



ZKL GROUP

ZKL 23152EKW33MH2RSR NEW FORCE CZECH HL 590

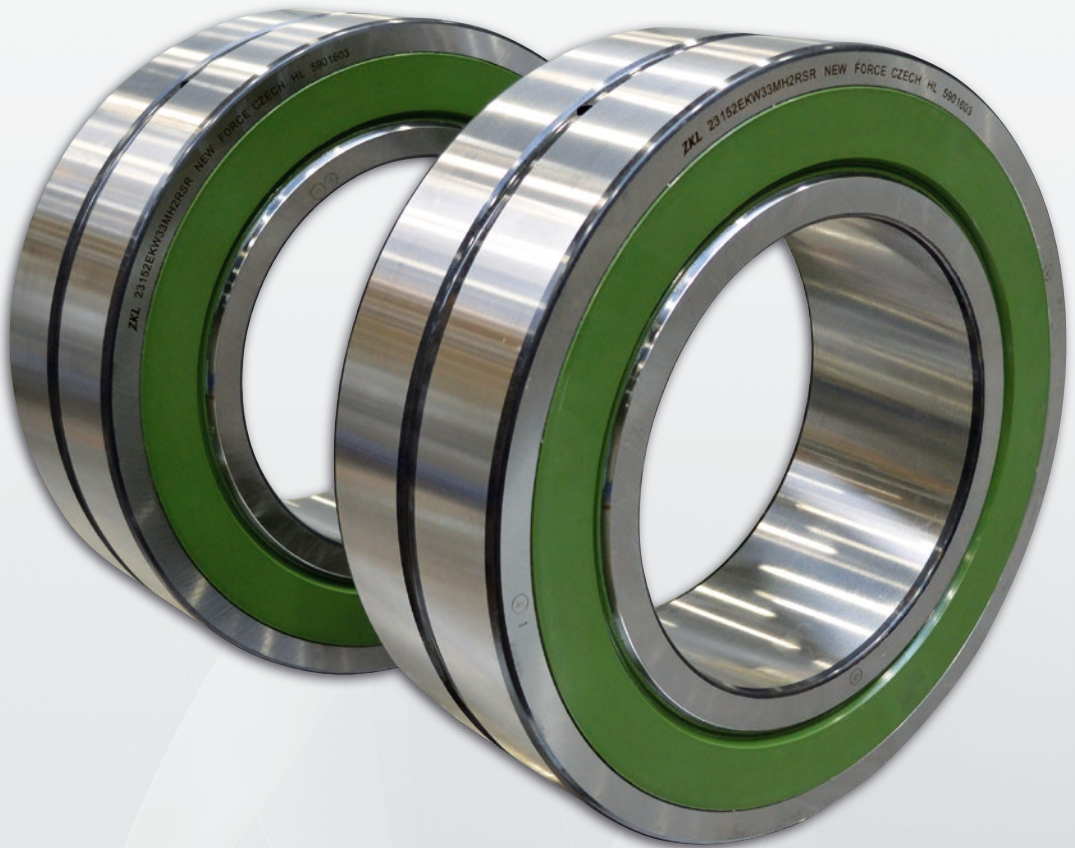
“NEW FORCE”

SEALED SPHERICAL ROLLER BEARINGS





ZKL “New Force” Sealed Double-Row Spherical Roller Bearings



Optimum protection against contamination of the bearing with impurities, reduction of costs of downtimes and maintenance.

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Economical and Environment-Friendly

Advantages of Sealed Spherical Roller Bearings by ZKL

Double-row spherical roller bearings by ZKL are popular and widespread across all engineering branches. They consist of two rows of spherical rollers with a common spherical track in the outer ring. This structure allows for mutual tipping of the bearing rings. Thus they can simultaneously transfer considerable radial and axial loads in both directions. The bearings are made with a cylindrical and a tapered bore. These bearings are suitable for applications with high loads acting on them where tipping has to be ensured so as the bearings may eliminate movement and misalignment of shafts.

Sealed double-row spherical roller bearings by ZKL have the same inside structure as their open counterparts.

Reduced Maintenance Need

Sealed double-row spherical roller bearings by ZKL are ready for immediate use. They are lubricated by the manufacturer with high-standard grease. Bearing contamination is prevented by contact seal on both sides of the bearing. The lubricant needs neither replenishment nor change and so the bearings are virtually maintenance-free in many applications.

Increased Availability and Reliability

Maintenance of clean bearing inside is necessary for its long-term function - service life - in the machine. Even very small particles can negatively affect the life of the bearing. Use of sealed double-row spherical roller bearings can successfully prevent penetration of impermissible humidity and impurities.

Reduced Lubricant Consumption

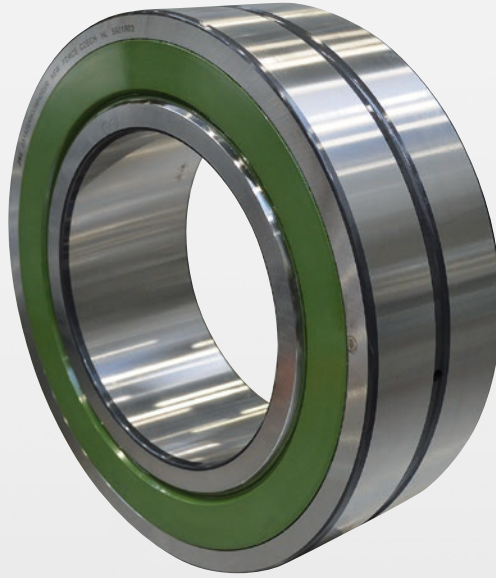
The contact seals on both sides of the bearing assure that the bearing will always keep sufficient grease. In many cases the life of the lubricant is longer than the life of the bearing (or application). For that reason the bearings do not need further lubrication.

Applications of Sealed Spherical Roller Bearings

Sealed spherical roller bearings are mainly used in applications with increased contamination and humidity of the surroundings. Where outer seal cannot be applied or in the case of strong contamination "multi-barrier" seal should be used.

Environment-Friendly

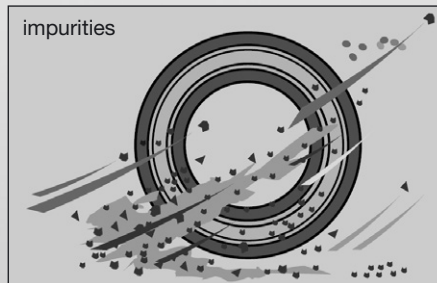
Users of sealed double-row spherical roller bearings can reduce their costs of purchase and disposal of grease. Another important factor is that these bearings are able to reduce environmental impact of the machine during its operation time.



Increased Efficiency in Various Industrial Branches

Reliability

Sealed double-row spherical roller bearings by ZKL provide a high level of reliability in most demanding applications. The contact seal prevents lubricant leaks and protects the bearing against impurities in its surroundings both during handling and assembly and mainly during the machine operation.



Lubrication

Bearings used for standard operation temperatures and speeds are lubricated with grease ZKL LV 2 EP (reinforced with lithium soap). Greases are mainly designed for lubrication of rolling bearings working under increased pressures and exposed to high dynamic stress.

Protection

The bearings are provided with contact seals on both sides. The seals are made of NBR, HNBR and - for high temperatures - FKM rubber. The seal is also reinforced with steel sheet metal.

