7. SPHERICAL ROLLER BEARINGS

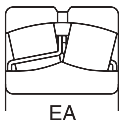
DESIGN, TYPES, AND FEATURES

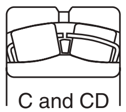
Various types of high load capacity spherical roller bearings are available. Types EA, C and CD have pressed-steel cages, and type CA has machined-brass cages. EA-type bearings listed here are classified as NSKHPS™ bearings, which offer particularly high load-carrying capacity, high limiting speeds, and superior performance under high-temperature operating conditions up to 200 °C.

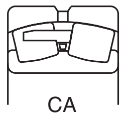
An oil groove and holes are located in the outer ring to supply lubricant, and the bearing numbers are suffixed with E4.

To use bearings with oil grooves and holes, an oil groove should be located in the housing bore since depth for the groove in the bearing is limited. The dimensions of the oil groove and number of holes present are listed in Tables 1 and 2.

When bearings with a hole for a locking pin to prevent outer ring rotation are required, please contact NSK.


EA

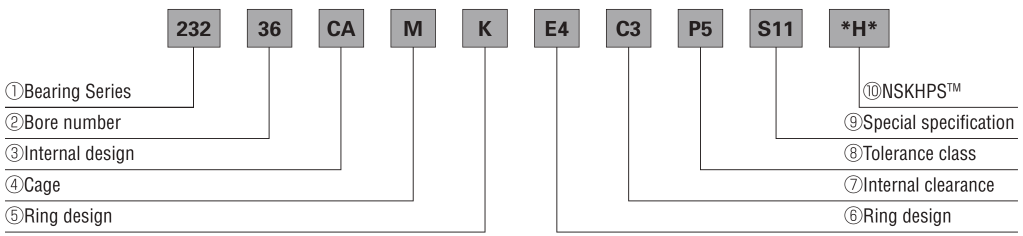

C and CD


CA

Formulation of Bearing Designations

Spherical Roller Bearings

Example:



①Bearing Series	239, 230, 240, 231, 241, 222, 232, 213, 223 : Spherical roller bearings
②Bore number	Bore number indicates bore diameter. Bore number X 5 (mm)
③Internal design	EA, CA : High load capacity
④Cage	M : Machined-brass cage (for CA Design)
	Omitted: Pressed-steel cage (for EA Design)
⑤⑥Ring design	K : Tapered bore of inner ring (taper 1 : 12)
	K30 : Tapered bore of inner ring (taper 1 : 30)
	E4 : Lubricating groove in outside surface and holes in outer ring
⑦Internal clearance	Omitted : CN clearance, C3 : Clearance greater than CN,
	C4 : Clearance greater than C3, C5 : Clearance greater than C4
⑧Tolerance class	Omitted : ISO Normal, P6 : ISO Class 6, P5 : ISO Class 5, P4 : ISO Class 4
⑨Special specification	S11 ; Dimensional stabilizing treatment: working temperature under 200 °C
	(omitted for EA design)
⑩NSKHPS™	*H* : NSKHPS™ designation
	Tolerance Class : ISO Normal

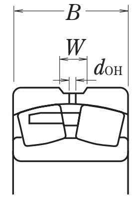


Table 1 Dimensions of Oil Grooves and Holes Units : mm

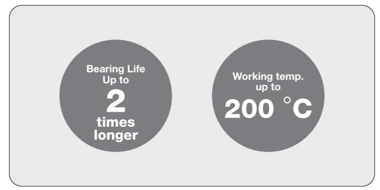
Nominal Width B over	Nominal Width B incl.	Oil Groove Width W	Hole Diameter d_{OH}
18	30	5	2.5
30	40	6	3
40	50	7	4
50	65	8	5
65	80	10	6
80	100	12	8
100	120	15	10
120	160	20	12
160	200	25	15
200	250	30	20
250	315	35	20
315	400	40	25
400	—	40	25

Table 2 Number of Oil Holes

Nominal Outer Ring Dia D (mm) over	Nominal Outer Ring Dia D (mm) incl.	Number of Holes
—	180	4
180	250	6
250	315	6
315	400	6
400	500	6
500	630	8
630	800	8
800	1000	8
1000	1250	8
1250	1600	8
1600	2000	8

NSKHPS™ Spherical Roller Bearings

Features Compared with conventional bearings:



1. Improved reliability
Bearing life is up to twice that of conventional bearings thanks to optimization of the bearing's internal design and improvement of processing technology.
2. High-temperature dimensional stabilizing treatment comes standard
Dimensional stabilization up to 200 °C has been achieved through the application of NSK's proprietary heat treatment technology.

