



Spherical Roller Bearings

For rotor bearing arrangements in wind turbines
Locating bearings

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Spherical roller bearings for rotor bearing arrangements in wind turbines

Features

Spherical roller bearings for rotor bearing arrangements

Where locating bearings and non-locating bearings are accommodated in separate housings it is possible that, due to mounting and manufacturing inaccuracies as well as the shaft deflection resulting from operating loads, the only bearing type that can be used is one with an angular adjustment facility. Due to the high loads acting on the rotor bearings, spherical roller bearings are the preferred bearing type here.

Since non-locating bearings are subjected to radial load only, Schaeffler standard spherical roller bearings can be used in this case, see Catalogue HR 1, Rolling Bearings.

Locating bearings are subjected to particularly high axial loads as a result of the wind forces. Schaeffler has therefore optimised the proven symmetrical spherical roller bearings in relation to the specific requirements placed on locating bearings in wind turbines. Furthermore, Schaeffler has developed asymmetrical spherical roller bearings for increased axial loads or for a reduced design envelope.

Symmetrical spherical roller bearings according to this description can also be used, following consultation and agreement with Application Engineering at Schaeffler, as non-locating bearings.



Asymmetrical spherical roller bearings according to this description must be used as locating bearings.

Further information

- Catalogue HR 1, Rolling Bearings
 - ▶ <https://www.schaeffler.de/std/1D3D>.

X-life

X-life is the premium brand that identifies particularly high performance products under the INA and FAG brands. They are characterised by longer rating life and operating life.

This improved performance results from the use of state of the art manufacturing techniques and improved internal constructions. Products identified as the X-life premium brand have an increase in the basic dynamic load rating.

At Schaeffler, the systematic calculation of basic load ratings is compiled in the method “Method to investigate rolling bearing rating life”. This describes all calculation and test methods that are necessary in order to determine all the reference values that influence rating life. This procedure has been certified by Germanischer Lloyd (GL-CER-002-2015), *Figure 1*.

Spherical roller bearings for rotor bearing arrangements in wind turbines are predominantly available, due to their improved macrogeometry and microgeometry, in the X-life design.



Figure 1
Germanischer Lloyd –
certificate

Spherical roller bearings for rotor bearing arrangements in wind turbines

Improved geometry

The objective of the changes to the internal bearing geometry is to achieve increased robustness. In both the microgeometry and macrogeometry, modifications were therefore made that reduce fatigue close to the surface. The essential characteristics of the improved geometry are shown in *Figure 2*. Further measures can be implemented for specific customers, see page 6.

- ① Symmetrical spherical roller bearing
- ② Asymmetrical spherical roller bearing
- ③ Profiled rolling elements
- ④ Fixed central rib
- ⑤ Improved surface

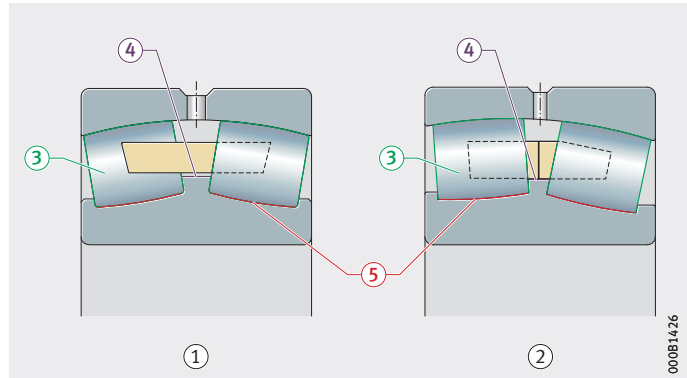


Figure 2
Improved geometry

Microgeometry

For spherical roller bearings as locating bearings for rotor bearing arrangements, the following optimisations have been made on a microgeometrical level:

- improved surface quality for uniform pressure distribution and reduced bearing friction
- closer osculations to reduce the contact pressures p
- profiled rolling elements to reduce the surface damage indicator¹⁾, *Figure 4*, page 5.

Macrogeometry

For spherical roller bearings as locating bearings for rotor bearing arrangements, the following optimisations have been made on a macrogeometrical level:

- reduced internal clearance tolerances for optimisation of the operating clearance, reduction in the pressures and the axial displacement of the drive train
- fixed central rib to increase the axial rigidity and thus reduce the axial sliding distances in the drive train, *Figure 3*, page 5.

Asymmetrical contact angle

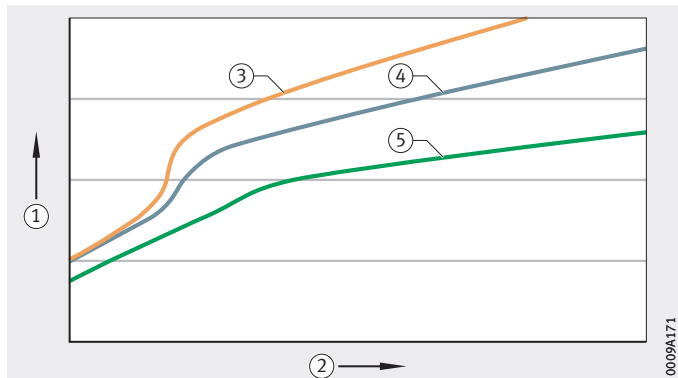
In addition, Schaeffler offers spherical roller bearings with an asymmetrical contact angle for even higher axial load carrying capacity and reduced vibrations in the drive train.

Comparison of the internal constructions

The influence of the contact angle and the central rib as well as the effects of profiled rolling elements are shown in *Figure 3* and *Figure 4*.

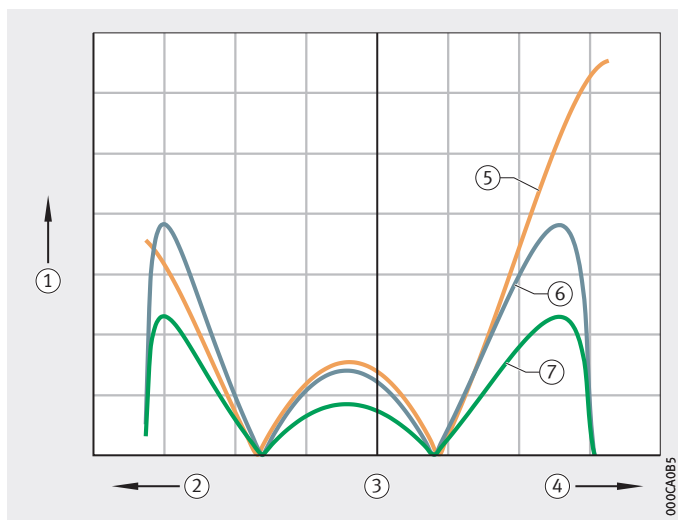
- ① Axial displacement
- ② Axial force (constant radial load)
- ③ Symmetrical with loose central rib
- ④ Symmetrical with fixed central rib
- ⑤ Asymmetrical with fixed central rib

Figure 3
Axial displacement from bearing centre



- ① Surface damage indicator
- ② Outer roller end
- ③ Roller centre
- ④ Inner roller end
- ⑤ Unprofiled roller and loose central rib
- ⑥ Profiled roller and fixed central rib
- ⑦ Triondur C coated, profiled roller and fixed central rib

Figure 4
Surface damage indicator¹⁾ along the roller axis under high axial load



¹⁾ The surface damage indicator is the product of the contact pressure p , the usual slip speed for spherical roller bearings v , the portion of the solid body load-bearing area that is caused by mixed friction λ and a coefficient of solid body friction μ .