Industrial branches:

- Metallurgy
- Mining
- Civil engineering
- Industrial transmissions
- Textile industry
- Energy generation
- Railways
- Material handling

Typical customer requirements:

- Long service intervals
- High load-bearing capacity of bearings
- Tipping option
- Minimum maintenance
- Low operation costs
- Minimum unplanned downtimes
- Availability
- Technical support
- Environment-friendly



Bearing Size Specification

Bearing Durability

For many years have been used satisfying basic lifetime calculation L_{10} as criteria of bearing performance parameter. This calculation is connected with 90% bearing reliability using common high quality materials, with high quality technological process and standard operating conditions.

For many applications it is desirable to conduct with another reliability or included the impact of conditions and lubrication, eventually lubricant contamination. With using modern high quality bearing steel was found, that with favourable operating conditions and with lower contact stress than limiting. And further if fatigue limit stress bearing steel isn't exceeded, is possible to achieve higher lifetime than basic lifetime L_{10} . On the other hand can happened with unfavorable operating conditions, that lifetime will be lower than basic lifetime L_{10} .

These factors are used in the modified durability equation.

$$L_m = a_1 * a_{ZKL} * L_{10}$$

Equation:

$$L_m = a_1 * a_{ZKL} * \left(\frac{C}{P} \right)^{\frac{10}{3}}$$

If the speed is constant durability may be expressed in operation hours with the following equation:

$$L_{mh} = a_1 * a_{23} * \frac{1000000}{60 * n} * \left(\frac{C}{P} \right)^{\frac{10}{3}}$$

Where:

L_m – durability adapted for reliability (100 - n) % and other than usual operation conditions

L_{mh} – durability adapted for reliability (100 - n) % and other than usual operation conditions

L_{10} – basic durability

a_1 – reliability coefficient for reliability other than 90 % (☞ table 1)

a_{ZKL} – coefficient of material, lubricant, technology of manufacture and operation conditions (☞ diagram 1)

C – basic dynamic load-bearing capacity [kN]

P – equivalent dynamic load of bearing [kN]

Table 1

Values of coefficient a_1		
Reliability (%)	L_n	a_1
90	L_{10}	1
95	L_5	0,64
96	L_4	0,55
97	L_3	0,47
98	L_2	0,37
99	L_1	0,25

Equivalent Dynamic Load P

To be able to calculate basic eventually modified durability with the relevant equation you need to recalculate the actually acting load on equivalent load, i.e. implied steady load meeting the conditions valid for the basic dynamic load-bearing capacity and equally affecting bearing durability as the actual load. For correct calculation of this load you need most accurate knowledge of the external forces acting on the bearing.

$$P = F_r + Y_1 F_a \quad \text{pro } F_a/F_r \leq e \text{ [kN]}$$

$$P = 0,67 F_r + Y_2 F_a \quad \text{pro } F_a/F_r > e \text{ [kN]}$$

Where:

P – equivalent dynamic load

F_r – radial load (kN)

F_a – axial load (kN)

Y – axial load coefficient

X – radial load coefficient

The values of coefficients e , Y_1 and Y_2 for the individual bearing types are shown in the table section of this document below.

Comparison of Durability of Sealed Double-Row Spherical Roller Bearing with its Open Variant

Higher durability of the sealed double-row spherical roller bearings in comparison to their open counterparts can be easily demonstrated by the durability calculation. We will therefore compare the sealed double-row spherical roller bearing B2-2224-2RSH TN with its open counterpart 2224EW33MH.

Dynamic load-bearing capacity C_r and limit fatigue load P_u of both bearings are the same.

$$C_r = 608 \text{ kN}$$

$$P_u = 81 \text{ kN}$$

Operating conditions of the bearings are:

- Equivalent dynamic load $P = 55 \text{ kN}$
- Viscosity ratio $k = 2$
- Contamination factor $e_c = 0.7$ for the sealed bearing (☞ table 2)
- Contamination factor $e_c = 0.4$ for the open bearing (☞ table 2)

Durability calculation for the sealed variant:

Enter $e_c \times (P_u / P) = 0.7 \times (81 / 55) = 1.03$ to the horizontal scale in (☞ Diagram 1). Move vertically towards the intersection with curve $k = 2$ to get $a_{ZKL} = 31$.

$$L_{10m} = a_{ZKL} \times (C / P)^{10/3} = 31 \times (608 / 55)^{10/3}$$

$$L_{10m} = 93,289 \text{ million revolutions}$$

Durability calculation for the open variant:

Enter $e_c \times (P_u / P) = 0.4 \times (81 / 55) = 0.58$ to the horizontal scale in (☞ Diagram 1). Move vertically towards the intersection with curve $k = 2$ to get $a_{ZKL} = 7$.

$$L_{10m} = a_{ZKL} \times (C / P)^{10/3} = 7 \times (608 / 55)^{10/3}$$

$$L_{10m} = 21,065 \text{ million revolutions}$$

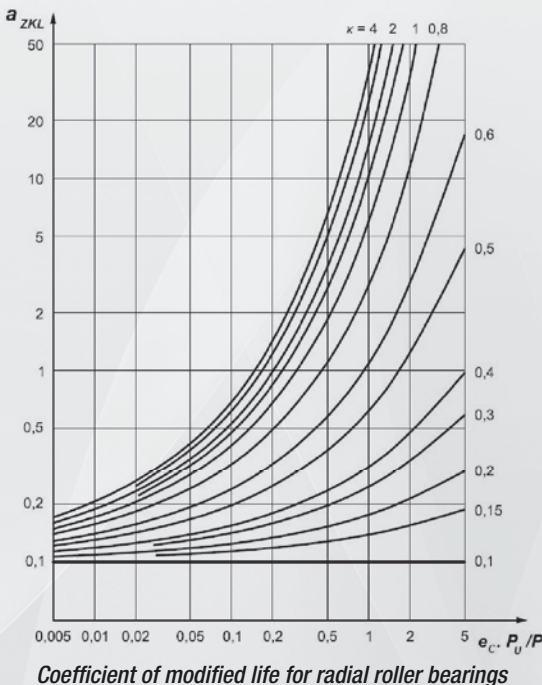
In this particular case the durability ratio between equivalent sealed and open bearing is $93,289/21,065 = 4.4$. It can then be said that the durability of the sealed bearing is more than quadruple in comparison to its open variant.



Table 2

Contamination level	e_c	
	$D_{pw} < 100 \text{ mm}$	$D_{pw} \geq 100 \text{ mm}$
Extremely clean Particle size in the order of lubricating film thickness, Laboratory conditions	1	1
Highly clean Oil filtered through a very fine filter, typical conditions for a bearing with plastic housing and lifetime lubricant filling	0.8 to 0.6	0.9 to 0.8
Normally clean Oil filtered through a fine filter, typical conditions for a bearing with metal-sheet housing and lifetime lubricant filling	0.6 to 0.5	0.8 to 0.6
Mild contamination Minor contamination in lubricant	0.5 to 0.3	0.6 to 0.4
Typical contamination Typical bearing conditions without integrated bearing glands, particles causing wear enter bearing from vicinity	0.3 to 0.1	0.4 to 0.2
Strong contamination The bearing environment is strongly contaminated, bearing housing with insufficient bearing glands	0.1 to 0	0.1 to 0
Very strong contamination	0	0

Diagram 1



Bearing Application

Connection Size

A part of the portfolio of sealed double-row spherical roller bearings by ZKL is wider than their open variants.

These bearings thus cannot replace the standard open variant without adaptation of the components immediately adjacent to the bearing.

Thanks to the bearing surface of the inner race flange for the seal, which is tapered, diameter d_2 (☞ product table) is reduced in comparison to the open variant.

When determining connection diameter d_a the diameter d_2 of the sealed variant must be considered (☞ figure 1).

