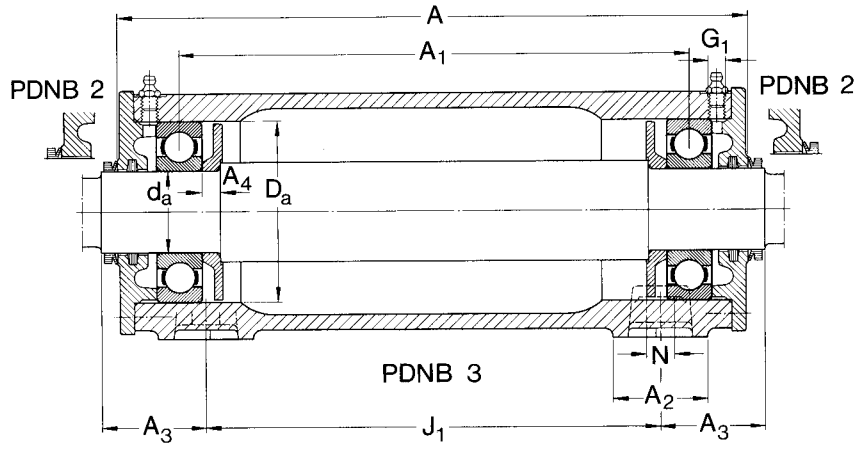
Sizes from PDNB 212 and PDNB 310

Shaft diameter d_a	**Bearings**[1] Designation	Basic load ratings dynamic C	static C_0	Limiting speed (grease lubrication)	**Housing** Designation[2]	Mass	**Shaft** Designation	**Spring washer** Designation	**Separate V-ring** Designation	**Separate felt strip** Designation
mm	–	N		r/min	–	kg	–	–	–	–
25	6305	22 500	11 400	11 000	PDN 305	5,10	VJ-PDNB 305	WF-62	V-25 A	FS 190
30	6206	19 500	10 000	10 000	PDN 206	5,10	VJ-PDNB 206	WF-62	V-30 A	–
	6306	28 100	14 600	9 000	PDN 306	6,50	VJ-PDNB 306	WF-72	V-30 A	FS 190
35	6207	25 500	13 700	9 000	PDN 207	6,50	VJ-PDNB 207	WF-72	V-35 A	–
	6307	33 200	18 000	8 500	PDN 307	9,10	VJ-PDNB 307	WF 80	V-35 A	FS 190
40	6208	30 700	16 600	8 500	PDN 208	9,30	VJ-PDNB 208	WF-80	V-40 A	–
	6308	41 000	22 400	7 500	PDN 308	12,5	VJ-PDNB 308	WF-90	V-40 A	FS 190
45	6309	52 700	30 000	6 700	PDN 309	15,1	VJ-PDNB 309	WF-100	V-45 A	FS 190
50	6210	35 100	19 600	7 000	PDN 210	12,5	VJ-PDNB 210	WF-90	V-50 A	–
	6310	61 800	36 000	6 300	PDN 310	17,9	VJ-PDNB 310	WF-110	V-50 A	FS 260
55	6211	43 600	25 000	6 300	PDN 211	15,0	VJ-PDNB 211	WF-100	V-55 A	–
	6311	71 500	41 500	5 600	PDN 311	23,1	VJ-PDNB 311	WF-120	V-55 A	FS 260
60	6212	47 500	28 000	6 000	PDN 212	17,8	VJ-PDNB 212	WF-110	V-60 A	–
	6312	81 900	48 000	5 000	PDN 312	32,6	VJ-PDNB 312	WF-130	V-60 A	FS 260
65	6313	92 300	56 000	4 800	PDN 313	32,2	VJ-PDNB 313	WF-140	V-65 A	FS 260
70	6214	61 800	37 500	5 000	PDN 214	34,5	VJ-PDNB 214	WF-125	V-70 A	–
	6314	104 000	63 000	4 500	PDN 314	37,8	VJ-PDNB 314	WF-150	V-70 A	FS 330
75	6215	66 300	40 500	4 800	PDN 215	32,0	VJ-PDNB 215	WF-130	V-75 A	–
	6315	114 000	71 000	4 300	PDN 315	43,7	VJ-PDNB 315	WF-160	V-75 A	FS 330
80	6216	70 200	45 000	4 500	PDN 216	31,1	VJ-PDNB 216	WF-140	V-80 A	–
	6316	124 000	80 000	3 800	PDN 316	49,5	VJ-PDNB 316	WF-170	V-80 A	FS 330
85	6317	133 000	90 000	3 600	PDN 317	61,2	VJ-PDNB 317	–	V-85 A	FS 330
90	6218	95 600	62 000	3 800	PDN 218	42,3	VJ-PDNB 218	WF-160	V-90 A	–
	6318	143 000	98 000	3 400	PDN 318	70,9	VJ-PDNB 318	–	V-90 A	FS 370
95	6319	153 000	110 000	3 200	PDN 319	82,5	VJ-PDNB 319	–	V-95 A	FS 370

[1] The designation and load ratings refer to a single bearing; please note that 2 bearings are required per housing

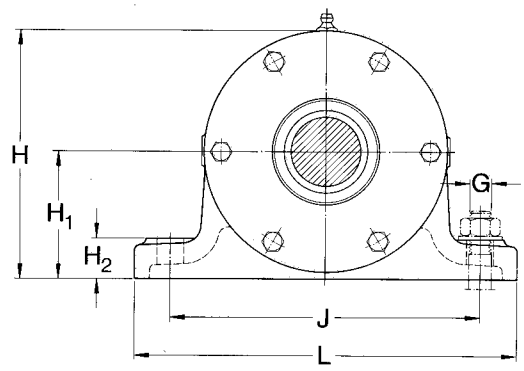
[2] The housing designation covers the following:
1 housing body with 2 grease nipples
2 covers with hexagon screws and spring rings
2 flinger rings
1 spring washer (for sizes up to and including PDN 218 and PDN 316)
2 seals (V-rings for series PDN 2, V-rings + felt strips for series PDN 3)

PDNB units
d_a **100–120** mm



Shaft diameter	Dimensions[1]																Mass	Designation
d_a	A	A_1	A_2	A_3	A_4	D_a	H	H_1	H_2	J	J_1	L	N	G		G_1		
mm	mm														in		kg	–
100	588	493	80	83,5	12	180	225	112	30	290	440	350	19	16	5/8	1/4	130	**PDNB 220**
	673	570	95	96,5	11,5	215	264	130	40	320	500	400	24	20	3/4	1/4	177	**PDNB 320**
110	634	547	90	88	13	200	253	125	36	320	480	400	24	20	3/4	1/4	176	**PDNB 222**
	686	580	95	94.5	10	240	296	150	40	380	520	450	28	24	1	1/4	226	**PDNB 322**
120	672	577	95	97	11,5	215	264	130	40	320	500	400	24	20	3/4	1/4	207	**PDNB 224**
	707	600	100	96	11,5	260	322	160	40	410	538	500	35	30	1 1/4	1/4	276	**PDNB 324**