TOLERANCES AND RUNNING ACCURACY

SPHERICAL ROLLER BEARINGS .... Table 7.2 (Pages A128 to A131)
NSKHPS SPHERICAL ROLLER BEARINGS
Tolerance for Dimensions: ISO Normal
Running Accuracy: ISO Normal

RECOMMENDED FITS

SPHERICAL ROLLER BEARINGS .... Table 8.3 (Page A164)
Table 8.5 (Page A165)

INTERNAL CLEARANCES

SPHERICAL ROLLER BEARINGS .... Table 8.16 (Page A172)
NSKHPS SPHERICAL ROLLER BEARINGS
INTERNAL CLEARANCE DESIGNATION : CN, C3, C4

PERMISSIBLE MISALIGNMENT

The permissible misalignment of spherical roller bearings varies depending on bearing size and load but is approximately 0.018 to 0.045 radian (1° to 2.5°) with normal loads.

LIMITING SPEEDS (GREASE)

The limiting speeds (grease) listed in the bearing tables should be adjusted depending on the bearing load condition. Furthermore, higher speeds are attainable by making changes in the lubrication method, cage design, etc. Refer to Page A098 for detailed information.

PRECAUTIONS FOR USE OF SPHERICAL ROLLER BEARINGS

If the load on spherical roller bearings becomes too small during operation or if, the ratio of axial and radial loads is larger than the value of 'e' as listed in the bearing tables, slippage occurs between the rollers and raceways, which may result in smearing. The higher the weight, the higher this tendency becomes, especially for large spherical roller bearings.

If very small bearing loads are expected, please contact NSK for selection of an appropriate bearing.

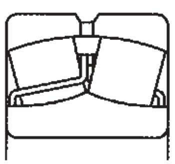
TECHNICAL DATA

Free Space of Spherical Roller Bearings

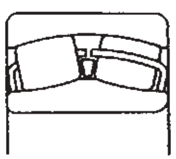
Spherical roller bearings have self-aligning capabilities and the capacity to carry substantially large radial and bi-axial loads. For these reasons, this bearing is used widely in many applications, such as plumber blocks. Application problems include a long span, which causes substantial deflection of the shaft, installation errors, and axial misalignment. These bearings may be exposed to large radial or shock loads.

Grease lubrication is common for spherical roller bearings because it simplifies the seal construction around the housing and makes maintenance and inspection easier. In this case, it is important to select a grease appropriate to the operating conditions and to fill the bearing with the proper amount of grease while considering the housing internal space.

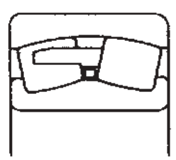
The amount of bearing free space for various spherical roller bearings is shown in Table 1. Under general operating conditions, a user may pack up to 1/3 to 2/3 of the free space of the bearing with grease.



EA type



C, CD type



CA type

Table 1 Free Space of Spherical Roller Bearings (EA, C, CD, and CA)

Units: cm^3

Bearing Bore No.	Bearing Free Space				
	Bearing Series				
	230	231	222	232	223
11	—	—	29	—	78
12	—	—	42	—	96
13	—	—	48	—	113
14	—	—	52	—	139
15	—	—	57	—	170
16	—	—	71	—	206
17	—	—	91	—	234
18	—	—	110	130	283
19	—	—	135	—	327
20	—	—	169	203	410
22	100	150	242	294	560
24	109	228	297	340	700
26	161	240	365	405	955
28	170	292	400	530	1 230
30	209	465	505	680	1 430
32	254	575	680	850	1 710
34	355	610	785	1 090	2 070
36	465	785	810	1 120	2 460
38	565	970	1 160	1 340	2 830
40	715	1 160	1 400	1 640	2 900
44	940	1 500	1 880	2 270	3 750
48	1 030	1 900	2 550	3 550	4 700
52	1 530	2 940	3 300	4 750	5 900
56	1 820	3 150	3 400	4 950	7 250
60	2 200	4 050	4 300	6 200	8 750

Remarks 22211 to 22226 and 22311 to 22324 are EA bearings.
23122 to 23148 and 23218 to 23244 are C bearings.
23022 to 23036 and 22228 to 22236 are CD bearings.
23038 to 23060, 23152 to 23160, 22238 to 22260, 23248 to 23260, and 22326 to 22360 are CA bearings.