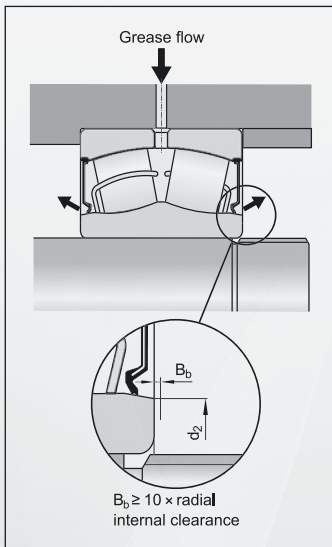


Figure 1

Bearing Space

Most sealed double-row spherical roller bearings by ZKL are designed with the seal inside the side front plane, with a slight overlap in some bearings. It is necessary to assure that nothing of the shaft or bearing body is in contact with the seal during operation.

For applications where additional lubrication is needed the axial space must be big enough (☞ figure 1), for the grease to be able to pass through the seal. The axial space should be at least 10times bigger than the inner radial clearance of the bearing.

Three Barrier Protection

Three barrier protection includes:

1. Sealed two-row spherical roller bearing,
2. Bearing body filled in 70 to 90 % with grease,
3. External labyrinth seal (☞ *figure 2*), representing a very efficient solution.

Applications with a standard open bearing and contact seal in the bearing body can generate higher friction than in the case of use of the Three barrier protection. The use of the sealed double-row spherical roller bearing also means that the grease used as the bearing body fill and lubricant for the labyrinth seal is independent on the bearing lubrication. The location must provide sufficient axial space in the bearing body for the axially loose bearing for the displacement to be allowed.

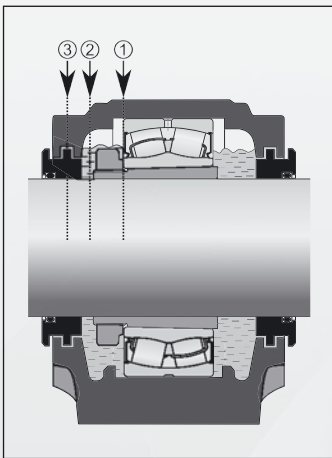


Figure 2

Lubrication

Sealed double-row spherical roller bearings in the product table below feature a perimeter groove in the outer race with three lubrication holes as a standard (W33).

When lubricating the bearing the lubricant must be replenished slowly until the new lubricant begins to go out under the seal. High pressures during lubrication must be prevented to avoid damage to the seal.

Re-Lubrication Intervals

Re-lubrication intervals should be the same for sealed as well as standard bearings. The inner structure of the sealed spherical roller bearing by ZKL is able to hold considerable axial forces but if $F_a/F_r > e$

(👁 *product table*) ZKL recommends increasing the re-lubrication frequency.

Grease Quantity for Re-Lubrication

The required quantity of grease for re-lubrication is calculated with the help of the following formula: $Q = 0.0015 \times D \times B$

Where:

Q – quantity of grease for replenishment, [g]

D – outer diameter of bearing, [mm]

B – bearing width, [mm]

Rules of No-Maintenance Operation

- Operation for 8 hours/day (not always in full use)
- Normal operation conditions
- Shaft in horizontal position

The bearing may be considered low-maintenance if:

- The speed below the 50 % of limit speed
- Operation temperature does not exceed 70 °C (160 °F)

Assembly and Disassembly

Assembly

It is important to prevent high tip of the bearing during assembly of sealed double-row spherical roller bearings. High tip of the outer bearing race in relation to the inner race may result in contact of a spherical roller face or the cage with the seal which may cause the seal to get loose or damaged.

Bearings with Cylindrical Bore

Sealed double-row spherical roller bearings with a cylindrical bore may be heated with induction heater and hot assembled or cold pressed onto the shaft.

ZKL does not recommend heating sealed bearings to temperatures exceeding 80 °C (175 °F). If a higher temperature is required it should not exceed the limit temperature of the seal or the lubricant depends on which limit temperature is lower.

ZKL does not recommend use of heating plates either, for this might result in direct contact

of the plate with the seal which is undesirable. To assure the appropriate distance a back plate must be used.

ZKL recommends locknuts with a lower diameter on one side for axial locking of sealed double-row spherical roller bearings, however with assurance of axial free space between the nut and the seal for the lubricant to be able to go off during re-lubrication (☞ figure 3).

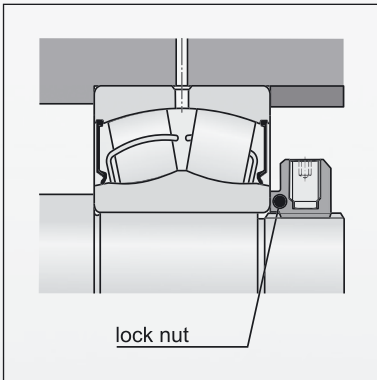


Figure 3

Another alternative is a standard locknut with a back plate. In this case a distance ring must be placed between the inner race of the bearing and the nut with a width and outer diameter not preventing the lubricant from going out during re-lubrication (☞ figure 4).

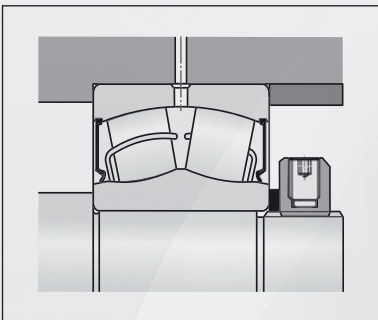


Figure 4

Bearings with Tapered Bore

When assembling sealed double-row spherical roller bearings with a tapered bore it is not possible to measure radial clearance of the bearing with gap gauge. ZKL recommends the traditional method using the hook wrench and angle measurement.

The pressurized mounting oil method is beneficial with larger bearings.

Recommended values of radial clearance and axial displacement reduction are shown in (☞ *table 3*). The minimum values of radial clearance reduction shown in the table are applicable to bearings with normal radial clearance close to the bottom limit of the required clearance range. For bearings with clearances C3 and C4 a value of radial clearance reduction close to the maximum recommended value is recommended.

Assembly of double-row spherical roller bearings with a tapered bore										
Bore diameter		Radial clearance reduction		Axial displacement on taper 1:12				Minimum allowed radial clearance of bearing with clearance		
d				On shaft		On housing		normal	C3	C4
ver	to	min	max	min	max	min	max			
mm		µm		mm				µm		
30	40	20	25	0.35	0.4	0.35	0.45	15	20	40
40	50	25	30	0.4	0.45	0.45	0.5	20	30	50
50	65	30	40	0.45	0.6	0.5	0.7	25	35	55
65	80	40	50	0.6	0.75	0.7	0.85	25	40	70
80	100	45	60	0.7	0.9	0.75	1	35	50	80
100	120	50	70	0.75	1.1	0.8	1.2	50	65	100
120	140	65	90	1.1	1.4	1.2	1.5	55	80	110
140	160	75	100	1.2	1.6	1.3	1.7	55	90	130
160	180	80	110	1.3	1.7	1.4	1.9	60	100	150
180	200	90	130	1.4	2	1.5	2.2	70	100	160
200	225	100	140	1.6	2.2	1.7	2.4	80	120	180
225	250	110	150	1.7	2.4	1.8	2.6	90	130	200
250	280	120	170	1.9	2.7	2	2.9	100	140	220
280	315	130	190	2	3	2.2	3.2	110	150	240
315	355	150	210	2.4	3.3	2.6	3.6	120	170	260
355	400	170	230	2.6	3.6	2.9	3.9	130	190	290
400	450	200	260	3.1	4.1	3.4	4.4	130	200	310
450	500	210	280	3.3	4.4	3.6	4.8	160	230	350
500	560	240	320	3.7	5	4.1	5.4	170	250	360
560	630	260	350	4	5.4	4.4	5.9	200	290	410
630	710	300	400	4.6	6.2	5.1	6.8	210	310	450
710	800	340	450	5.3	7	5.8	7.6	230	350	510
800	900	370	500	5.7	7.8	6.3	8.5	270	390	570

Table 3

Assembly on Clamping Case

Clamping case facilitates assembly and disassembly. This is generally the simplest arrangement (☞ *figure 5a*). When mounting sealed bearings on adapter sleeve is recommend to consult sleeve and nut type with ZKL technical support.