Spherical roller bearings for rotor bearing arrangements in wind turbines

Customer-specific bearings	<p>Spherical roller bearings can be additionally provided with the following features:</p> <ul style="list-style-type: none">■ coatings (Durotect B, Durotect CK, Triondur C)■ design in accordance with the Schaeffler Wind Power Standard■ bore diameter with specific modifications.
Durotect B	<p>Durotect B is the black oxide coating developed by Schaeffler. It offers the following advantages:</p> <ul style="list-style-type: none">■ better running-in behaviour■ increased protection against White Etching Cracks (WEC).
Durotect CK	<p>Durotect CK is a columnar hard chromium coating. It offers the advantage of high wear resistance (high hardness), particularly for fit surfaces, where fretting corrosion is to be expected.</p>
Triondur C	<p>Triondur C is a carbon-based coating system developed by Schaeffler. This coating system reduces the friction and wear occurring under mixed friction.</p>
Schaeffler Wind Power Standard	<p>The Schaeffler Wind Power Standard is the highest quality standard for all products and processes that are of significance in the field of wind power at Schaeffler. It ensures the highest quality and reliability worldwide.</p>
Modified bore diameter	<p>For reconditioning activities, the inner ring can be matched to the shaft:</p> <ul style="list-style-type: none">■ reduction in bore diameter by 1 mm or 2 mm■ no change to operating clearance. <p>This gives the following advantages:</p> <ul style="list-style-type: none">■ cost savings due to reuse of the rotor shaft in overhaul■ no requirement for material deposit on the shaft, thus deleting an additional work step.
Sealing	<p>Spherical roller bearings for rotor bearing arrangements in wind turbines are supplied as standard without seals. By agreement, sealed spherical roller bearings with Seal Concept 4 are also available for this diameter range.</p>
Further information	<ul style="list-style-type: none">■ TPI 218, Sealed Spherical Roller Bearings.

Lubrication

Spherical roller bearings for rotor bearing arrangements in wind turbines are predominantly lubricated using grease. Schaeffler recommends the use of greases of viscosity class ISO VG 320 or higher, especially Arcanol LOAD400 or Arcanol LOAD460, *Figure 5*.



Figure 5
Arcanol greases

In addition, Schaeffler offers relubrication devices that automatically feed fresh grease in the right quantity to the bearing positions, *Figure 6*.



Figure 6
Relubrication device

Further information

- TPI 176, Lubrication of Rolling Bearings
- TPI 252, Lubricators.

Spherical roller bearings for rotor bearing arrangements in wind turbines

Cages Symmetrical spherical roller bearings for rotor bearing arrangements in wind turbines have one-piece solid brass cages as standard. Two-piece solid brass cages are available by agreement. Asymmetrical spherical roller bearings for rotor bearing arrangements in wind turbines have two-piece solid brass cages as standard.

Suffixes Common designs

Suffix	Description
C2	Internal clearance of internal clearance group C2 (Group 2)
C2H	Half the internal clearance of internal clearance group C2 (Group 2), upper half
C2L	Half the internal clearance of internal clearance group C2 (Group 2), lower half
CNH	Half the internal clearance of internal clearance group CN (Group N), upper half
CNL	Half the internal clearance of internal clearance group CN (Group N), lower half
J24BA	Inner ring bore with Durotect CK coating
J30PC	Rings and rolling elements with black oxide coating (Durotect B)
J30PE	Rolling elements with black oxide coating (Durotect B)
J48BB	Rolling elements with Triondur C
H123C	Bore diameter reduced by 1 mm
H123E	Bore diameter reduced by 2 mm
H78	Lifting holes on the gearbox side row
M15BK	Measurement record included

Spherical roller bearings for rotor bearing arrangements in wind turbines

Design and safety guidelines

Design and safety guidelines are given in Catalogue HR 1, Rolling Bearings.

Mounting of spherical roller bearings

The mounting of a spherical roller bearing as described here relates to the most frequently used sealing system, *Figure 7*. In the case of other sealing systems, it may be necessary to adjust the mounting sequence. The temperatures indicated for heating of the components are valid for commonly used fits.

Figure 7 shows the completely mounted bearing unit with all individual components.



Mounting of a symmetrical spherical roller bearing is shown. When using an asymmetrical spherical roller bearing, the correct mounting direction must be ensured. For this purpose, the asymmetrical spherical roller bearings are marked or provided with a lifting hole (suffix H78).



This is not a substitute for a comprehensive mounting manual. For actual mounting, the complete mounting manual containing safety guidelines and further information must be used. Please request the mounting manual from Schaeffler.

- ① Labyrinth ring for rotor side
- ② V ring for rotor side
- ③ Housing cover for rotor side
- ④ Housing
- ⑤ Housing cover for gearbox side
- ⑥ V ring for gearbox side
- ⑦ Shaft nut
- ⑧ O ring for gearbox side
- ⑨ Labyrinth ring for gearbox side
- ⑩ Bearing
- ⑪ O ring for rotor side

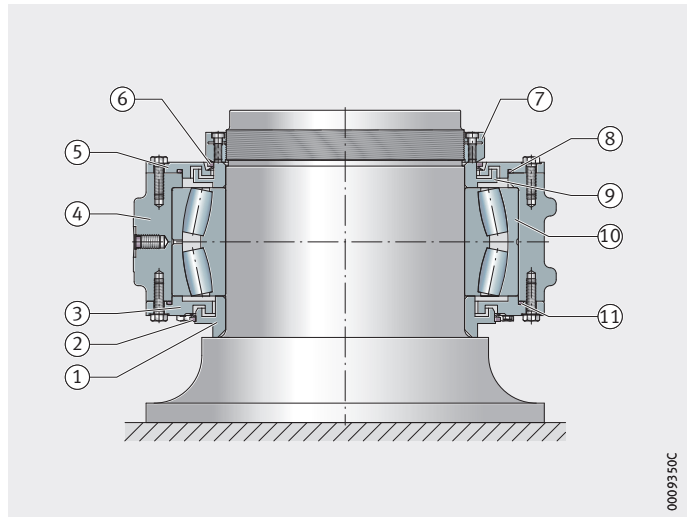


Figure 7
Mounted spherical roller bearing

0009350C

- Mounting sequence**
- ▶ Move the main shaft to a vertical position (rotor side down), *Figure 8*.