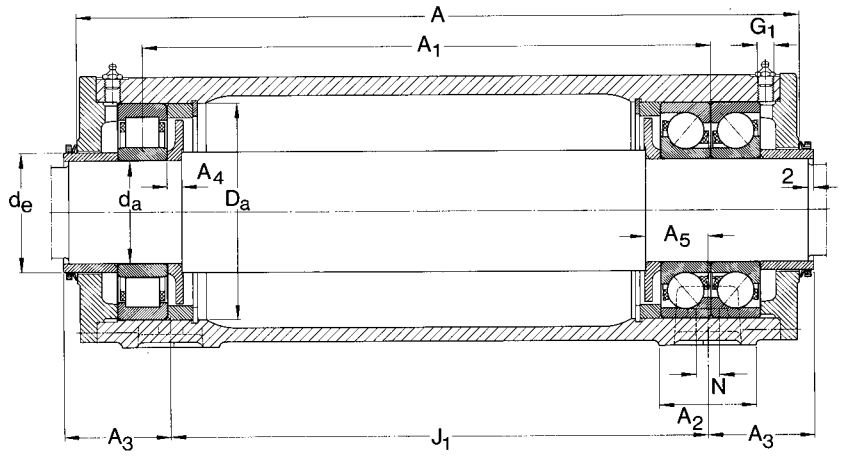
[1] For shaft end dimensions please refer to pages 22 and 23



Shaft diameter d_a	**Bearings**[1] Designation	Basic load ratings dynamic C	static C_0	Limiting speed (grease lubrication)	**Housing** Designation[2]	Mass	**Shaft** Designation	**Separate V-ring** Designation	**Separate felt strip** Designation
mm	–	N		r/min	–	kg	-	–	–
100	6220	124 000	80 000	3 400	PDN 220	60,0	VJ-PDNB 220	V-100 A	–
	6320	174 000	132 000	3 000	PDN 320	92,5	VJ-PDNB 320	V-100 A	FS 460
110	6222	146 000	100 000	3 000	PDN 222	81,0	VJ-PDNB 222	V-110 A	–
	6322	203 000	166 000	2 600	PDN 322	115	VJ-PDNB 322	V-110 A	FS 460
120	6224	146 000	100 000	2 800	PDN 224	90,0	VJ-PDNB 224	V-120 A	–
	6324	208 000	166 000	2 400	PDN 324	135	VJ-PDNB 324	V-120 A	FS 460

[1] The designation and load ratings refer to a single bearing; please note that 2 bearings are required per housing
[2] The housing designation covers the following:
1 housing body with 2 grease nipples and, from sizes PDN 224 and PDN 320 onwards, 2 eye bolts
2 covers with hexagon screws and spring rings
2 flinger rings
2 seals (V-rings for series PDN 2, V-rings + felt strips for series PDN 3)

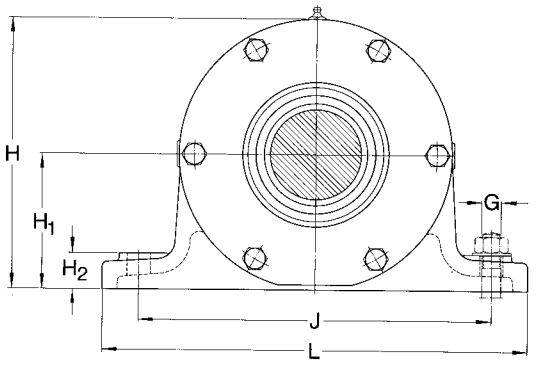
PDPF units
d_a **70–120** mm



Shaft diameter	Dimensions[1]																		Mass	Designation
d_a	A	A_1	A_2	A_3	A_4	A_5	d_e	D_a	H	H_1	H_2	J	J_1	L	N	G		G_1		
mm	mm																in		kg	–
70	459	376,5	70	69	10	20	79	125	165	80	25	210	340	260	19	16	5/8	1/8	63,0	**PDPF 2214**
80	493	394.5	70	76	11	24,5	90	140	185	95	25	230	360	280	19	16	5/8	1/4	70,5	**PDPF 2216**
90	543	437	80	81	12	28,5	100	160	200	100	30	260	400	320	19	16	5/8	1/4	100	**PDPF 2218**
100	585	470	80	83,5	12	36,5	112	180	225	112	30	290	440	350	19	16	5/8	1/4	137	**PDPF 2220**
110	634	520,5	90	88	13	36,5	122	200	253	125	36	320	480	400	24	20	3/4	1/4	185	**PDPF 2222**
120	672	548	95	97	11,5	33	132	215	264	130	40	320	500	400	24	20	3/4	1/4	219	**PDPF 2224**

[1] For shaft end dimensions please refer to page 24

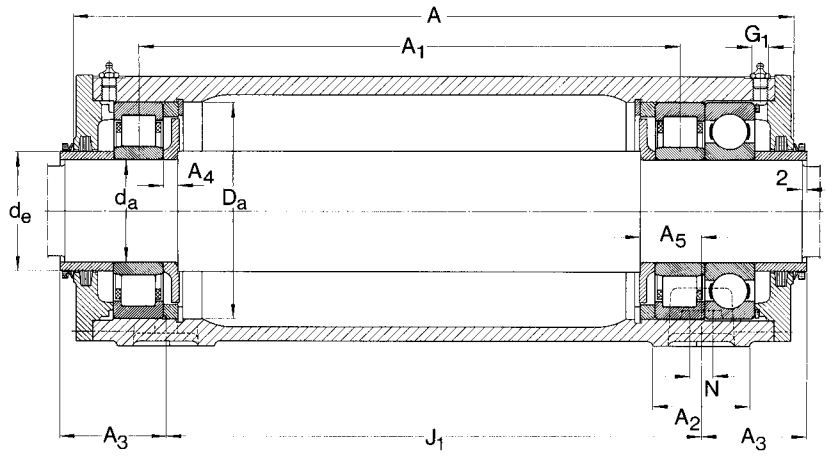
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Shaft diameter d_a	**Bearings** Designations Locating side	Non-locating side	Basic load ratings Ball bearings[1] dynamic C	static C_0	Roller bearing dynamic C	static C_0	Limiting speed (grease lubrication)	**Housing** Designation[2]	Mass	**Shaft** Designation	**Separate V-ring** Designation
mm	–		N				r/min	–	kg	–	–
70	2×7214 BECBP	NU 2214 ECP	114 000	95 000	154 000	206 000	3 400	PDP 214	35,0	VJ-PDPF 2214	V-80 A
80	2×7216 BECBP	NU 2216 ECP	135 000	116 000	187 000	258 000	3 000	PDP 216	32,0	VJ-PDPF 2216	V-90 A
90	2×7218 BECBP	NU 2218 ECP	178 000	153 000	242 000	331 000	2 600	PDP 218	43,3	VJ-PDPF 2218	V-100 A
100	2×7220 BECBP	NU 2220 ECP	221 000	193 000	336 000	478 000	2 200	PDP 220	61,5	VJ-PDPF 2220	V-110 A
110	2×7222 BECBP	NU 2222 ECP	260 000	245 000	380 000	552 000	1 900	PDP 222	82,5	VJ-PDPF 2222	V-120 A
120	2×7224 BCB	NU 2224 ECP	270 000	255 000	457 000	662 000	1 700	PDP 224	92,0	VJ-PDPF 2224	V-130 A