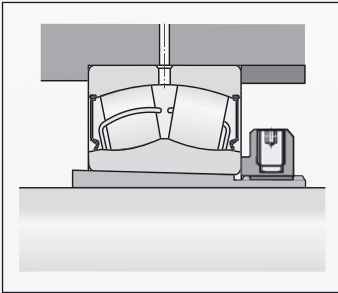


Figure 5a

A folding case is more appropriate for bearings requiring axial positioning (☞ figure 5b)

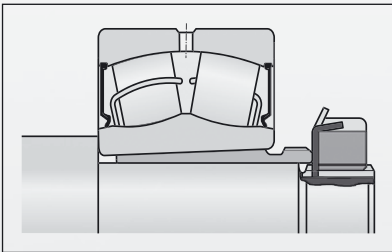


Figure 5b

Nevertheless even with the clamping case the bearings can be positioned axially with a support ring (☞ figure 5c)

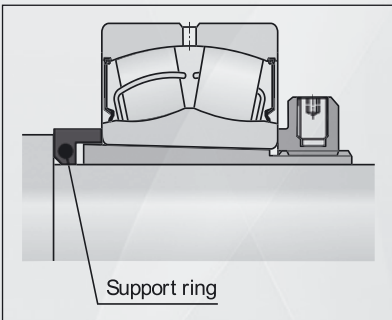


Figure 5c

Some bearings are made with a relatively small radial space for the support ring and so big axial forces acting on these bearings are not desirable.

Note: Bore radius $r_{s,min}$ of sealed spherical roller bearings with taper bore is different from the bearings with cylindrical bore.

Disassembly

Bearing disassembly is described in the main catalogue of ZKL "Roller Bearings", ZKL Publication 3/13/ CZ on ☞ **page 147**.

If the bearings are to be reused after disassembly their seal must be intact.

Bearings – General Data

All ZKL sealed double-row spherical roller bearings are made in the NEW FORCE quality.

Cylindrical or Tapered Bore

ZKL sealed double-row spherical roller bearings are made either with a cylindrical or with a tapered bore. The taper of the tapered bore is 1:12.

Peripheral Groove with Three Lubrication Holes

For easier re-lubrication all ZKL sealed double-row spherical roller bearings feature a perimeter groove in the outer race with three lubrication holes as a standard

Radial clearance of double-row spherical roller bearings																	
Bore diameter		Cylindrical bore								Tapered bore							
		Radial clearance								Radial clearance							
d		C2		Normal		C3		C4		C2		Normal		C3		C4	
over	to	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
mm		µm								µm							
30	40	15	30	30	45	45	60	60	80	25	35	35	50	50	65	65	85
40	50	20	35	35	55	55	75	75	100	30	45	45	60	60	80	80	100
50	65	20	40	40	65	65	90	90	120	40	55	55	75	75	95	95	120
65	80	30	50	50	80	80	110	110	145	50	70	70	95	95	120	120	150
80	100	35	60	60	100	100	135	135	180	55	80	80	110	110	140	140	180
100	120	40	75	75	120	120	160	160	210	65	100	100	135	135	170	170	220
120	140	50	95	95	145	145	190	190	240	80	120	120	160	160	200	200	260
140	160	60	110	110	170	170	220	220	280	90	130	130	180	180	230	230	300
160	180	65	120	120	180	180	240	240	310	100	140	140	200	200	260	260	340
180	200	70	130	130	200	200	260	260	340	110	160	160	220	220	290	290	370
200	225	80	140	140	220	220	290	290	380	120	180	180	250	250	320	320	410
225	250	90	150	150	240	240	320	320	420	140	200	200	270	270	350	350	450
250	280	100	170	170	260	260	350	350	460	150	220	220	300	300	390	390	490
280	315	110	190	190	280	280	370	370	500	170	240	240	330	330	430	430	540
315	355	120	200	200	310	310	410	410	550	190	270	270	360	360	470	470	590
355	400	130	220	220	340	340	450	450	600	210	300	300	400	400	520	520	650

Table 4

Dimensions

The main dimensions of ZKL sealed double-row spherical roller bearings comply with ISO 15:1998 standard, except for B2 bearings the bearing width being larger.

Inner Radial Clearance

Standard sealed spherical roller bearings by ZKL are made with normal inner radial clearance. The bearings are also available with increased inner clearances, C3 and C4. Some dimensions are also available with lower than normal C2 radial clearance.

Inner radial clearances comply with ISO 5753:1991. Value of radial clearances are mentioned in (👁 *Table 4*).

Tip

The structure of sealed spherical roller bearings is designed to allow for tipping. Thus the bearing is able to eliminate angular deflection of the shaft in relation to the bearing body without any negative impact on the load-bearing capacity of the bearing.

Under operation conditions where the deflection is constant in relation to the outer race ZKL sealed spherical roller bearings are able to eliminate misalignment of the shaft in relation to the body up to about 0.5°. Unless the above value is exceeded the misalignment does not negatively affect efficiency of the seal.

If the misalignment in relation to the outer race of the bearing is not constant (👁 *figure 6*) then friction inside the bearing increases and that is why the misalignment of the inner in relation to the outer race should not exceed a couple of tenths of a degree.

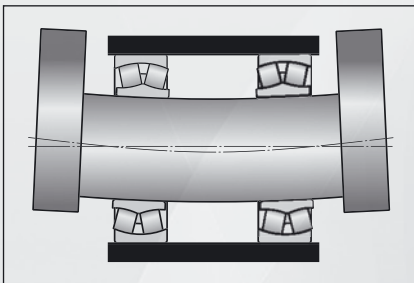


Figure 6

Effect of Operation Temperature on Bearing Materials

Operation temperature of sealed double-row spherical roller bearings must not exceed the limit temperatures for the seal and the grease.

- Bearings with suffix 2RSN TM should not be used at operation temperatures above +90 deg. C (194 deg. F).
- Bearings with suffix 2RSH TM or 2RSF TM should not be used at operation temperatures above +110 deg. C (230 deg. F).

- As for the possibility of use of sealed double-row spherical roller bearings at higher temperatures please contact the technical department of ZKL.

Axial Load-Bearing Capacity of Bearings

Thanks to their inner structure the sealed spherical roller bearings by ZKL are able to hold considerable axial forces acting on the bearing, but if $F_a/F_r > e$ (☞ *product table*) it is recommended to increase the re-lubrication frequency.

Speed

The speed of the sealed double-row spherical roller bearings is limited by friction generated by the contact seal. That is why just limit speeds are shown in the product table. Limit speeds of sealed double-row spherical roller bearings are lower than limits speeds of unsealed bearings (☞ *product table*).

Sealing Materials

The sealing material type depends on the bearing size.