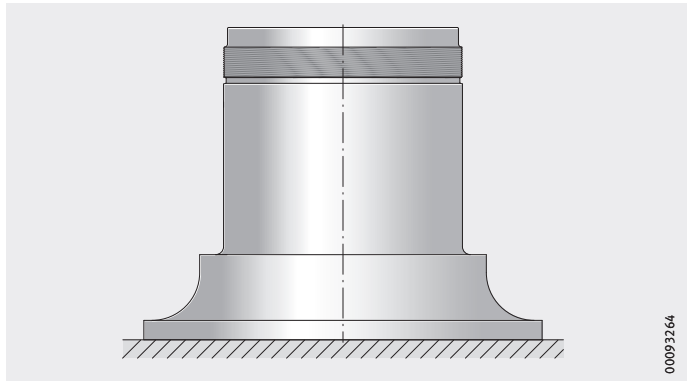
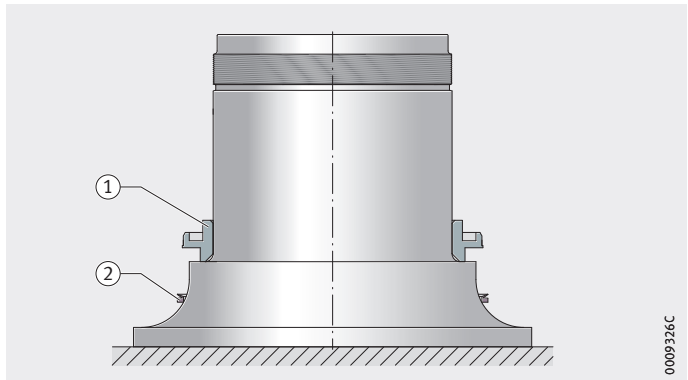


Figure 8
Main shaft in mounting position

- ▶ Position the V ring for the rotor side on the shaft, *Figure 9*, ②.
- ▶ Heat the labyrinth ring for the rotor side to approx. +50 °C.
- ▶ Slide the heated labyrinth ring for the rotor side as far as possible onto the shaft end (rotor side). Observe the correct direction for mounting (labyrinth nose towards the gearbox), *Figure 9*.
- ▶ Check the contact of the ring on the flange, *Figure 9*, ①.



① Labyrinth ring for rotor side
② Positioned V ring for rotor side

Figure 9
Mounting of the labyrinth ring
for the rotor side

Spherical roller bearings for rotor bearing arrangements in wind turbines

- ▶ Allow the labyrinth ring for the rotor side to cool.
- ▶ Grease the O ring for the rotor side and insert in the slot on the housing cover for the rotor side, *Figure 10*.
- ▶ Fill the inner profile of the housing cover for the rotor side completely with rotor bearing grease.
- ▶ Slide the housing cover for the rotor side (with the inserted O ring) onto the shaft and place on the labyrinth ring, *Figure 10*.

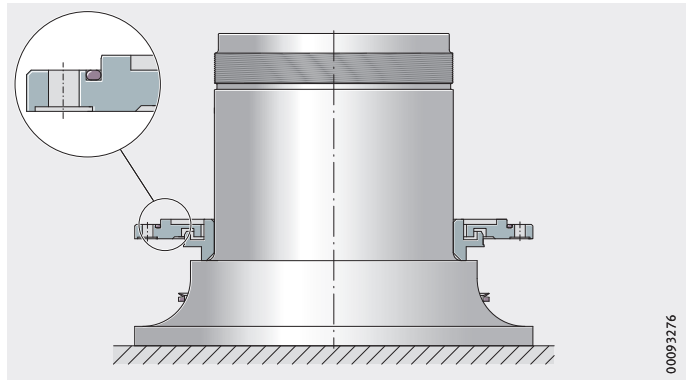


Figure 10
Preliminary positioning
of the housing cover
for the rotor side with the O ring

- ▶ Clean and degrease the inner ring bore of the bearing using a suitable cleaning agent.
- ▶ Heat the spherical roller bearing in steps (step size +20 °C) to approx. +100 °C to +110 °C.

Note!

During heating, ensure that the components are of uniform temperature, in order to prevent distortion of the rolling elements (by applying several temperature sensors). The difference in temperature between the components should not exceed +25 °C.

- ▶ Slide the heated spherical roller bearing onto the shaft using a suitable lifting device until it reaches the labyrinth ring, *Figure 11*. While it is being moved into place, the inner ring must remain aligned precisely parallel to the shaft, in order to prevent tilting of the inner ring relative to the shaft. If there is a risk of jamming, remove the bearing immediately and heat it again.



When using an asymmetrical spherical roller bearing, the correct mounting direction must be ensured. Normally, the flat angle faces in the direction of the rotor flange and the marked side faces in the direction of the gearbox. Lifting holes, where present, face in the direction of the gearbox.

- ▶ Press the spherical roller bearing (inner ring) against the labyrinth ring until it has cooled.
- ▶ Check the contact of the bearing on the labyrinth ring.

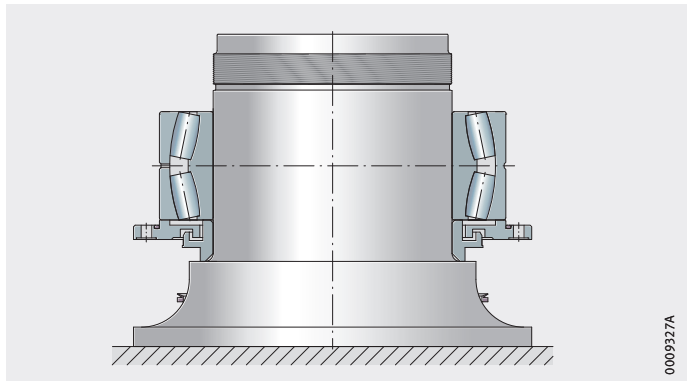


Figure 11
Mounting of the bearing

Spherical roller bearings for rotor bearing arrangements in wind turbines

- ▶ Heat the bearing housing to at least +60 °C to +80 °C.
- ▶ Slide the heated bearing housing over the cooled spherical roller bearing with coaxial alignment to the shaft, *Figure 12*. Avoid any damage to the housing cover and labyrinth ring.