[1] The values quoted are for bearing pairs
[2] The housing designation covers the following:
1 housing body with 2 grease nipples and, for size PDP 224, 2 eye bolts
2 covers with hexagon screws and spring rings
2 flinger rings
2 snap rings
2 spacer sleeves
2 sleeves
2 seals (V-rings)
The housings can be delivered without sleeves and are then identified by the suffix U, e.g. PDP 214 U

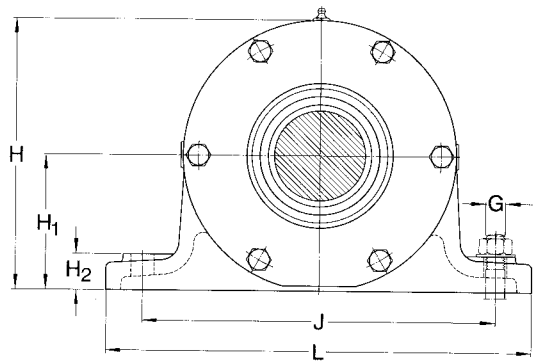
PDRJ units
d_a **75–120** mm



Shaft diameter	Dimensions[1]																	Mass	Designation
d_a	A	A_1	A_2	A_3	A_4	A_5	d_e	D_a	H	H_1	H_2	J	J_1	L	N	G	G_1		
mm	mm															in		kg	–
75	531	414	80	75,5	12	42	90	160	200	100	30	260	400	320	19	16	5/8	1/4	85,5	**PDRJ 315**
80	552	430	80	76	12	46	95	170	220	112	30	260	420	320	19	16	5/8	1/4	98,3	**PDRJ 316**
85	585	446	80	82,5	12	50	100	180	225	112	30	290	440	350	19	16	5/8	1/4	120	**PDRJ 317**
90	603	468	85	81,5	11	50	105	190	230	112	30	290	460	350	19	16	5/8	1/4	142	**PDRJ 318**
95	632	496	90	87,5	13	50	110	200	253	125	36	320	480	400	24	20	3/4	1/4	164	**PDRJ 319**
100	671	524	95	97	11,5	46,5	120	215	264	130	40	320	500	400	24	20	3/4	1/4	187	**PDRJ 320**
110	684	531	95	93,5	10	54,5	130	240	296	150	40	380	520	450	28	24	1	1/4	240	**PDRJ 322**
120	705	546	100	95	11,5	62,5	140	260	322	160	40	410	538	500	35	30	1 1/4	1/4	289	**PDRJ 324**

[1] For shaft end dimensions please refer to page 25

SKF



Shaft diameter d_a	**Bearings** Designations Locating side	Non-locating side	Basic load ratings Ball bearing dynamic C	static C_0	Roller bearing dynamic C	static C_0	Limiting speed (grease lubrication)	**Housing** Designation[1]	Mass	**Shaft** Designation	**Separate V-ring** Designation	**Separate felt strip** Designation
mm	–		N				r/min	–	kg	–	–	–
75	NU 315 ECP + 6315/C3	NU 315 ECP	114 000	71 000	242 000	300 000	3 400	PDR 315	45,0	VJ-PDRJ 315	V-90 A	FS 370
80	NU 316 ECP + 6316/C3	NU 316 ECP	124 000	80 000	260 000	324 000	3 200	PDR 316	50,8	VJ-PDRJ 316	V-95 A	FS 370
85	NU 317 ECP + 6317/C3	NU 317 ECP	133 000	90 000	297 000	375 000	3 000	PDR 317	62,5	VJ-PDRJ 317	V-100 A	FS 460
90	NU 318 ECP + 6318/C3	NU 318 ECP	143 000	98 000	319 000	405 000	2 800	PDR 318	72,2	VJ-PDRJ 318	V-100 A	FS 460
95	NU 319 ECP + 6319/C3	NU 319 ECP	153 000	110 000	341 000	434 000	2 600	PDR 319	83,8	VJ-PDRJ 319	V-110 A	FS 460
100	NU 320 ECP + 6320/C3	NU 320 ECP	174 000	132 000	391 000	497 000	2 400	PDR 320	93,9	VJ-PDRJ 320	V-120 A	FS 460
110	NU 322 ECP + 6322/C3	NU 322 ECP	203 000	166 000	468 000	598 000	2 000	PDR 322	117	VJ-PDRJ 322	V-130 A	FS 510
120	NU 324 ECP + 6324/C3	NU 324 ECP	208 000	166 000	539 000	699 000	1 900	PDR 324	137	VJ-PDRJ 324	V-140 A	FS 680

[1] The housing designation covers the following:
1 housing body with 2 grease nipples and, from size PDR 320 onwards, 2 eye bolts
2 covers with hexagon screws and spring rings
2 flinger rings
2 snap rings
2 spacer sleeves
2 sleeves
2 seals (V-rings + felt strips)
1 O-ring
The housings can be delivered without sleeves and are then identified by the suffix U, e.g. PDR 315 U

Separate components

Where it is preferred to purchase the housings and bearings separately and to produce the shafts in house, reference should be made to the tables on pages 22 to 25 which give the shaft dimensions for the standard combinations (series PDNB 3, PDNB 2, PDPF 22 and PDRJ 3). Recommendations for bearing seating tolerances are given on page 5.

To facilitate subsequent assembly it is recommended to mark the shaft as shown in the illustrations which follow. For shafts for PDN units up to and including sizes 218 and 316, the shaft end with the shorter bearing seating should be marked and for shafts for PDP and PDR housings, the end with the longer bearing seating should be marked. No marking is needed for shafts for larger PDN housings (from sizes 220 and 317) because the bearing seatings have the same length.

If shafts are required for other combinations of bearings than those incorporated in the standard units, then SKF should be contacted for further information.