Measurement of Clearance in SRBs

The measurement of internal bearing clearance before mounting is critical. Before handling the bearing and measuring the internal bearing clearance, be sure to wear thin rubber gloves.

If bearings are touched with bare hands, the touched part may rust.

When measuring the internal bearing clearance, ensure that the rollers are positioned correctly.

1. Measurement of Bearing Clearance

To measure only internal bearing clearance, set the bearing upright (vertically) on a flat surface while holding the outer ring with one hand. Take care not to incline the inner and outer rings, and stabilize the rollers by turning the inner ring clockwise and counter-clockwise by about one half to one full rotation. Adjust the rollers until a random roller is positioned at the very top of the bearing. Next, use a thickness gauge to measure the internal clearance. Measurement positioning and location may vary slightly depending on the size of the outer ring outside diameter.

1.1 When Bearing Outside Diameter Is Under 200 mm

Insert the thickness gauge between the two rows of rollers and the outer ring at the rollers located at the very top of the bearing. Then, measure the internal clearance Δ_r (see Fig. 1).

1.2 When Bearing Outside Diameter Is Over 200 mm

Insert the thickness gauge between the two rows of rollers and the outer ring at the very top of the bearing and on the sides at two symmetrical points relative to the bearing center. Then, take respective measurements for the bearing internal clearance (see Fig. 2).

Take the individual values measured at the very top of bearing and outer ring as Δ_{rT1} and Δ_{rT2}, and determine the internal clearance at the top of the bearing Δ_{rT} by the following equation:

$$\Delta_{rT} = 1/2\ (\Delta_{rT1} + \Delta_{rT2})$$

Then, take the measurements between the two rows of rollers on the left side as Δ_{rL1} and Δ_{rL2}, and determine the internal clearance on the left side of the bearing Δ_{rL} by the following equation:

$$\Delta_{rL} = 1/2\ (\Delta_{rL1} + \Delta_{rL2})$$

Next, take the measurements between the two rows of rollers on the right side as Δ_{rR1} and Δ_{rR2}, and determine the internal clearance on the right side of the bearing Δ_{rR} by the following equation:

$$\Delta_{rR} = 1/2\ (\Delta_{rR1} + \Delta_{rR2})$$

Finally, determine the internal bearing clearance Δ_r by the following equation:

$$\Delta_r = 1/2\ (\Delta_{rT} + \Delta_{rL} + \Delta_{rR})$$

2. Measuring Bearing Clearance When Mounted on Shaft or Sleeve

In this case, clearance measurements are taken with the outer ring of the bearing hanging down from the rollers. First, while holding the bearing upright, rotate the outer ring clockwise and counter-clockwise by one-half to one full rotation until both rows have a random roller positioned exactly at the bottom. Use a thickness gauge to measure the clearance at the designated measuring points.

The measurement points vary slightly depending on the size of the outer ring outside diameter.

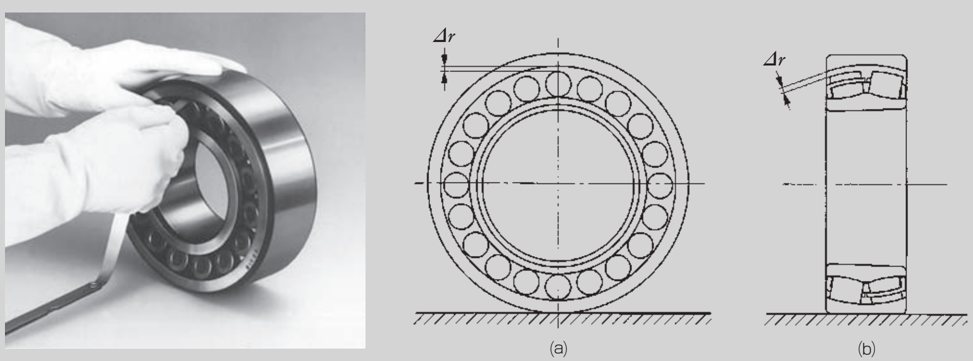


Fig. 1 Clearance Measurement Point (Bearing Outside Diameter: Less Than 200 mm)

2.1 When Bearing Outside Diameter is Under 200 mm

Insert the thickness gauge between the two rows of rollers and outer ring at the very bottom of the bearing, and measure the internal clearance Δ_{rS} (Fig. 3).