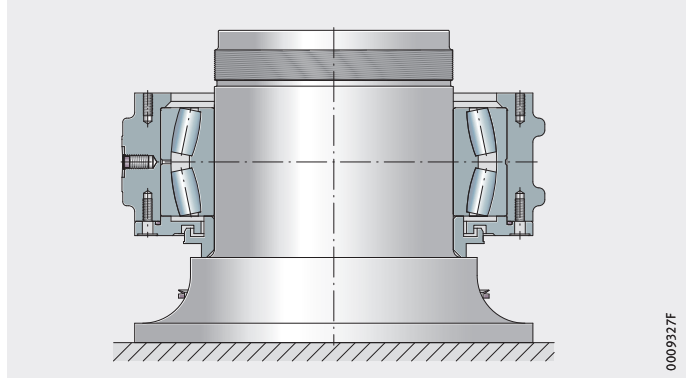


Figure 12
Mounting of the housing

- ▶ Fill the bearing spaces completely with rotor bearing grease so that all the rolling elements are coated with grease. For greasing of the bearing, please observe the document “Lubrication advice” and the lubricant quantity calculation method available from Schaeffler.
- ▶ Heat the labyrinth ring for the gearbox side to approx. +50 °C.
- ▶ Slide the heated labyrinth ring for the gearbox side onto the shaft as far as the bearing inner ring. Observe the correct direction for mounting (labyrinth nose towards the gearbox), *Figure 13*.

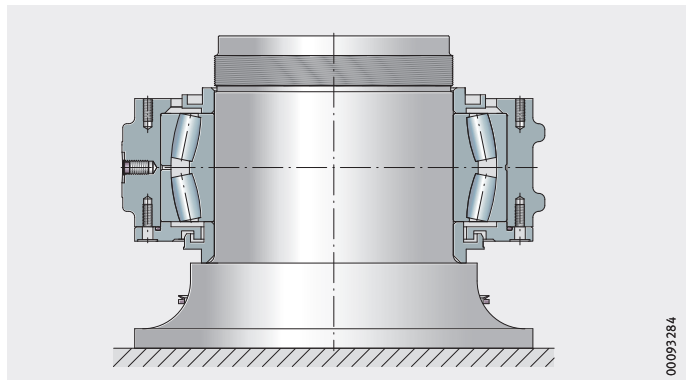


Figure 13
Mounting of the labyrinth ring
for the gearbox side

- ▶ Allow the labyrinth ring for the gearbox side to cool.
- ▶ Grease the O ring for the gearbox side and insert in the slot on the housing cover for the gearbox side, *Figure 14*.
- ▶ Fill the inner profile of the housing cover for the gearbox side completely with rotor bearing grease.
- ▶ Slide the housing cover for the gearbox side (with the inserted O ring) onto the shaft, *Figure 14*.
- ▶ Screw mount the housing covers for the rotor side and gearbox side to the rotor bearing housing.

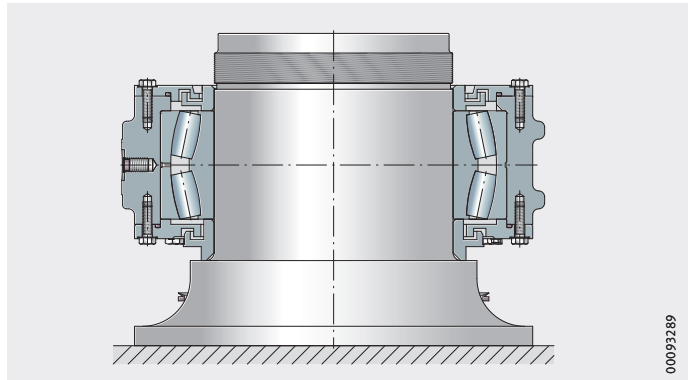


Figure 14
Mounting of the housing covers

- ▶ Apply the grease with the aid of a brush or a grease pump to the contact surfaces of the V rings and the housing covers.
- ▶ Align the V rings correctly to the labyrinth rings (seal lip towards the housing), *Figure 15*.

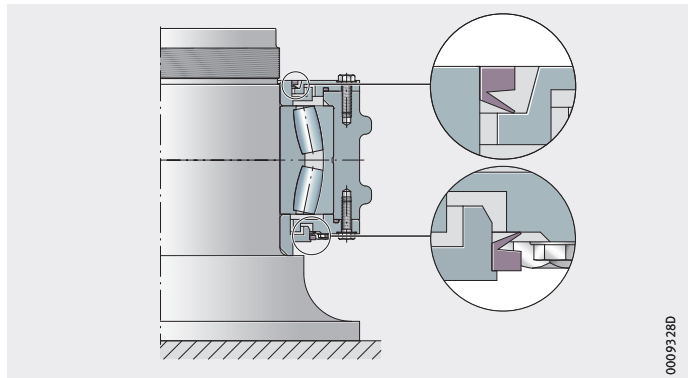


Figure 15
Positioning of the V rings

Spherical roller bearings for rotor bearing arrangements in wind turbines

- ▶ Mount the shaft nut in accordance with the manufacturer's mounting manual and secure against loosening, *Figure 16*.

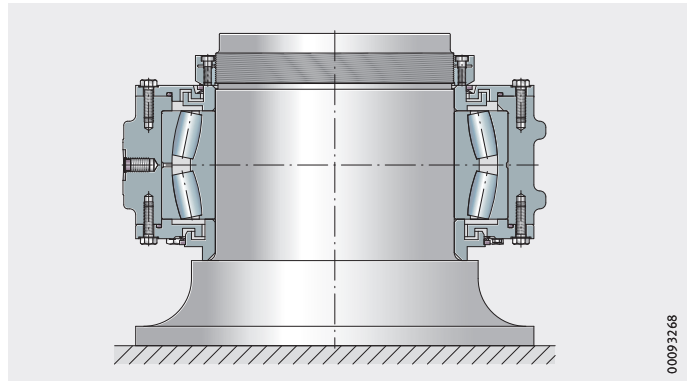


Figure 16
Mounting of the shaft nut

- ▶ Grease the bearing under slow rotational motion until grease escapes at the two labyrinth seals.

Note!

Once mounting has been completed, Schaeffler recommends that any paintwork damage should be repaired and all screws and support washers should additionally be coated with housing colour, in order to ensure optimum protection against rust. Paintwork damage should also be repaired after torsion testing and maintenance work.

Further information

- PDB 31, Products for Maintenance.

Asymmetrical spherical roller bearings

Calculation of the rating life in accordance with ISO 281 is only possible under certain conditions. In order to take account of various effects, a computer-aided rating life calculation in accordance with ISO TS 18281 is therefore recommended. This can be carried out, for example, using the calculation program BEARINX.