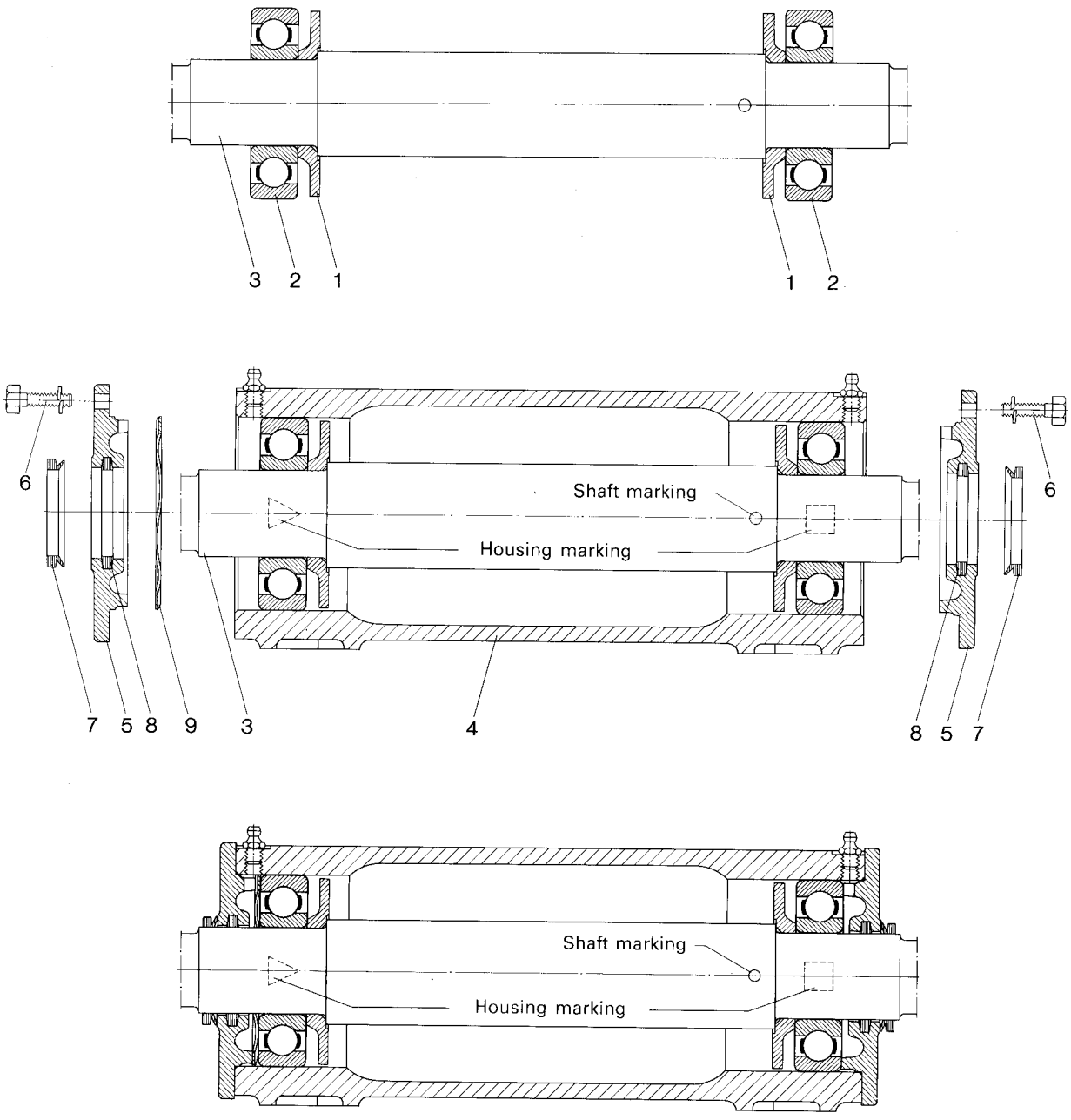
Assembly instructions

Having produced the shafts, it is then necessary to assemble the individual components. The following procedure should be followed.



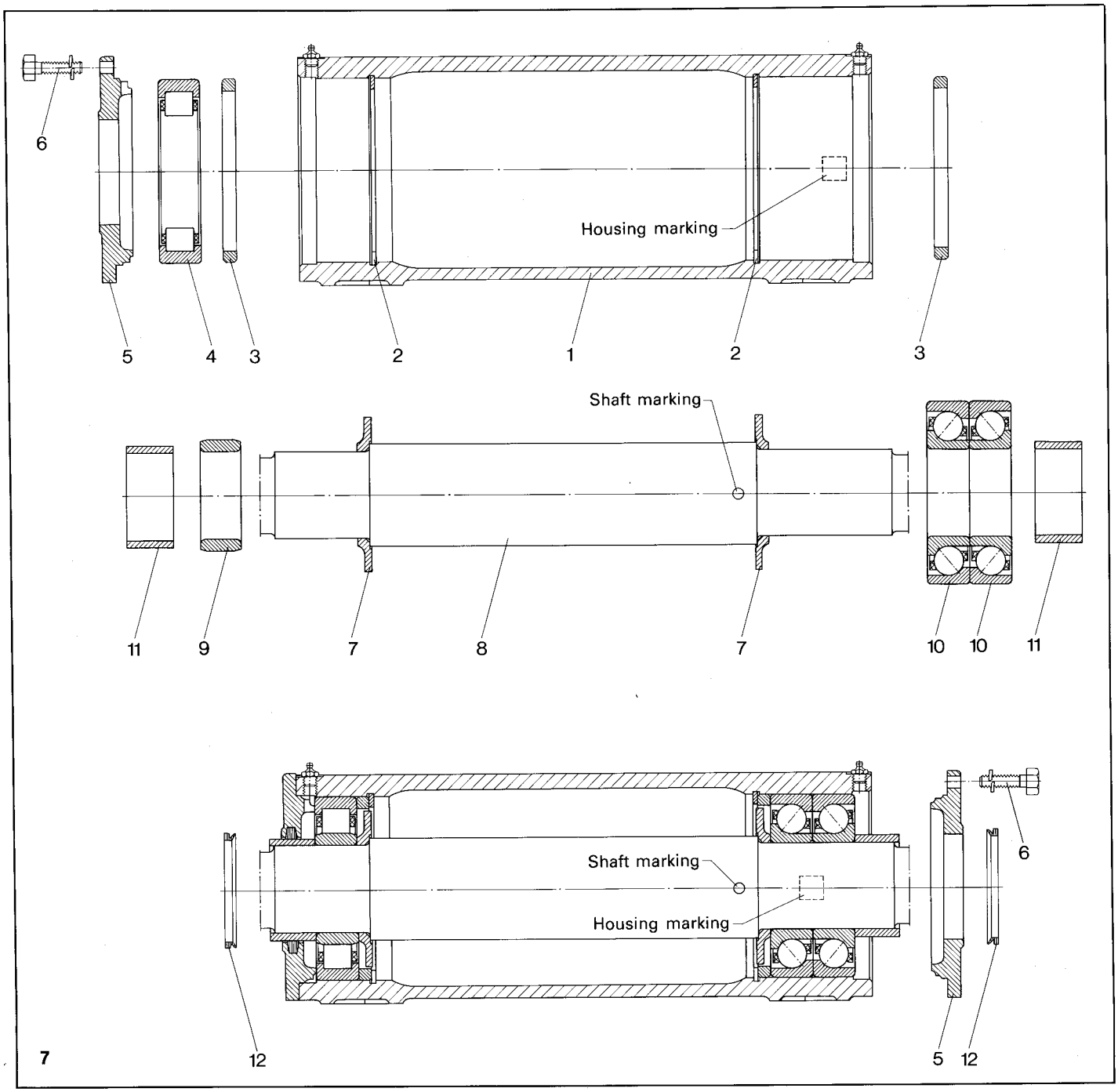
Series PDNB 3 (fig 6)
Mount the flinger rings (1) and bearings (2) on the shaft (3). Insert the shaft with bearings and flinger rings in the housing (4). Please observe the position of the markings on the shaft and housing when fitting the shaft and when fitting the spring washer (9), if this is included (up to and including size 16). Fit the spring washer (9) and insert the felt strips (8) in the seal recesses of the covers (5). Before fitting, the felt strips should be soaked for several minutes in hot oil. Fit the covers (5) and screws (6). Finally mount the V-rings (7).