2.2 When Bearing Outside Diameter Is Over 200 mm

Insert the thickness gauge between the two rows of rollers and the outer ring at the very bottom of the bearing and on the sides at two symmetrical points relative to the bearing center. Then, take respective measurements for the bearing internal clearance Δ_r (Fig. 3). Because the bearing has two rows, two measurements of bearing internal clearance should be taken as Δ_{rS1} and Δ_{rS2}, and the internal clearance at the very bottom of the bearing Δ_{rS} should be determined by the following equation:

$$\Delta_{rS} = 1/2\ (\Delta_{rS1} + \Delta_{rS2})$$

Then, take the individual values on the left side as Δ_{rL1} and Δ_{rL2}, and determine the internal clearance on the left side of bearing Δ_{rL} by the following equation:

$$\Delta_{rL} = 1/2\ (\Delta_{rL1} + \Delta_{rL2})$$

Next, take the individual values on the right side as Δ_{rR1} and Δ_{rR2}, and determine the internal clearance on the right side of bearing Δ_{rR} by the following equation:

$$\Delta_{rR} = 1/2\ (\Delta_{rR1} + \Delta_{rR2})$$

Finally, determine internal bearing clearance (Δ_r) by the following equation:

$$\Delta_r = 1/2\ (\Delta_{rS} + \Delta_{rL} + \Delta_{rR})$$

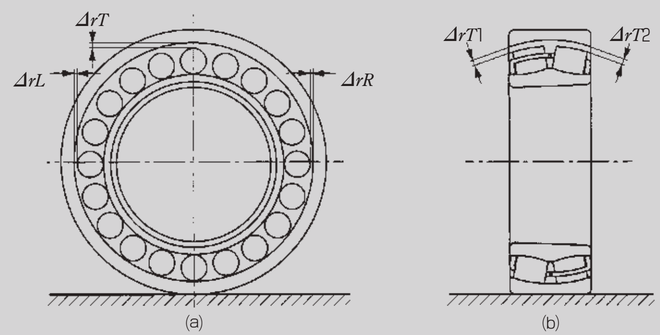


Fig. 2 Clearance Measurement Points (Bearing Outside Diameter: Larger Than 200 mm)

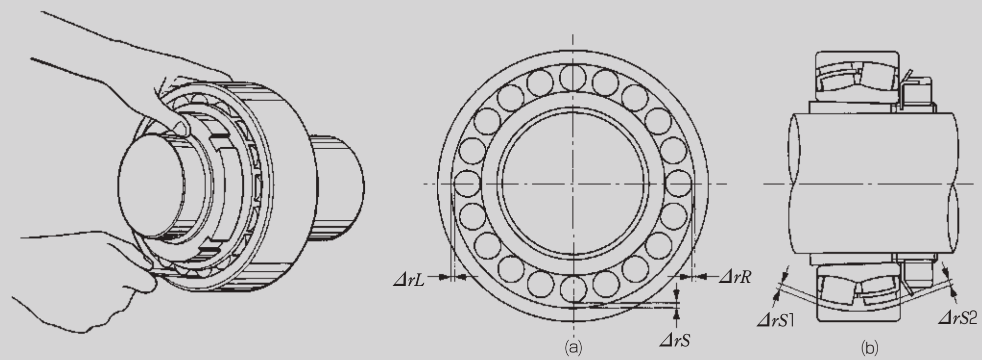


Fig. 3 Clearance Measurement Points

3. Temperature Equilibrium When Taking Measurements

To ensure accurate bearing measurements, the temperature of the measurement instrument and components to be measured must be the same. If the bearing is mounted with an oil heating tank or induction heater, be sure to measure the internal clearance only after a complete cooldown. If a bearing is brought from a warehouse to the measurement area, the temperature of the bearing may still be high; thus, if clearance or dimensions were measured without confirming bearing temperature, the measured value may be wrong.

For a large bearing with an outer ring outside diameter larger than 400 mm, the unpacked bearing should be left on a surface plate for about 24 hours before making a clearance or dimensional measurement. Put the end face of the bearing on a surface plate prior to measurement to ensure both objects have the same temperature.