When mounting asymmetrical spherical roller bearings, the correct mounting direction must be ensured. Normally, the row subjected to axial load, in other words the row with the larger contact angle, is located on the gearbox side.

Accuracy

Radial internal clearance

The radial internal clearance corresponds as standard to the internal clearance group CN (Group N) in accordance with DIN 620-4 (ISO 5753). This is supplied if no suffix is stated for the internal clearance group.

Normally, bearings with the restricted, halved internal clearance of internal clearance groups CN (Group N) or C2 (Group 2) in accordance with DIN 620-4 (ISO 5753) are used in preference, see tables, page 17. The lower half of the internal clearance is indicated by the suffixes CNL or C2L. The upper half of the internal clearance is indicated by the suffixes CNH or C2H. Further internal clearance groups are available by agreement.

**Radial internal clearance
CN, CNL, CNH**

Bore d mm		Radial internal clearance					
		CN (Group N) μm		CNL (Group N/2L) μm		CNH (Group N/2H) μm	
over	incl.	min.	max.	min.	max.	min.	max.
400	450	240	370	240	305	305	370
450	500	260	410	260	335	335	410
500	560	280	440	280	360	360	440
560	630	310	480	310	395	395	480
630	710	350	530	350	440	440	530
710	800	390	580	390	485	485	580
800	900	430	650	430	540	540	650
900	1 000	480	710	480	595	595	710
1 000	1 120	530	770	530	650	650	770
1 120	1 250	580	840	580	710	710	840
1 250	1 400	630	910	630	770	770	910
1 400	1 600	700	1 020	700	860	860	1 020
1 600	1 800	780	1 140	780	960	960	1 140
1 800	2 000	860	1 260	860	1 060	1 060	1 260
2 000	2 250	950	1 400	950	1 175	1 175	1 400
2 250	2 500	1 050	1 550	1 050	1 300	1 300	1 550

**Radial internal clearance
C2, C2L, C2H**

Bore d mm		Radial internal clearance					
		C2 (Group 2) μm		C2L (Group 2/2L) μm		C2H (Group 2/2H) μm	
over	incl.	min.	max.	min.	max.	min.	max.
400	450	140	240	140	190	190	240
450	500	140	260	140	200	200	260
500	560	150	280	150	215	215	280
560	630	170	310	170	240	240	310
630	710	190	350	190	270	270	350
710	800	210	390	210	300	300	390
800	900	230	430	230	330	330	430
900	1 000	260	480	260	370	370	480
1 000	1 120	290	530	290	410	410	530
1 120	1 250	320	580	320	450	450	580
1 250	1 400	350	630	350	490	490	630
1 400	1 600	380	700	380	540	540	700
1 600	1 800	420	780	420	600	600	780
1 800	2 000	460	860	460	660	660	860
2 000	2 250	500	950	500	725	725	950
2 250	2 500	550	1 050	550	800	800	1 050

Spherical roller bearings for rotor bearing arrangements in wind turbines

Ordering examples Bearing replacement with symmetrical spherical roller bearing

In a turbine, a symmetrical spherical roller bearing 230/800 (locating bearing) is to be replaced. The basis bearing is accordingly F-607299.PRL, see dimension table. This is to be optimised in relation to internal clearance (CNL). The bearing is to be designed in accordance with the Schaeffler Wind Power Standard. The rolling elements of the bearing are to be coated with Triondur C. Finally, the shaft is to be specifically ground down by 2 mm and the bearing bore made correspondingly smaller.

Bearing type	Symmetrical spherical roller bearing
Series	230
Original shaft diameter	800 mm
Schaeffler Wind Power Standard	WPOS
Shaft diameter reduced by 2 mm	H123E
Rolling elements with Triondur C coating	J48BB
Internal clearance	CNL

Ordering designation

F-607299.PRL-WPOS-H123E-J48BB-CNL

Bearing replacement with asymmetrical spherical roller bearing

In a turbine, an asymmetrical spherical roller bearing 230/800 (locating bearing) is to be replaced. The basis bearing is accordingly F-630647.PRL, see dimension table. This is to be optimised in relation to internal clearance (CNL). The bearing is to be designed in accordance with the Schaeffler Wind Power Standard. The rolling elements of the bearing are to be coated with Triondur C. Finally, the shaft is to be specifically ground down by 2 mm and the bearing bore made correspondingly smaller.

Bearing type	Asymmetrical spherical roller bearing
Series	230
Original shaft diameter	800 mm
Schaeffler Wind Power Standard	WPOS
Shaft diameter reduced by 2 mm	H123E
Rolling elements with Triondur C coating	J48BB
Internal clearance	CNL

Ordering designation

F-630647.PRL-WPOS-H123E-J48BB-CNL

**New design
with symmetrical
spherical roller bearing**

The locating bearing arrangement of a rotor is to be designed using a symmetrical spherical roller bearing. For new designs, spherical roller bearings 240 should be used in preference as locating bearings. The design of the turbine results in a shaft diameter of 630 mm. Accordingly, the preferred bearing is a spherical roller bearing 240/630 with the designation F-623424.PRL, see dimension table. Due to the mounting situation and the fits derived as a result, the internal clearance is defined as CNL. For improved operating behaviour, the rolling elements are to have a black oxide coating.

Bearing type	Symmetrical spherical roller bearing
Series	240
Shaft diameter	630 mm
Rolling elements with black oxide coating	J30PE
Internal clearance	CNL

Ordering designation

F-623424.PRL-J30PE-CNL

**New design
with asymmetrical
spherical roller bearing**

Alternatively, this bearing arrangement can be implemented in the development process with a narrower, asymmetrical spherical roller bearing 230.

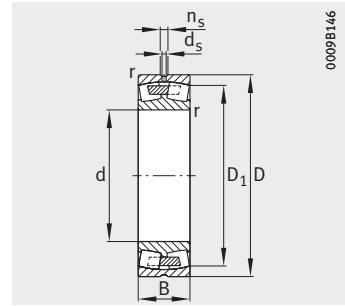
Bearing type	Asymmetrical spherical roller bearing
Series	230
Shaft diameter	630 mm
Rolling elements with black oxide coating	J30PE
Internal clearance	CNL

Ordering designation

F-630644.PRL-J30PE-CNL

Symmetrical spherical roller bearings

For rotor bearing arrangements in wind turbines



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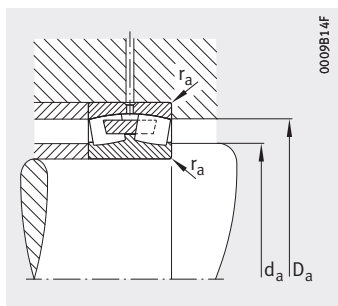
Dimensions