- Acrylonitrile-butadiene rubber (NBR), identified with suffix N
- Hydrogenated acrylonitrile-butadiene rubber (HNBR), identified with suffix H
- Fluor-elastomere (FKM), identified with suffix F

Additional Data

For a practical listing of the portfolio of sealed bearings including their individual structural differences and re-lubrication data see the (☞ *product table*).

Radiuses of the bearing bores r_{smin} are shown in the product table and apply to the bearings with a cylindrical bore. The corresponding values for the bearings with a tapered bore are shown in (☞ *table 5*).

Assembly radium in the bearing bore	
For cylindrical and tapered bores	
Cylindrical bore	Tapered bore
r_{smin}	r_{smin}
1.0 to 1.1	0.6
1.5 to 2.0	1.0
2.1 to 3.0	1.1
4.0	1.5
5.0	2.0
6.0	3.0

Table 5

Attention!

Safety Precautions for Rubber Fluoride (FKM)

Fluoride rubber is very stable and harmless up to operation temperature +200 deg. C. Nevertheless, if the seal is exposed to a temperature higher than 300 deg. C, such as fire or cutting burner flame, the fluoride rubber may produce dangerous evaporations. These vapours may be harmful to human health if inhaled and also eye contact should be avoided.

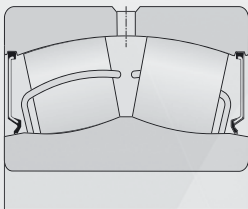
If the seal has ever been exposed to these high temperatures skin contact should be avoided even after the seal has been cooled down. If handling a sealed bearing after its exposure to high temperatures, for example during disassembly, is required, then the following precautions should be observed:

- Always use protective goggles, gloves and a suitable respirator.
- Place the seal in an airtight package with a symbol or text warning of cauterisation.

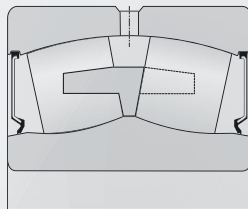
In the case of contact with the seal wash hands with plenty of water with soap, rinse the eyes with plenty of water and seek medical attention immediately.

The user is liable for proper use during operation and for lawful disposal. ZKL does not take responsibility for handling of fluoride rubber during transport.

Additional Data



EJ



EMH

Bearing identification	Bearing type	Seal type	Grease for operation temperature range	Standard lubrication groove	Free space inside bearing
-	-	-	-	-	cm ³
B2-2205-2RSN TM	EJ	NBR, HNBR, FKM	TM, TN, TH	W33	5,5
B2-2206-2RSN TM	EJ	NBR, HNBR, FKM	TM, TN, TH	W33	8
B2-2207-2RSN TM	EJ	NBR, HNBR, FKM	TM, TN, TH	W33	13

Bearing identification	Bearing type	Seal type	Grease for operation temperature range	Standard lubrication groove	Free space inside bearing
-	-	-	-	-	cm ³
B2-2208-2RSN TM	EJ	NBR, HNBR, FKM	TM, TN, TH	W33	18
B2-2308-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	34
B2-2209-2RSN TM	EJ	NBR, HNBR, FKM	TM, TN, TH	W33	20
B2-2309-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	47
B2-2210-2RSN TM	EJ	NBR, HNBR, FKM	TM, TN, TH	W33	21
B2-2310-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	60
B2-2211-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	29
B2-2311-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	78
B2-2212-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	41
B2-2312-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	99
B2-2213-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	48
B2-2313-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	120
B2-2214-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	57
B2-2314-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	148
B2-2215-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	62
B2-2315-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	180
B2-2216-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	74
B2-2316-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	210
B2-2217-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	95
B2-2218-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	120
23218-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	100
B2-2219-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	145
24020-2RSF TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	60
23120-2RSF TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	87
B2-2220-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	185
23220-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	145
23022-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	96
24022-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	100
23122-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	165
24122-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	225
B2-2222-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	250

Bearing identification	Bearing type	Seal type	Grease for operation temperature range	Standard lubrication groove	Free space inside bearing
-	-	-	-	-	cm ³
23222-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	250
23024-2RSF TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	90
24024-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	135
24124-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	305
B2-2224-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	290
23224-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	310
22324-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	630
23026-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	170
24026-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	200
24126-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	325
B2-2226-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	390
23226-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	375
22326-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	760
23028-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	180
24028-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	210
24128-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	395
22228-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	400
23228-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	530
22328-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	950
23030-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	215
24030-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	265
23130-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	405
24130-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	595
22230-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	495
23230-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	780
22330-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1100
23032-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	265
24032-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	320
23132-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	590
24132-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	690
22232-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	785
22332-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1320
23034-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	335
24034-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	505
23134-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	610
24134-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	805
22234-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	935
23036-2RSR TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	465

Bearing identification	Bearing type	Seal type	Grease for operation temperature range	Standard lubrication groove	Free space inside bearing
-	-	-	-	-	cm ³
24036-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	575
23136-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	750
24136-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	880
22236-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	830
23138-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	840
22238-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1050
23040-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	650
23140-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1050
24140-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1550
22240-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1200
23240-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1800
23044-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	850
23144-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1300
23944-2RSN TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	370
22244-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1650
22344-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	3200
23048-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	920
23148-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1650
23052-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	1350
23152-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	2700
22252-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	3050
23156-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	2500
23160-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	3200
23164-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	3900
23168-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	5300
23172-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	6100
23180-2RSH TM	EMH	NBR, HNBR, FKM	TM, TN, TH	W33	6800

Identification

ZKL uses two types of identification of sealed double-row spherical roller bearings. The first identification type for sealed bearings is based on the ISO dimension standard. The second identification type is used for bearings wider than those specified in the ISO standard.

Wider than ISO standard bearings

B2-2212-2RSN C3 TN

Basic structure

B2

Double-row spherical roller bearing
Wider bearing
The first two digits identify the dimensional series, the last two multiplied with 5 identify the bore diameter

Seal

2RSN

Acrylonitrile-butadiene rubber (NBR), sealing on both sides with the option of re-lubrication via the outer race

2RSH

Hydrogenated acrylonitrile-butadiene rubber (HNBR), sealing on both sides with the option of re-lubrication via the outer race

2RSF

Fluor-elastomere (FKM), sealing on both sides with the option of re-lubrication via the outer race

Radial clearance

C2

Inner radial clearance lower than normal

C3

Inner radial clearance higher than normal

C4

Inner radial clearance higher than C3

Lubricant

TM

Grease up to 110 °C

TN

Grease up to 150 °C

TH

Grease up to 200 °C

Bearings with main dimensions pursuant to ISO standard

23048-2RSN C3 TN

Basic structure

Five standard digits of basic identification for unsealed bearings

Seal

2RSN

Acrylonitrile-butadiene rubber (NBR), sealing on both sides with the option of re-lubrication via the outer race

2RSH

Hydrogenated acrylonitrile-butadiene rubber (HNBR), sealing on both sides with the option of re-lubrication via the outer race

2RSF

Fluor-elastomere (FKM), sealing on both sides with the option of re-lubrication via the outer race