Series PDNB 2
Assembly similar to series PDNB 3, but without felt strips.



6

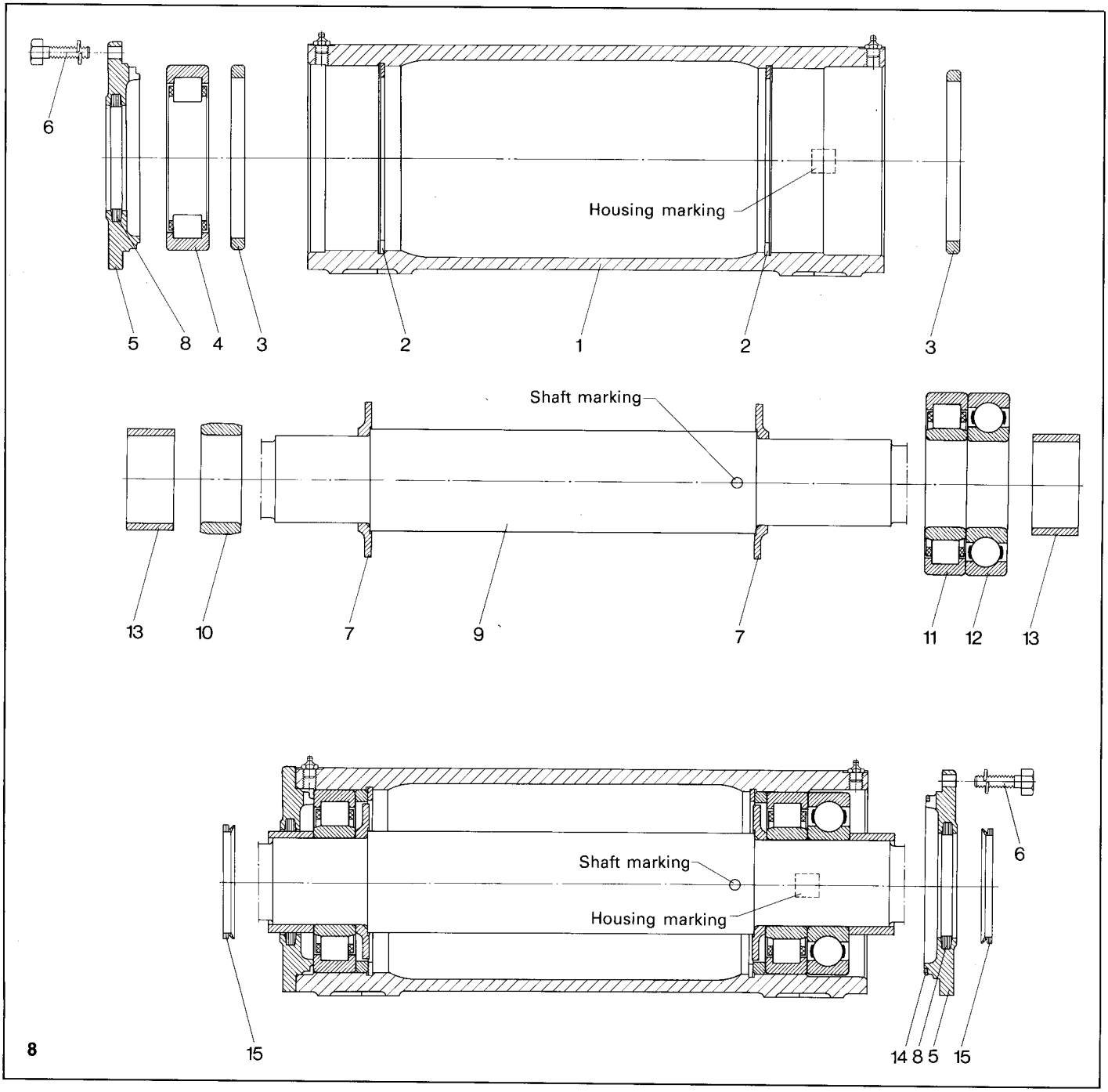
Series PDPF 22 (fig 7)
Mount the snap rings (2) in the housing (1). Fit the spacer sleeves (3) against the snap rings (2). Mount the outer ring with its roller and cage assembly (4) noting the correct position of the housing marking. Fit the cover (5) and screws (6) at the roller bearing side. Mount the flinger rings (7) on the shaft (8) followed by the roller bearing inner ring (9) and the angular contact ball bearings (10). Then fit the sleeves (11). Insert the shaft into the housing taking care that the shaft and housing markings are correctly positioned. Fit the cover (5) and screws (6) at the ball bearing side and finally place the V-rings (12) in position.



7

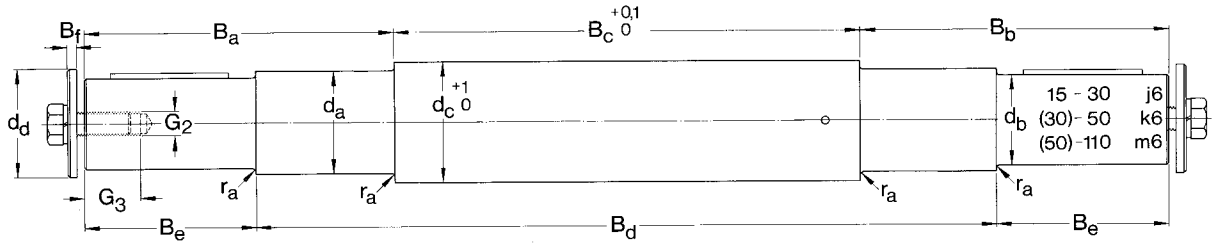
Series PDRJ 3 (fig 8)
Mount the snap rings (2) in the housing (1) and fit the spacer sleeves (3) against the snap rings. Mount the outer ring with integral roller and cage assembly (4). Insert the felt strips (8) in the seal recesses of the covers (5) after having soaked the felt strips for some minutes in hot oil. Mount the cover (5) at the roller bearing side and fit the screws (6). Mount the flinger rings (7) on the shaft (9) followed by the inner ring of the roller bearing (10). Mount the other roller bearing (11) and the deep groove ball bearing (12), then the sleeves (13). Fit the shaft into the housing, observing that the shaft and housing markings are correctly positioned. Mount the O-ring (14) in the cover (5) and fit the cover (complete with O-ring and felt strip) and screws (6). Mount the V-rings (15).