Dimension table · Dimensions in mm

Designation			Mass m ≈ kg	Dimensions						
Standard	Schaeffler designation	X-life		d	D	B	r min.	D ₁	d _s	n _s
23160	F-626426.PRL	XL	128	300	500	160	5	433	9,5	17,7
23064	F-626425.PRL	XL	78	320	480	121	4	429	9,5	17,7
23072	F-623391.PRL	XL	109	360	540	134	5	482	12,5	23,5
24076	F-623390.PRL	XL	153	380	560	180	5	504	9,5	17,7
24188	F-623389.PRL	XL	446	440	720	280	6	614	12,5	23,5
230/500	F-623400.PRL	XL	230	500	720	167	6	657	12,5	23,5
240/500	F-623420.PRL	XL	294	500	720	218	6	647	12,5	23,5
241/500	F-623440.PRL	XL	702	500	830	325	7,5	705	12,5	23,5
230/530	F-623401.PRL	XL	311	530	780	185	6	708	12,5	23,5
240/530	F-623421.PRL	XL	410	530	780	250	6	694	12,5	23,5
241/530	F-623441.PRL	XL	790	530	870	335	7,5	743	12,5	23,5
230/560	F-623402.PRL	XL	361	560	820	195	6	745	12,5	23,5
240/560	F-623422.PRL	XL	466	560	820	258	6	732	12,5	23,5
230/600	F-623403.PRL	XL	410	600	870	200	6	793	12,5	23,5
240/600	F-623423.PRL	XL	545	600	870	272	6	778	12,5	23,5
230/630	F-623404.PRL	XL	490	630	920	212	7,5	838	12,5	23,5
240/630	F-623424.PRL	XL	655	630	920	290	7,5	822	12,5	23,5
230/670	F-623419.PRL	XL	608	670	980	230	7,5	881	12,5	23,5
240/670	F-623439.PRL	XL	794	670	980	308	7,5	873	12,5	23,5
230/710	F-623405.PRL	XL	679	710	1030	236	7,5	939	12,5	23,5
240/710	F-623425.PRL	XL	889	710	1030	315	7,5	922	12,5	23,5
230/750	F-623406.PRL	XL	804	750	1090	250	7,5	993	12,5	23,5
240/750	F-623426.PRL	XL	1064	750	1090	335	7,5	975	12,5	23,5
230/800	F-607299.PRL	XL	908	800	1150	258	7,5	1051	12,5	23,5
240/800	F-623427.PRL	XL	1198	800	1150	345	7,5	1033	12,5	23,5
230/850	F-623408.PRL	XL	1079	850	1220	272	7,5	1116	12,5	23,5
240/850	F-623428.PRL	XL	1421	850	1220	365	7,5	1096	12,5	23,5

The spherical roller bearings listed here are intended as locating bearings.
 For non-locating bearings, see standard range.
 For new designs, spherical roller bearings of series 240 should be used in preference.

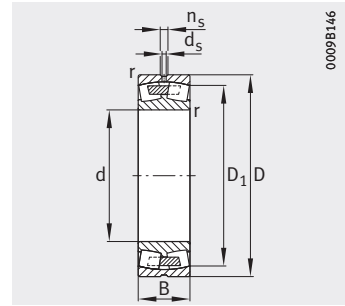


Mounting dimensions

Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C	stat. C_0	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	kN	kN					kN	min^{-1}	min^{-1}
320	480	4	3 250	4 950	0,31	2,18	3,24	2,13	465	1 300	720
335	465	3	2 300	3 750	0,22	3,01	4,48	2,94	380	1 480	920
378	522	4	2 800	4 650	0,22	3,04	4,53	2,97	460	1 300	790
398	542	4	3 750	7 000	0,29	2,33	3,47	2,28	680	990	530
466	694	5	7 600	12 900	0,38	1,78	2,65	1,74	1 130	710	260
523	697	5	4 700	8 700	0,21	3,24	4,82	3,16	820	890	510
523	697	5	5 700	11 100	0,27	2,51	3,74	2,45	1 060	750	370
532	798	6	10 000	17 300	0,38	1,78	2,65	1,74	1 450	600	209
553	757	5	5 600	10 100	0,22	3,1	4,62	3,03	950	820	475
553	757	5	7 000	13 500	0,29	2,33	3,47	2,28	1 240	670	335
562	838	6	10 700	19 100	0,37	1,83	2,72	1,79	1 570	560	190
583	797	5	6 100	11 200	0,22	3,1	4,62	3,03	1 030	760	440
583	797	5	7 500	14 600	0,28	2,39	3,56	2,34	1 330	630	315
623	847	5	6 600	12 300	0,21	3,24	4,82	3,16	1 120	710	405
623	847	5	8 300	16 600	0,28	2,41	3,59	2,35	1 480	580	285
658	892	6	7 400	13 700	0,21	3,24	4,82	3,16	1 230	670	380
658	892	6	9 400	18 600	0,28	2,39	3,56	2,34	1 630	550	265
698	952	6	8 400	15 900	0,22	3,14	4,67	3,07	1 350	620	350
698	952	6	10 500	21 500	0,28	2,39	3,56	2,34	1 820	510	241
738	1 002	6	9 000	17 300	0,21	3,24	4,82	3,16	1 500	580	320
738	1 002	6	11 000	22 500	0,28	2,43	3,61	2,37	1 940	485	225
778	1 062	6	10 100	19 300	0,21	3,24	4,82	3,16	1 650	550	300
778	1 062	6	12 300	25 500	0,28	2,41	3,59	2,35	2 140	450	207
828	1 122	6	10 900	21 200	0,2	3,31	4,92	3,23	1 790	520	275
828	1 122	6	13 300	28 000	0,27	2,49	3,71	2,43	2 330	420	189
878	1 192	6	11 900	24 000	0,2	3,34	4,98	3,27	1 980	475	255
878	1 192	6	14 800	31 500	0,27	2,51	3,74	2,45	2 600	390	173

Symmetrical spherical roller bearings

For rotor bearing arrangements in wind turbines



Dimensions



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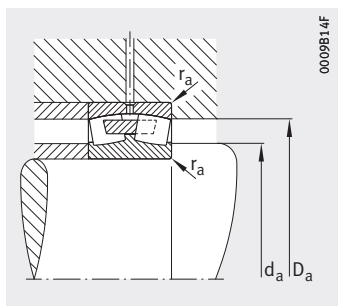
Dimension table (continued) · Dimensions in mm