4. Clearance Adjustment When Mounting a Bearing on a Tapered Shaft or Sleeve

When mounting a bearing with a tapered bore to a tapered shaft or sleeve (adapter or removable sleeve), the inner ring of the bearing will widen and interference will increase when pushing in the bearing, resulting in reduced internal clearance depending on the taper. Be sure to provide proper interference and internal clearance when mounting the bearing. See Table 2 for the clearance reduction amounts when mounting spherical roller bearings with tapered bores.

Each time the bearing is pushed further onto the tapered shaft or sleeve, measure the variation of the internal clearance and repeat the above procedure until the clearance reduction amount specified in Table 2 is attained. This procedure is called "clearance adjustment," and when the proper reduction amount is attained, the clearance necessary for operation is secured. The clearance reduction amount must be confirmed by a thickness gauge; however, depending on the method of clearance adjustment, the measured value obtained with the thickness gauge may not be correct. Therefore, execute the following corrective procedures:

1. When using heat:
   When the bearing and shaft are both at room temperature, measure the clearance again with a thickness gauge to confirm that the speified value is secured.
2. When using a lockwasher as a turning stopper for the locknut:
   Prior to bending the tooth of the lockwasher into the cutout for the locknut, measure the clearance with the thickness gauge again to confirm that the specified value is secured.
3. When using a hydraulic nut:
   After removal of the hydraulic nut, mount the locknut and measure the clearance again to confirm that the specified value remains constant prior to stopping turning.
4. When using an oil injection pump:
   Drop the pressure of the oil fed from the oil injection pump to zero so that there is no pressure on the bearing or fitted part of the sleeve. Next, measure the clearance with a thickness gauge to confirm that the specified value remains secured.

Radial Internal Clearance and Clearance Reduction Amount for the Bearing to be Mounted

- When radial internal clearance is CN (normal clearance):
  Perform the clearance adjustment by aiming for a middle value between the minimum and maximum clearance reduction amounts.
- When radial internal clearance is C3 or C4:
  Perform the clearance adjustment by aiming for the maximum clearance reduction amount.

Internal Clearance Adjustment of Tapered Bore Bearings

Perform the adjustment by measuring the clearance reduction amount with a thickness gauge.

1. For measurement location and positioning, refer to Section 2 (Page C262) of this catalog.
2. When mounting a bearing on a tapered shaft, perform a clearance adjustment each time the bearing is pushed in by a locknut, end plate, end cap, or hydraulic nut.
3. When using an adapter sleeve, perform a clearance adjustment each time the bearing is pushed in by a locknut or hydraulic nut.
4. When using a removable sleeve, perform an adjustment each time the removable sleeve is pushed in by a locknut or hydraulic nut.

Since the outer ring of the bearing hangs down from the rollers, turn the outer ring clockwise and counterclockwise by onehalf to one full rotation while maintaining the proper bearing position before taking clearance measurements for these operations. Position one randomly chosen roller from each row at the very bottom of the bearing. Then, insert the thickness gauge to measure the internal clearance at the appropriate location(s) based on the size of the outer ring outside diameter. These clearance measurement values should be recorded.