Lubrication
A good quality lithium base grease with rust inhibiting properties and a consistency of 2 or 3 to the NLGI Scale should be used, e.g. SKF greases LGMT 2 and LGMT 3. The grease should be applied during mounting so that the free space in the bearings is completely filled, and the space between bearing and cover is filled to between one third and half its volume.



8

Shafts for housings
of series PDN 2
d_a **30–120** mm

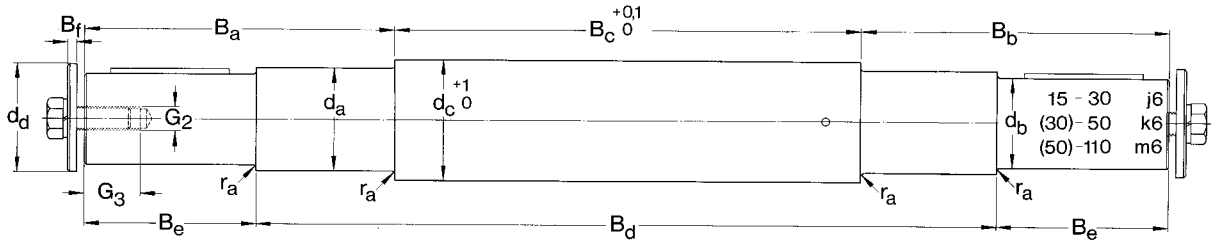


Dimensions													Appropriate bearing	Appropriate housing	Mass[2]	Designations Shaft[3]	Shaft keys (ISO/R 773)
d_a[1]	d_b	d_c	d_d	B_a	B_b	B_c	B_d	B_e	B_f	r_a	G_2	G_3					
mm													–		kg	–	
30	24	39	32	97	95,5	117,5	210	50	4	0,8	10	27	6206	PDN 206	1,80	**VJ-PDNB 206**	8×7×40
35	28	44	36	109,5	108	142,5	240	60	4	1,2	10	27	6207	PDN 207	2,85	**VJ-PDNB 207**	8×7×40
40	32	49	40	135,5	134	164,5	274	80	5	1,2	12	30	6208	PDN 208	4,25	**VJ-PDNB 208**	10×8×63
50	42	59	50	166	164,5	218,5	329	110	6	1,6	16	36	6210	PDN 210	7,65	**VJ-PDNB 210**	12×8×80
55	48	64	63	175	173,5	242,5	371	110	6	1,6	16	40	6211	PDN 211	10,3	**VJ-PDNB 211**	14×9×80
60	48	69	63	169	167,5	274,5	391	110	6	1,6	16	40	6212	PDN 212	12,8	**VJ-PDNB 212**	14×9×80
70	60	79	70	206,5	205	346,5	478	140	6	1,6	16	40	6214	PDN 214	23,0	**VJ-PDNB 214**	18×11×100
75	65	84	78	207,5	206	344,5	478	140	6	1,6	20	46	6215	PDN 215	26,3	**VJ-PDNB 215**	18×11×100
80	70	89	90	216	214,5	361,5	512	140	6	1,6	20	46	6216	PDN 216	31,4	**VJ-PDNB 216**	20×12×100
90	80	104	100	251	249,5	401,5	562	170	8	1,6	20	46	6218	PDN 218	47,3	**VJ-PDNB 218**	22×14×140
100	90	114	105	256	256	435	607	170	8	2,5	24	52	6220	PDN 220	61,2	**VJ-PDNB 220**	25×14×140
110	100	124	115	296,5	296,5	483	656	210	8	2,5	24	52	6222	PDN 222	83,0	**VJ-PDNB 222**	28×16×180
120	110	134	132	300	300	514	694	210	12	2,5	30	60	6224	PDN 224	102	**VJ-PDNB 224**	28×16×180

[1] Recommended tolerances for the bearing seatings are given on page 5
[2] Mass of shaft only
[3] All standard shafts are supplied complete with 2 keys and 2 end plates with hexagon screws and spring rings

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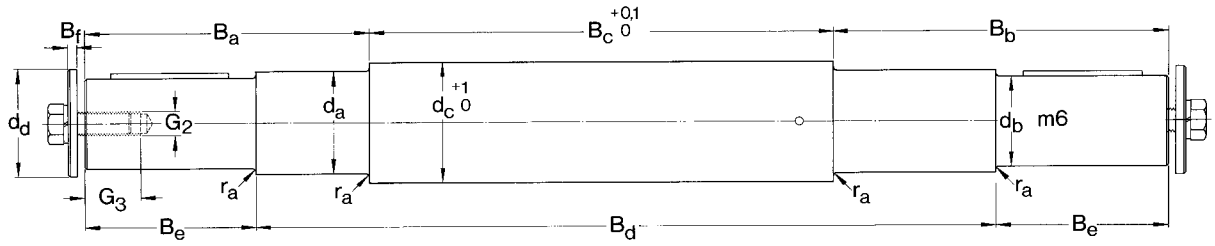
Shafts for housings
of series PDN 3
d_a **25–120** mm



Dimensions													Appropriate bearing	housing	Mass[2]	Designations Shaft[3]	Shaft keys (ISO/R 773)
d_a[1]	d_b	d_c	d_d	B_a	B_b	B_c	B_d	B_e	B_f	r_a	G_2	G_3					
mm													–		kg	–	
25	19	34	28	91	89,5	115,5	216	40	4	0,8	8	20	6305	PDN 305	1,40	**VJ-PDNB 305**	6×6×32
30	24	39	32	101,5	100	138,5	240	50	4	0,8	10	27	6306	PDN 306	2,20	**VJ-PDNB 306**	8×7×40
35	28	44	36	118,5	117	158,5	274	60	4	1,2	10	27	6307	PDN 307	3,35	**VJ-PDNB 307**	8×7×40
40	32	49	40	140	138,5	212,5	331	80	5	1,2	12	30	6308	PDN 308	5,25	**VJ-PDNB 308**	10×8×63
45	38	54	45	151,5	150	234,5	376	80	5	1,2	12	30	6309	PDN 309	7,30	**VJ-PDNB 309**	10×8×63
50	42	59	50	175	173,5	264,5	393	110	6	1,6	16	36	6310	PDN 310	9,85	**VJ-PDNB 310**	12×8×80
55	48	64	63	186,5	185	286,5	438	110	6	1,6	16	40	6311	PDN 311	12,9	**VJ-PDNB 311**	14×9×80
60	48	69	63	182,5	181	332,5	476	110	6	1,6	16	40	6312	PDN 312	15,7	**VJ-PDNB 312**	14×9×80
65	55	74	70	191	189,5	347,5	508	110	6	1,6	16	40	6313	PDN 313	19,7	**VJ-PDNB 313**	16×10×80
70	60	79	70	225	223,5	363,5	532	140	6	1,6	16	40	6314	PDN 314	24,9	**VJ-PDNB 314**	18×11×100
75	65	84	78	230,5	229	387,5	567	140	6	1,6	20	46	6315	PDN 315	29,8	**VJ-PDNB 315**	18×11×100
80	70	89	90	227	225,5	403,5	576	140	6	1,6	20	46	6316	PDN 316	34,3	**VJ-PDNB 316**	20×12×100
85	75	99	90	234,5	234,5	421	610	140	6	1,6	20	46	6317	PDN 317	43,1	**VJ-PDNB 317**	20×12×100
90	80	104	100	260	260	445	625	170	8	1,6	20	46	6318	PDN 318	51,1	**VJ-PDNB 318**	22×14×140
95	85	109	100	269,5	269,5	469	668	170	8	2,5	20	46	6319	PDN 319	59,5	**VJ-PDNB 319**	22×14×140
100	90	114	105	266,5	266,5	500	693	170	8	2,5	24	52	6320	PDN 320	67,7	**VJ-PDNB 320**	25×14×140
110	100	124	115	309,5	309,5	510	709	210	8	2,5	24	52	6322	PDN 322	87,5	**VJ-PDNB 322**	28×16×180
120	110	134	132	314	314	522	730	210	12	2,5	30	60	6324	PDN 324	106	**VJ-PDNB 324**	28×16×180