Designation			Mass m ≈ kg	Dimensions						
Standard	Schaeffler designation	X-life		d	D	B	r min.	D ₁	d _s	n _s
230/900	F-623409.PRL	XL	1 195	900	1 280	280	7,5	1 174	12,5	23,5
240/900	F-623429.PRL	XL	1 584	900	1 280	375	7,5	1 154	12,5	23,5
230/950	F-623410.PRL	XL	1 471	950	1 360	300	7,5	1 228	12,5	23,5
240/950	F-623430.PRL	XL	1 983	950	1 360	412	7,5	1 221	12,5	23,5
230/1000	F-623411.PRL	XL	1 623	1 000	1 420	308	7,5	1 285	12,5	23,5
240/1000	F-623431.PRL	XL	2 148	1 000	1 420	412	7,5	1 280	12,5	23,5
230/1060	F-623412.PRL	XL	1 894	1 060	1 500	325	9,5	1 358	12,5	23,5
240/1060	F-623432.PRL	XL	2 526	1 060	1 500	438	9,5	1 352	12,5	23,5
230/1120	F-623413.PRL	XL	2 217	1 120	1 580	345	9,5	1 431	12,5	23,5
240/1120	F-623433.PRL	XL	2 921	1 120	1 580	462	9,5	1 427	12,5	23,5
230/1180	F-623414.PRL	XL	2 513	1 180	1 660	355	9,5	1 506	12,5	23,5
240/1180	F-623434.PRL	XL	3 297	1 180	1 660	475	9,5	1 503	12,5	23,5

The spherical roller bearings listed here are intended as locating bearings.

For non-locating bearings, see standard range.

For new designs, spherical roller bearings of series 240 should be used in preference.

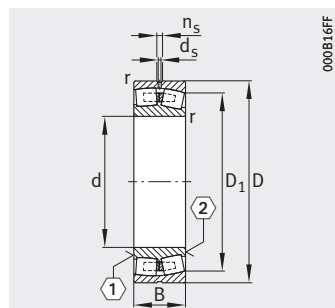


Mounting dimensions

Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load	Limiting speed	Reference speed
d_a	D_a	r_a	dyn. C	stat. C_0	e	Y_1	Y_2	Y_0	C_{ur}	n_G	n_B
min.	max.	max.	kN	kN					kN	min^{-1}	min^{-1}
928	1 252	6	12 800	25 500	0,2	3,42	5,09	3,34	2 050	455	239
928	1 252	6	15 900	34 500	0,26	2,57	3,83	2,52	2 800	370	160
978	1 332	6	14 400	29 000	0,2	3,38	5,03	3,3	2 330	420	220
978	1 332	6	18 400	40 000	0,27	2,47	3,67	2,41	3 150	340	147
1 028	1 392	6	15 300	31 500	0,2	3,46	5,15	3,38	2 450	400	205
1 028	1 392	6	19 100	42 000	0,26	2,6	3,87	2,54	3 200	325	137
1 094	1 466	8	16 900	35 500	0,2	3,46	5,15	3,38	2 700	375	189
1 094	1 466	8	21 400	47 500	0,26	2,57	3,83	2,52	3 550	305	126
1 154	1 546	8	18 600	39 000	0,2	3,42	5,09	3,34	2 950	350	177
1 154	1 546	8	23 500	53 000	0,26	2,57	3,83	2,52	4 000	285	116
1 214	1 626	8	19 900	42 500	0,19	3,5	5,21	3,42	3 150	330	164
1 214	1 626	8	25 500	57 000	0,26	2,64	3,93	2,58	4 300	270	108

Asymmetrical spherical roller bearings

For rotor bearing arrangements in wind turbines



Dimensions



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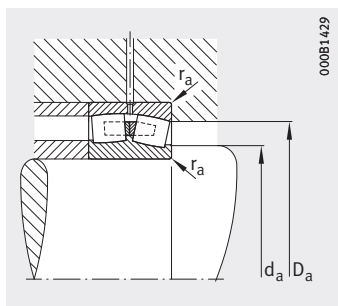
Dimension table · Dimensions in mm

Designation			Mass m ≈ kg	Dimensions						
Standard	Schaeffler designation	X-life		d	D	B	r min.	D ₁	d _s	n _s
23064	F-630634.PRL	XL	77	320	480	121	4	440	9,5	17,7
24072	F-630635.PRL	XL	146	360	540	180	5	484	9,5	17,7
24076	F-630636.PRL	XL	152	380	560	180	5	506	9,5	17,7
24188	F-630637.PRL	XL	455	440	720	280	6	623	12,5	23,5
230/500	F-630640.PRL	XL	224	500	720	167	6	666	12,5	23,5
240/500	F-630660.PRL	XL	293	500	720	218	6	655	12,5	23,5
241/500	F-630680.PRL	XL	713	500	830	325	7,5	714	12,5	23,5
230/530	F-630641.PRL	XL	303	530	780	185	6	719	12,5	23,5
240/530	F-630661.PRL	XL	409	530	780	250	6	704	12,5	23,5
241/530	F-630681.PRL	XL	797	530	870	335	7,5	753	12,5	23,5
230/560	F-630642.PRL	XL	350	560	820	195	6	756	12,5	23,5
240/560	F-630662.PRL	XL	463	560	820	258	6	742	12,5	23,5
230/600	F-630643.PRL	XL	397	600	870	200	6	804	12,5	23,5
240/600	F-630663.PRL	XL	540	600	870	272	6	789	12,5	23,5
230/630	F-630644.PRL	XL	476	630	920	212	7,5	849	12,5	23,5
240/630	F-630664.PRL	XL	652	630	920	290	7,5	833	12,5	23,5
230/670	F-630659.PRL	XL	588	670	980	230	7,5	903	12,5	23,5
240/670	F-630679.PRL	XL	788	670	980	308	7,5	887	12,5	23,5
230/710	F-630645.PRL	XL	657	710	1030	236	7,5	951	12,5	23,5
240/710	F-630665.PRL	XL	877	710	1030	315	7,5	934	12,5	23,5
230/750	F-630646.PRL	XL	782	750	1090	250	7,5	1006	12,5	23,5
240/750	F-630666.PRL	XL	1048	750	1090	335	7,5	988	12,5	23,5
230/800	F-630647.PRL	XL	880	800	1150	258	7,5	1064	12,5	23,5
240/800	F-630667.PRL	XL	1177	800	1150	345	7,5	1046	12,5	23,5
230/850	F-630648.PRL	XL	1042	850	1220	272	7,5	1129	12,5	23,5
240/850	F-630668.PRL	XL	1398	850	1220	365	7,5	1109	12,5	23,5

① Rotor side; ② Gearbox side

The spherical roller bearings listed here are intended as locating bearings.
For non-locating bearings, see standard range.

Where necessary, asymmetrical bearings have different mounting dimensions in comparison with symmetrical bearings.