Radial clearance

C2

Inner radial clearance lower than normal

C3

Inner radial clearance higher than normal

C4

Inner radial clearance higher than C3

Lubricant

TM

Grease up to 110 °C

TN

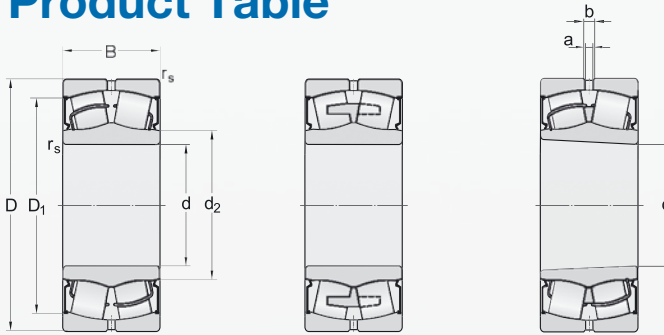
Grease up to 150 °C

TH

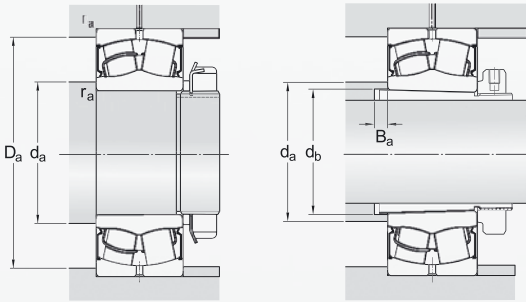
Grease up to 200 °C



Product Table



Principal dimensions			Basic load-bearing capacity		Limit fatigue load	Limit rotation frequency	Weight	Bearing identification	
d	D	B	C	C ₀	P _u			With cylindrical bore	With tapered bore
mm			kN		kN	r/min	kg		
25	52	23	52	50.2	6.1	3400	0.2	B2-2205-2RSN TM	-
30	62	25	68	66.4	8.1	3000	0.335	B2-2206-2RSN TM	-
35	72	28	90	93.5	11	2520	0.515	B2-2207-2RSN TM	-
40	80	28	98	99.7	12	2400	0.574	B2-2208-2RSN TM	B2-2208-2RSNK TM
	90	38	154	160	20	1640	1.32	B2-2308-2RSN TM	-
45	85	28	105	110	13	2120	0.656	B2-2209-2RSN TM	B2-2209-2RSNK TM
	100	42	183	194	24	1480	1.63	B2-2309-2RSN TM	-
50	90	28	112	120	15	2000	0.693	B2-2210-2RSN TM	B2-2210-2RSNK TM
	110	45	220	238	29	1320	2.12	BS2-2310-2RSN TM	-
55	100	31	137	147	18	1800	1	B2-2211-2RSN TM	B2-2211-2RSNK TM
	120	49	163	176	21	1360	2.79	B2-2311-2RSN TM	-
60	110	34	168	183	22	1600	1.3	B2-2212-2RSN TM	B2-2212-2RSNK TM
	130	53	304	315	38	1120	3.25	B2-2312-2RSN TM	-
65	120	38	200	224	27	1520	1.58	B2-2213-2RSN TM	B2-2213-2RSNK TM
	140	56	329	351	42	1040	3.94	B2-2313-2RSN TM	-
70	125	38	208	239	29	1440	1.9	B2-2214-2RSN TM	B2-2214-2RSNK TM
	150	60	246	284	34	1040	4.93	B2-2314-2RSN TM	-
75	130	38	216	255	31	1360	2.11	B2-2215-2RSN TM	B2-2215-2RSNK TM
	160	64	436	489	57	920	6.25	B2-2315-2RSN TM	-
80	140	40	246	295	35	1280	2.43	B2-2216-2RSN TM	B2-2216-2RSNK TM
	170	67	487	551	63	880	6.94	B2-2316-2RSN TM	-
85	150	44	286	337	39	1200	3.02	B2-2217-2RSN TM	B2-2217-2RSNK TM



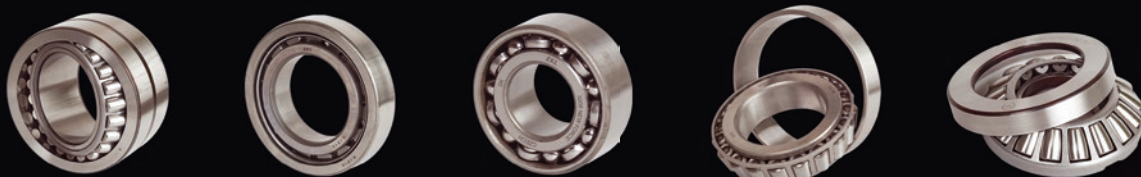
Dimensions						Connection dimensions						Coefficients			
d	d ₂	D ₁	b	a	r _s min	d _a min	d _a max	d _b min	B _a min	D _a max	r _a max	e	Y ₁	Y ₂	Y ₀
mm						mm									
25	30	47	3.7	2	1	30	30	-	-	46.4	1	0.34	2	3	2
30	36	55.7	3.7	2	1	35.6	36	-	-	56.4	1	0.31	2.2	3.2	2.1
35	43	63.7	3.7	2	1.1	42	43	-	-	65	1	0.31	2.2	3.3	2.2
40	47	73	5.5	3	1.1	47	47	44	8	73	1	0.27	2.5	3.7	2.4
	47.5	81	5.5	3	1.5	47.5	47.5	-	-	81	1.5	0.36	1.8	2.6	1.8
45	53	77.1	5.5	3	1.1	52	53	48.5	0	78	1	0.25	2.7	4	2.6
	55	89.1	5.5	3	1.5	54	55	50	6	81	1.5	0.36	1.9	2.8	1.9
50	58	82.1	5.5	3	1.1	57	58	53.5	2	83	1	0.24	2.8	4.2	2.8
	61.5	97.6	5.5	3	2	61	61.5	56	6	99	2	0.36	1.9	2.7	1.8
55	64	91.9	6	3	1.5	64	64	59	2	91	1.5	0.23	2.9	4.4	2.9
	67	109	5.5	3	2	66	67	61	6	109	2	0.35	1.9	2.8	1.9
60	69	102	6	3	1.5	69	69	64	1	101	1.5	0.24	2.8	4.2	2.8
	75	117.1	8.3	4.5	2.1	72	75	66	6	118	2	0.35	1.9	2.9	1.9
65	76	111	5.5	3	1.5	74	76	70.5	14	111	1.5	0.24	2.9	4.2	2.8
	78.8	125.6	8.3	4.5	2.1	77	78.8	72	5	128	2	0.34	2	3	2
70	80	115	6	3	1.5	79	80	75	1	116	1.5	0.23	2.9	4.2	2.8
	86.8	136.1	8.3	4.5	2.1	82	86.8	76	6	138	2	0.34	2	3	2
75	84	119	6	3	1.5	84	84	80	3	121	1.5	0.22	3.1	4.5	2.9
	88	144	8.3	4.5	2.1	87	88	82	5	148	2	0.33	2	3	2
80	91.5	128	6	3	2	91	91.5	85	2.5	129	2	0.22	3.1	4.5	3
	94.2	152.1	8.3	4.5	2.1	92	94.2	88	6	158	2	0.33	2	3	2
85	98	138	6	3	2	96	98	90	1.5	139	2	0.22	3	4.4	2.9