[1] Recommended tolerances for the bearing seatings are given on page 5
[2] Mass of shaft only
[3] All standard shafts are supplied complete with 2 keys and 2 end plates with hexagon screws and spring rings

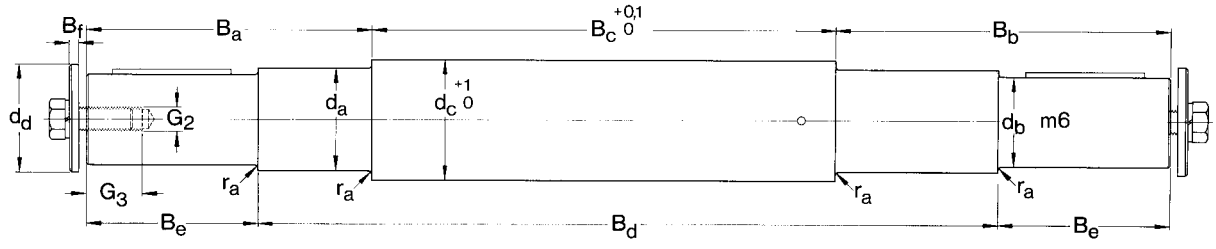
Shafts for housings
of series PDP 2
d_a **70–120** mm



Dimensions														Appropriate bearings		housing	Mass[2]	Designations	
d_a[1]	d_b	d_c	d_d	B_a	B_b	B_c	B_d	B_e	B_f	r_a	G_2	G_3		Locating side	Non-locating side		Shaft[3]	Shaft keys (ISO/R 773)
mm												–					kg	–	
70	60	79	70	212	229	317	474	142	6	1,6	16	40		2×7214 BECBP	NU 2214 ECP	PDP 214	23,2	**VJ-PDPF 2214**	18×11×100
80	70	89	90	221,5	240,5	330	508	142	6	1,6	20	46		2×7216 BECBP	NU 2216 ECP	PDP 216	32,3	**VJ-PDPF 2216**	20×12×100
90	80	104	100	259,5	279,5	363	558	172	8	1,6	20	46		2×7218 BECBP	NU 2218 ECP	PDP 218	46,6	**VJ-PDPF 2218**	22×14×140
100	90	114	105	268	290	389	603	172	8	2,5	24	52		2×7220 BECBP	NU 2220 ECP	PDP 220	60,3	**VJ-PDPF 2220**	25×14×140
110	100	124	115	311,5	334,5	430	652	212	8	2,5	24	52		2×7222 BECBP	NU 2222 ECP	PDP 222	81,9	**VJ-PDPF 2222**	28×16×180
120	110	134	132	318	340	456	690	212	12	2,5	30	60		2×7224 BCB	NU 2224 ECP	PDP 224	101	**VJ-PDPF 2224**	28×16×180

[1] Recommended tolerances for the bearing seatings are given on page 5
[2] Mass of shaft only
[3] All standard shafts are supplied complete with 2 keys and 2 end plates with hexagon screws and spring rings

Shafts for housings
of series PDR 3
d_a **75–120** mm



Dimensions													Appropriate bearings		housing	Mass[2]	Designations	
d_a[1]	d_b	d_c	d_d	B_a	B_b	B_c	B_d	B_e	B_f	r_a	G_2	G_3	Locating side	Non-locating side			Shaft[3]	Shaft keys (ISO/R 773)
mm												–				kg	–	
75	65	84	78	220,5	257,5	353	547	142	6	1,6	20	46	NU 315 ECP + 6315/C3	NU 315 ECP	PDR 315	28,9	**VJ-PDRJ 315**	18×11×100
80	70	89	90	223	262	367	568	142	6	1,6	20	46	NU 316 ECP + 6316/C3	NU 316 ECP	PDR 316	33,8	**VJ-PDRJ 316**	20×12×100
85	75	99	90	231,5	272,5	381	601	142	6	1,6	20	46	NU 317 ECP + 6317/C3	NU 317 ECP	PDR 317	42,2	**VJ-PDRJ 317**	20×12×100
90	80	104	100	258,5	301,5	403	619	172	8	1,6	20	46	NU 318 ECP + 6318/C3	NU 318 ECP	PDR 318	50,3	**VJ-PDRJ 318**	22×14×140
95	85	109	100	262,5	307,5	425	651	172	8	2,5	20	46	NU 319 ECP + 6319/C3	NU 319 ECP	PDR 319	58,1	**VJ-PDRJ 319**	22×14×140
100	90	114	105	266,5	313,5	454	690	172	8	2,5	24	52	NU 320 ECP + 6320/C3	NU 320 ECP	PDR 320	66,9	**VJ-PDRJ 320**	25×14×140
110	100	124	115	308	358	461	703	212	8	2,5	24	52	NU 322 ECP + 6322/C3	NU 322 ECP	PDR 322	86,3	**VJ-PDRJ 322**	28×16×180
120	110	134	132	312,5	367,5	468	724	212	12	2,5	30	60	NU 324 ECP + 6324/C3	NU 324 ECP	PDR 324	104	**VJ-PDRJ 324**	28×16×180