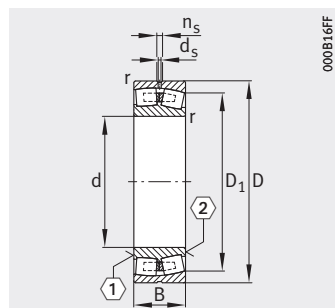


Mounting dimensions

Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load C_{ur} kN	Limiting speed n_G min^{-1}	Reference speed n_B min^{-1}
d_a	D_a	r_a	dyn. C kN	stat. C_0 kN	Rotor side		Gearbox side				
min.	max.	max.			e	Y_0	e	Y_0			
335	465	3	2 260	3 700	0,12	5,28	0,34	2,02	360	1 480	920
378	522	5	3 600	6 500	0,25	2,61	0,38	1,79	620	1 040	570
398	542	4	3 700	6 900	0,23	2,82	0,37	1,85	650	990	530
466	694	5	7 500	12 700	0,33	1,95	0,43	1,61	1 050	710	260
523	697	5	4 650	8 600	0,10	6,58	0,31	2,18	770	890	510
523	697	5	5 600	10 900	0,22	2,97	0,35	1,96	980	750	370
532	798	6	9 800	17 000	0,34	1,89	0,43	1,61	1 340	600	209
553	757	5	5 600	10 100	0,11	6,09	0,32	2,14	880	820	475
553	757	5	6 900	13 300	0,24	2,70	0,37	1,85	1 150	670	335
562	838	6	10 500	18 800	0,33	1,97	0,42	1,63	1 450	560	190
583	797	5	6 000	11 100	0,11	5,82	0,32	2,11	960	760	440
583	797	5	7 400	14 500	0,23	2,79	0,36	1,88	1 240	630	315
623	847	5	6 500	12 300	0,10	6,22	0,31	2,22	1 050	710	405
623	847	5	8 200	16 500	0,23	2,82	0,36	1,90	1 380	580	285
658	892	6	7 200	13 600	0,10	6,19	0,31	2,18	1 150	670	380
658	892	6	9 200	18 400	0,23	2,78	0,36	1,87	1 520	550	265
698	952	6	8 300	15 800	0,11	5,96	0,32	2,14	1 300	620	350
698	952	6	10 300	20 900	0,23	2,79	0,36	1,89	1 690	510	241
738	1 002	6	8 800	17 200	0,11	6,08	0,31	2,23	1 400	580	320
738	1 002	6	10 800	22 200	0,23	2,86	0,36	1,92	1 800	485	225
778	1 062	6	9 900	19 100	0,11	6,07	0,31	2,21	1 540	550	300
778	1 062	6	12 100	25 000	0,22	2,88	0,36	1,88	1 990	450	207
828	1 122	6	10 700	21 000	0,10	6,19	0,30	2,27	1 670	520	275
828	1 122	6	13 100	27 500	0,22	2,93	0,35	1,95	2 170	420	189
878	1 192	6	11 800	23 800	0,10	6,48	0,30	2,29	1 850	475	255
878	1 192	6	14 600	31 500	0,22	2,98	0,34	2,00	2 400	390	173

Asymmetrical spherical roller bearings

For rotor bearing arrangements in wind turbines



Dimensions



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Dimension table (continued) · Dimensions in mm

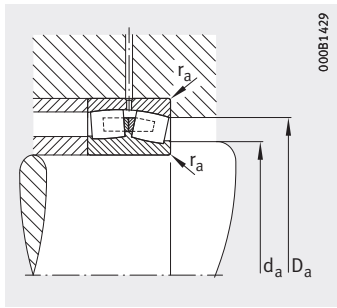
Designation			Mass m ≈ kg	Dimensions						
Standard	Schaeffler designation	X-life		d	D	B	r min.	D ₁	d _s	n _s
230/900	F-630649.PRL	XL	1 160	900	1 280	280	7,5	1 187	12,5	23,5
240/900	F-630669.PRL	XL	1 553	900	1 280	375	7,5	1 168	12,5	23,5
230/950	F-630650.PRL	XL	1 421	950	1 360	300	7,5	1 260	12,5	23,5
240/950	F-630670.PRL	XL	1 951	950	1 360	412	7,5	1 236	12,5	23,5
230/1000	F-630651.PRL	XL	1 565	1 000	1 420	308	7,5	1 318	12,5	23,5
240/1000	F-630671.PRL	XL	2 094	1 000	1 420	412	7,5	1 297	12,5	23,5
230/1060	F-630652.PRL	XL	1 830	1 060	1 500	325	9,5	1 392	12,5	23,5
240/1060	F-630672.PRL	XL	2 467	1 060	1 500	438	9,5	1 370	12,5	23,5
230/1120	F-630653.PRL	XL	2 142	1 120	1 580	345	9,5	1 467	12,5	23,5
240/1120	F-630673.PRL	XL	2 869	1 120	1 580	462	9,5	1 444	12,5	23,5
230/1180	F-630654.PRL	XL	2 420	1 180	1 660	355	9,5	1 543	12,5	23,5
240/1180	F-630674.PRL	XL	3 238	1 180	1 660	475	9,5	1 519	12,5	23,5

① Rotor side; ② Gearbox side

The spherical roller bearings listed here are intended as locating bearings.

For non-locating bearings, see standard range.

Where necessary, asymmetrical bearings have different mounting dimensions in comparison with symmetrical bearings.



Mounting dimensions

Mounting dimensions			Basic load ratings		Calculation factors				Fatigue limit load C_{ur} kN	Limiting speed n_G min^{-1}	Reference speed n_B min^{-1}
d_a min.	D_a max.	r_a max.	dyn. C kN	stat. C_0 kN	Rotor side		Gearbox side				
					e	Y_0	e	Y_0			
928	1 252	6	12 600	25 500	0,10	6,50	0,29	2,33	1 980	455	239
928	1 252	6	15 600	34 000	0,21	3,04	0,34	2,01	2 600	370	160
978	1 332	6	14 200	29 000	0,10	6,21	0,30	2,31	2 200	420	220
978	1 332	8	18 200	39 500	0,22	2,95	0,35	1,94	2 900	340	147
1 028	1 392	8	15 100	31 500	0,10	6,65	0,29	2,39	2 360	400	205
1 028	1 392	8	18 800	41 500	0,21	3,13	0,33	2,05	3 100	325	137
1 094	1 466	8	16 700	35 000	0,10	6,48	0,29	2,38	2 600	375	189
1 094	1 466	8	21 100	47 000	0,21	3,10	0,33	2,05	3 400	305	126
1 154	1 546	8	18 400	39 000	0,10	6,36	0,29	2,35	2 850	350	177
1 154	1 546	8	23 200	52 000	0,21	3,10	0,33	2,03	3 750	285	116
1 214	1 626	8	19 700	42 500	0,10	6,64	0,28	2,40	3 050	330	164
1 214	1 626	8	25 000	57 000	0,20	3,20	0,32	2,11	4 050	270	108

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