Principal dimensions			Basic load-bearing capacity		Limit fatigue load	Limit rotation frequency	Weight	Bearing identification	
d	D	B	C	C ₀	P _u			With cylindrical bore	With tapered bore
mm			kN		kN	r/min	kg		
90	160	48	339	406	46	1040	3.72	B2-2218-2RSN TM	B2-2218-2RSNK TM
	160	52.4	590	673	74	760	4.61	23218-2RSN TM	-
95	170	51	381	464	52	960	4.7	B2-2219-2RSN TM	B2-2219-2RSNK TM
100	150	50	327	528	60	720	3.15	24020-2RSF TM	-
	165	52	410	587	66	800	4.45	23120-2RSF TM	-
	180	55	417	510	56	880	5.48	B2-2220-2RSH TM	B2-2220-2RSHK TM
	180	60.3	512	667	74	680	6.67	23220-2RSN TM	-
110	170	45	362	516	57	880	3.73	23022-2RSN TM	-
	170	60	442	717	79	680	5.04	24022-2RSN TM	-
	180	56	410	585	64	760	5.45	23122-2RSH TM	23122-2RSHK TM
	180	69	550	849	93	640	6.94	24122-2RSH TM	-
	200	63	537	653	70	800	7.76	B2-2222-2RSH TM	B2-2222-2RSHK TM
	200	69.8	645	867	93	640	9.67	23222-2RSH TM	23222-2RSHK TM
120	180	46	380	572	62	800	4.09	23024-2RSF TM	-
	180	60	454	770	83	640	5.45	24024-2RSH TM	-
	200	80	702	1080	114	560	10.1	24124-2RSH TM	-
	215	69	608	775	81	760	10.12	B2-2224-2RSH TM	B2-2224-2RSHK TM
	215	76	746	1020	107	600	12.1	23224-2RSH TM	23224-2RSHK TM
	260	86	1020	1180	119	560	22	22324-2RSH TM	22324-2RSHK TM
130	200	52	488	711	75	760	5.85	23026-2RSH TM	23026-2RSHK TM
	200	69	592	978	103	600	8	24026-2RSH TM	-
	210	80	722	1160	121	520	10.9	24126-2RSH TM	-
	230	75	708	948	97	720	11.6	B2-2226-2RSH TM	B2-2226-2RSHK TM
	230	80	828	1180	121	520	14.2	23226-2RSH TM	23226-2RSHK TM
	280	93	1180	1380	136	520	27.4	22326-2RSH TM	22326-2RSHK TM
140	210	53	511	781	81	720	6.58	23028-2RSH TM	23028-2RSHK TM
	210	69	603	1040	107	560	8.52	24028-2RSH TM	-
	225	85	814	1330	135	440	13.1	24128-2RSH TM	-
	250	68	822	1080	108	680	14.1	22228-2RSH TM	22228-2RSHK TM
	250	88	985	1370	137	480	18.7	23228-2RSH TM	23228-2RSHK TM
	300	102	1320	1560	150	480	33.9	22328-2RSH TM	22328-2RSHK TM
150	225	56	517	881	89	680	7.99	23030-2RSH TM	23030-2RSHK TM
	225	75	698	1220	123	520	10.6	24030-2RSH TM	-
	250	80	905	1310	130	560	15.5	23130-2RSH TM	23130-2RSHK TM
	250	100	1060	1690	167	400	20	24130-2RSH TM	-
	270	73	949	1260	123	640	17.9	22230-2RSH TM	22230-2RSHK TM
	270	96	1140	1620	158	440	23.8	23230-2RSH TM	-
160	320	108	1520	1850	175	400	41.1	22330-2RSH TM	22330-2RSHK TM
160	240	60	646	1010	100	680	9.4	23032-2RSH TM	23032-2RSHK TM
	240	80	790	1400	139	440	12.9	24032-2RSH TM	-

Dimensions						Connection dimensions						Coefficients			
d	d ₂	D ₁	b	a	r _s min	d _a min	d _a max	d _b min	B _a min	D _a max	r _a max	e	Y ₁	Y ₂	Y ₀
mm						mm									
90	102	148	6	3	2	101	102	96.5	20.5	149	2	0.23	2.9	4.2	2.8
	104.5	147.1	5.5	3	2	101	104.5	-	-	149	2	0.31	2.2	3.3	2.2
95	109	157.1	8.3	4.5	2.1	107	109	105	23	158	2	0.23	2.9	4.2	2.7
100	108	139	6	3	1.5	107	108	-	-	143	1.5	0.3	2.3	3.4	2.3
	112	152	6	3	2	111	112	-	-	154	2	0.29	2.4	3.5	2.3
	114	162	8.3	4.5	2.1	112	114	107.5	22.5	168	2	0.24	2.9	4.1	2.7
	114	161	8.3	4.5	2.1	112	114	-	-	168	2	0.31	2.2	3.2	2.1
110	122	157	6	3	2	119	122	-	-	161	2	0.24	2.9	4.3	2.8
	121	157	5.5	3	2	119	121	-	-	161	2	0.32	2.1	3.2	2.1
	122	166	8.3	4.5	2	121	122	117	7	169	2	0.3	2.3	3.4	2.2
	121	163	6	3	2	121	121	-	-	169	2	0.35	1.9	2.8	1.9
	126	182	8.3	4.5	2.1	122	126	118	21.5	188	2	0.25	2.7	4	2.6
	126	178	8.3	4.5	2.1	122	126	121	17	188	2	0.33	2.1	3.1	2
120	132	172	6	3	2	129	132	-	-	171	2	0.23	3	4.5	2.9
	130	166	6	3	2	129	130	-	-	171	2	0.3	2.3	3.4	2.2
	132	179	6	3	2	131	132	-	-	189	2	0.37	1.8	2.7	1.6
	136	193	11.1	6	2.1	132	136	129	21.5	203	2	0.25	2.7	3.9	2.5
	137	193	8.3	4.5	2.1	132	137	131	17	203	2	0.33	2	3	2
	147	229	13.9	7.5	3	134	147	131	7	246	2.5	0.33	2.1	3.1	2
130	145	186	8.3	4.5	2	139	145	137	8	191	2	0.23	2.9	4.3	2.9
	140	183	6	3	2	139	140	-	-	191	2	0.31	2.2	3.2	2.1
	141	190	6	3	2	141	141	-	-	199	2	0.35	1.9	2.9	1.9
	147	205	11.1	6	3	144	147	139	23.5	216	2.5	0.26	2.6	3.8	2.5
	147	209	8.3	4.5	3	144	147	142	21	216	2.5	0.33	2.1	3.1	2
159	246	16.7	9	4	147	159	142	8	263	3	0.33	2.1	3.1	2	
140	155	197	8.3	4.5	2	149	155	147	8	201	2	0.22	3	4.5	3
	151	195	6	3	2	149	151	-	-	201	2	0.29	2.3	3.4	2.3
	153	203	8.3	4.5	2.1	152	153	-	-	213	2	0.35	1.9	2.9	1.9
	161	225	11.1	6	3	154	161	149	8	236	2.5	0.25	2.7	3.9	2.5
	161	225	11.1	6	3	154	161	152	22	236	2.5	0.33	2	3	2
	169	261	16.7	9	4	157	169	152	8	283	3	0.34	2	3	2
150	165	211	8.3	4.5	2.1	161	165	158	8	214	2	0.22	3.1	4.6	3
	162	206	6	3	2.1	161	162	-	-	214	2	0.3	2.3	3.4	2.2
	168	226	11.1	6	2.1	162	168	160	8	238	2	0.29	2.3	3.4	2.3
	163	222	8.3	4.5	2.1	162	163	-	-	238	2	0.37	1.8	2.7	1.8
	174	248	13.9	7.5	3	164	174	160	15	256	2.5	0.25	2.7	3.9	2.5
	171	243	11.1	6	3	164	171	163	20	256	2.5	0.33	2	3	2
	181	281	16.7	9	4	167	181	163	8	313	3	0.33	2	3	2
160	177	225	11.1	6	2.1	171	177	168	9	229	2	0.22	3.1	4.6	3
	173	218	8.3	4.5	2.1	171	173	-	-	229	2	0.3	2.3	3.4	2.2