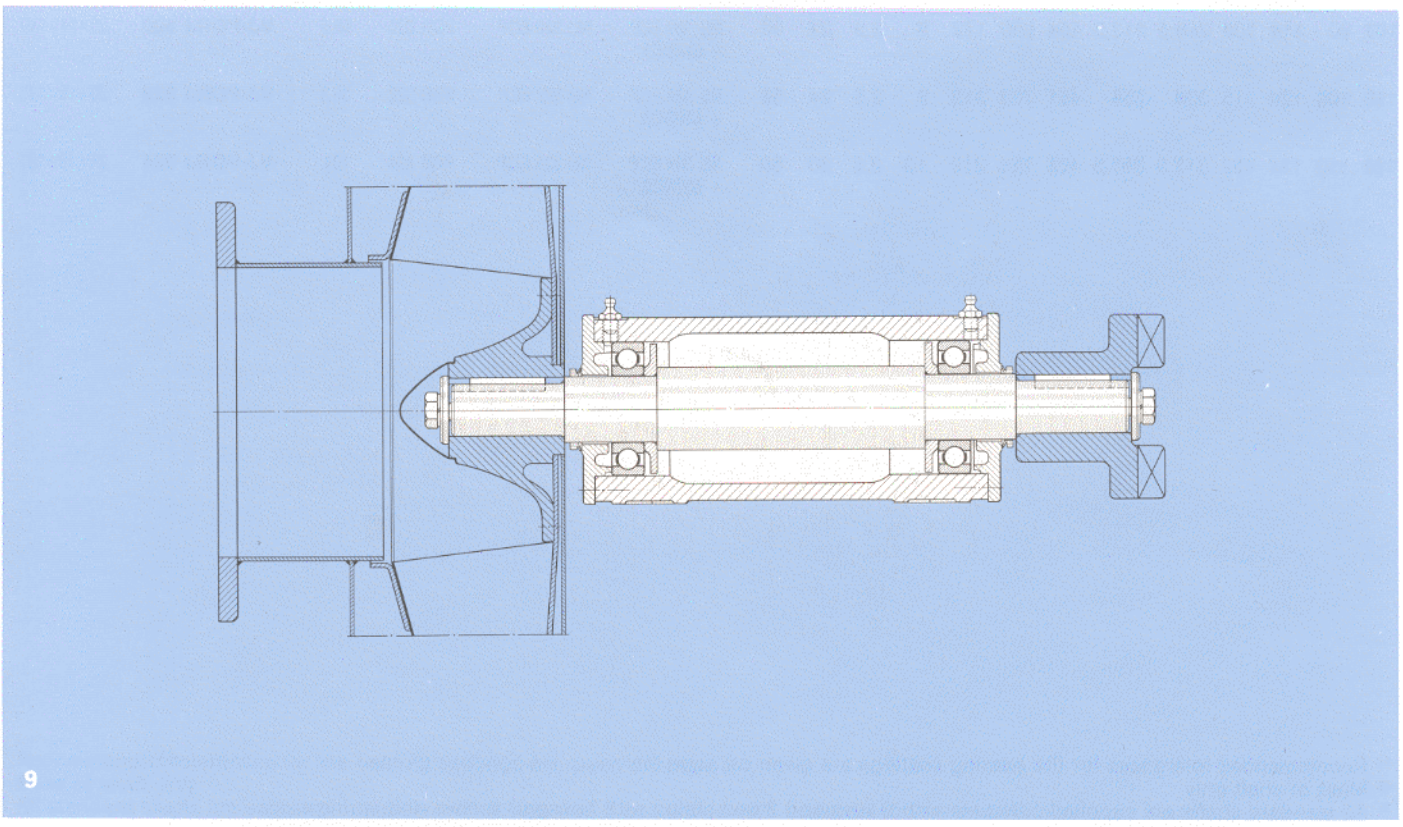
[1] Recommended tolerances for the bearing seatings are given on page 5
[2] Mass of shaft only
[3] All standard shafts are supplied complete with 2 keys and 2 end plates with hexagon screws and spring rings

Application examples

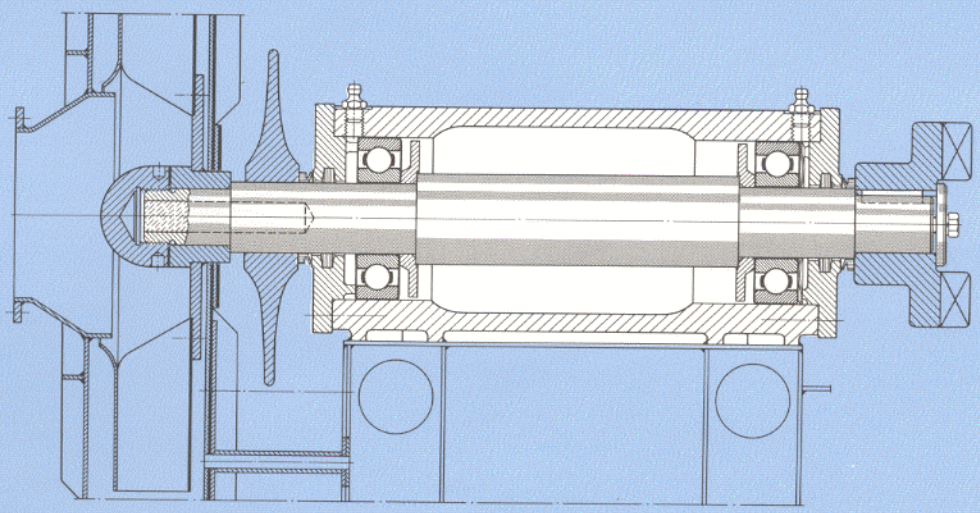
Figs 9 and 10 show two-bearing units used for fan applications. These arrangements incorporate single row deep groove ball bearings. V-ring seals have been used at both sides, but the unit in fig 10 is also provided with felt strip seals.

The application in fig 10 is intended for a hot fan installation and is therefore protected on the outside by a heat-resistant wall; the shaft on the rotor side is drilled and filled with a similar heat-resistant material. A cooling ring has been included between the impeller and the bearing housing.

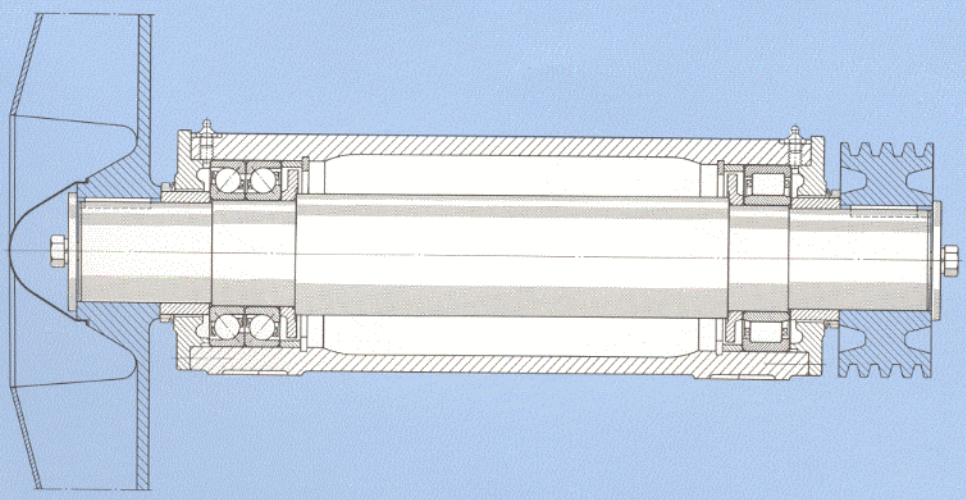
A more robust application to be used when radial or axial loads are heavy is shown in fig 11. It is fitted with paired angular contact ball bearings of series 72 BECBP as locating bearings and a cylindrical roller bearing of series NU 22 ECP as the non-locating bearing.



9



10



11

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