Principal dimensions			Basic load-bearing capacity		Limit fatigue load	Limit rotation frequency	Weight	Bearing identification	
d	D	B	C	C ₀	P _u			With cylindrical bore	With tapered bore
mm			kN		kN	r/min	kg		
160	270	86	1040	1480	143	520	19.4	23132-2RSH TM	23132-2RSHK TM
	270	109	1120	1980	192	380	25.7	24132-2RSH TM	–
	290	80	1080	1440	138	600	22.7	22232-2RSH TM	22232-2RSHK TM
	340	114	1690	2090	194	400	50.5	22332-2RSH TM	22332-2RSHK TM
170	260	67	770	1190	97	640	12.6	23034-2RSH TM	23034-2RSHK TM
	260	90	962	1660	136	400	17.3	24034-2RSH TM	–
	280	88	1070	1620	131	480	21	23134-2RSH TM	23134-2RSHK TM
	280	109	1260	2090	169	360	27	24134-2RSH TM	–
	310	86	1190	1600	128	520	27.6	22234-2RSH TM	22234-2RSHK TM
180	280	74	920	1410	134	560	16.3	23036-2RSH TM	23036-2RSHK TM
	280	100	1170	1980	188	380	23.2	24036-2RSH TM	–
	300	96	1260	1890	177	440	26.6	23136-2RSH TM	23136-2RSHK TM
	300	118	1370	2400	225	340	32.9	24136-2RSH TM	–
	320	86	1230	1700	157	520	29.6	22236-2RSH TM	22236-2RSHK TM
190	320	104	1440	2180	201	400	34.5	23138-2RSH TM	23138-2RSHK TM
	340	92	1400	1900	173	480	35.6	22238-2RSH TM	22238-2RSHK TM
200	310	82	1120	1730	159	480	22.5	23040-2RSH TM	23040-2RSHK TM
	340	112	1630	2410	218	380	41.5	23140-2RSH TM	23140-2RSHK TM
	340	140	1920	3160	286	320	53.4	24140-2RSH TM	–
	360	98	1560	2140	192	440	42.7	22240-2RSH TM	22240-2RSHK TM
	360	128	1930	2850	255	320	56	23240-2RSH TM	–
220	340	90	1320	2090	187	440	29.6	23044-2RSH TM	23044-2RSHK TM
	370	120	1880	2890	255	360	52.3	23144-2RSH TM	23144-2RSHK TM
	300	60	980	1330	122	600	12.4	23944-2RSN TM	–
	400	108	1900	2630	228	380	58.6	22244-2RSH TM	22244-2RSHK TM
	460	145	2660	3570	302	300	112	22344-2RSH TM	22344-2RSHK TM
240	360	92	1390	2310	203	400	32.4	23048-2RSH TM	23048-2RSHK TM
	400	128	2160	3340	287	340	64.5	23148-2RSH TM	23148-2RSHK TM
260	400	104	1650	2790	238	360	46.4	23052-2RSH TM	23052-2RSHK TM
	440	144	2560	4130	346	320	90.3	23152-2RSH TM	23152-2RSHK TM
280	460	146	2650	4470	368	300	96.5	23156-2RSH TM	23156-2RSHK TM
300	500	160	3050	5160	415	270	127	23160-2RSH TM	23160-2RSHK TM
320	540	176	3560	6150	484	250	162	23164-2RSH TM	23164-2RSHK TM
340	580	190	4240	7080	546	240	206	23168-2RSH TM	23168-2RSHK TM
360	600	192	4250	7500	571	220	217	23172-2RSH TM	23172-2RSHK TM
400	650	200	4550	8750	649	200	263	23180-2RSH TM	23180-2RSHK TM

Dimensions						Connection dimensions						Coefficients			
d	d ₂	D ₁	b	a	r _s min	d _a min	d _a max	d _b min	B _a min	D _a max	r _a max	e	Y ₁	Y ₂	Y ₀
mm						mm									
160	180	244	13.9	7.5	2.1	172	180	170	8	258	2	0.32	2.1	3	2
	176	239	8.3	4.5	2.1	172	176	-	-	258	2	0.38	1.8	2.7	1.8
	185	264	13.9	7.5	3	174	185	170	14	276	2.5	0.26	2.6	3.8	2.5
	193	296	16.7	9	4	177	193	174	8	323	3	0.33	2	3	2
170	188	243	11.1	6	2.1	181	188	179	9	249	2	0.23	2.9	4.4	2.9
	184	235	8.3	4.5	2.1	181	184	-	-	249	2	0.31	2.2	3.2	2.1
	190	256	13.9	7.5	2.1	182	190	180	8	268	2	0.29	2.4	3.5	2.3
	185	248	8.3	4.5	2.1	182	185	-	-	268	2	0.36	1.9	2.8	1.8
	198	282	16.7	9	4	187	198	180	10	293	3	0.26	2.6	3.9	2.6
180	199	262	13.9	7.5	2.1	191	199	189	9	269	2	0.24	2.9	4.2	2.8
	194	251	8.3	4.5	2.1	191	194	-	-	269	2	0.32	2.1	3.1	2
	202	272	13.9	7.5	3	194	202	191	8	286	2.5	0.29	2.3	3.4	2.3
	198	266	11.1	6	3	194	198	-	-	286	2.5	0.37	1.8	2.7	1.8
	208	289	16.7	9	4	197	208	191	18	303	3	0.25	2.7	4	2.7
190	215	288	13.9	7.5	3	204	215	202	9	306	2.5	0.3	2.3	3.4	2.2
	220	306	16.7	9	4	207	220	202	21	323	3	0.25	2.7	4	2.6
200	223	286	13.9	7.5	2.1	211	223	210	10	299	2	0.24	2.9	4.3	2.8
	227	306	16.7	9	3	214	227	212	9	326	2.5	0.3	2.2	3.3	2.2
	221	294	11.1	6	3	214	221	-	-	326	2.5	0.39	1.9	2.6	1.7
	232	324	16.7	9	4	217	232	212	24	343	3	1.25	2.6	3.9	2.6
	229	320	16.7	9	4	217	229	-	-	343	3	0.33	2	3	2
220	245	314	13.9	7.5	3	233	245	231	10	327	2.5	0.24	2.9	4.3	2.8
	249	322	16.7	9	4	237	249	233	10	353	3	0.3	2.3	3.4	2.2
	238	284	8.3	4.5	2.1	231	238	-	-	289	2	0.16	4.2	6.3	4
	257	359	16.7	9	4	237	257	233	21	383	3	0.25	2.7	4	2.6
	269	407	22.3	12	5	240	269	236	10	440	4	0.31	2.2	3.2	2.1
240	265	333	13.9	7.5	3	253	365	251	11	347	2.5	0.23	3	4.5	2.9
	270	360	16.7	9	4	257	270	254	11	383	3	0.29	2.3	3.4	2.3
260	289	369	16.7	9	4	275	289	272	11	385	3	0.23	2.9	4.3	2.9
	293	398	16.7	9	4	270	293	276	11	423	3	0.32	2	3.1	2
280	314	417	16.7	9	5	300	314	296	12	440	4	0.29	2.3	3.5	2.3
300	337	450	16.7	9	5	320	337	318	12	480	4	0.29	2.3	3.4	2.3
320	361	483	22.3	12	5	340	361	338	13	520	4	0.3	2.2	3.3	2.2
340	385	517	22.3	12	5	360	385	360	14	560	4	0.3	2.2	3.3	2.2
360	408	542	22.3	12	5	380	408	380	14	580	4	0.3	2.3	3.4	2.2
400	457	588	22.3	12	6	426	457	421	15	624	5	0.28	2.4	3.8	2.4



ZKL EDITION 2/19/EN

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