Table 2 Mounting of Spherical Roller Bearings With Tapered Bores

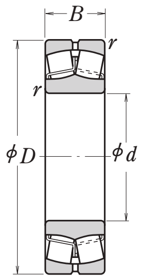
Units : mm

Bore Diameter *d* (mm)		Reduction in Radial Clearance		Axial Movement				Minimum Permissible Residual Clearance		
				Taper 1 : 12		Taper 1 : 30				
over	incl.	min.	max.	min.	max.	min.	max.	CN	C3	C4
30	**40**	0.025	0.030	0.40	0.45	—	—	0.010	0.025	0.035
40	**50**	0.030	0.035	0.45	0.55	—	—	0.015	0.030	0.045
50	**65**	0.030	0.035	0.45	0.55	—	—	0.025	0.035	0.060
65	**80**	0.040	0.045	0.60	0.70	—	—	0.030	0.040	0.075
80	**100**	0.045	0.055	0.70	0.85	1.75	2.15	0.035	0.050	0.085
100	**120**	0.050	0.060	0.75	0.90	1.9	2.25	0.045	0.065	0.110
120	**140**	0.060	0.070	0.90	1.1	2.25	2.75	0.055	0.080	0.130
140	**160**	0.065	0.080	1.0	1.3	2.5	3.25	0.060	0.100	0.150
160	**180**	0.070	0.090	1.1	1.4	2.75	3.5	0.070	0.110	0.170
180	**200**	0.080	0.100	1.3	1.6	3.25	4.0	0.070	0.110	0.190
200	**225**	0.090	0.110	1.4	1.7	3.5	4.25	0.080	0.130	0.210
225	**250**	0.100	0.120	1.6	1.9	4.0	4.75	0.090	0.140	0.230
250	**280**	0.110	0.140	1.7	2.2	4.25	5.5	0.100	0.150	0.250
280	**315**	0.120	0.150	1.9	2.4	4.75	6.0	0.110	0.160	0.280
315	**355**	0.140	0.170	2.2	2.7	5.5	6.75	0.120	0.180	0.300
355	**400**	0.150	0.190	2.4	3.0	6.0	7.5	0.130	0.200	0.330
400	**450**	0.170	0.210	2.7	3.3	6.75	8.25	0.140	0.220	0.360
450	**500**	0.190	0.240	3.0	3.7	7.5	9.25	0.160	0.240	0.390
500	**560**	0.210	0.270	3.4	4.3	8.5	11.0	0.170	0.270	0.410
560	**630**	0.230	0.300	3.7	4.8	9.25	12.0	0.200	0.310	0.460
630	**710**	0.260	0.330	4.2	5.3	10.5	13.0	0.220	0.330	0.520
710	**800**	0.280	0.370	4.5	5.9	11.5	15.0	0.240	0.390	0.590
800	**900**	0.310	0.410	5.0	6.6	12.5	16.5	0.280	0.430	0.660
900	**1000**	0.340	0.460	5.5	7.4	14.0	18.5	0.310	0.470	0.730
1000	**1120**	0.370	0.500	5.9	8.0	15.0	20.0	0.360	0.530	0.800

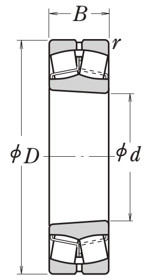
Remarks The values for reduction in radial internal clearance are for bearings with CN clearance.
For bearings with C3 or C4 Clearance, the maximum values listed should be used.

SPHERICAL ROLLER BEARINGS

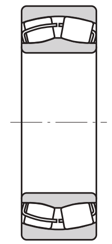
Bore Diameter 20 – 55 mm



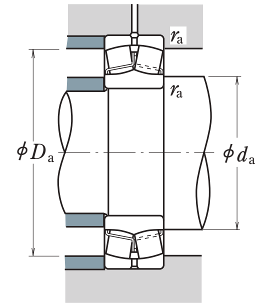
Cylindrical Bore



Tapered Bore



Without an Oil Groove or Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

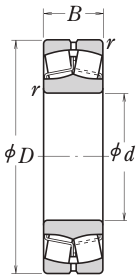
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Desginations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
						Thermal Reference Speed	Limiting Speeds													
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore	Tapered Bore([1])	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
20	52	15	1.1	29 300	26 900	10 000	—	6 300	**21304CDE4**	**21304CDKE4**	27	28	45	42	1	0.31	3.2	2.1	2.1	0.17
25	52	18	1	37 500	37 000	10 000	—	7 100	**22205CE4**	**22205CKE4**	31	31	46	45	1	0.35	2.9	1.9	1.9	0.17
	62	17	1.1	43 000	40 500	9 000	—	5 300	**21305CDE4**	**21305CDKE4**	32	34	55	51	1	0.29	3.4	2.3	2.3	0.26
30	62	20	1	50 000	50 000	8 500	—	6 000	**22206CE4**	**22206CKE4**	36	37	56	54	1	0.33	3.1	2.1	2.0	0.27
	72	19	1.1	55 000	54 000	7 500	—	4 500	**21306CDE4**	**21306CDKE4**	37	40	65	59	1	0.28	3.6	2.4	2.3	0.39
35	72	23	1.1	69 000	71 000	7 500	—	5 300	**22207CE4**	**22207CKE4**	42	43	65	63	1	0.32	3.1	2.1	2.0	0.42
	80	21	1.5	71 500	76 000	7 100	—	4 000	**21307CDE4**	**21307CDKE4**	44	47	71	67	1.5	0.28	3.6	2.4	2.4	0.53
40	80	23	1.1	113 000	99 500	7 100	12 000	6 700	***22208EAE4**	***22208EAKE4**	47	49	73	70	1	0.28	3.6	2.4	2.4	0.50
	90	23	1.5	118 000	111 000	6 700	11 000	6 000	***21308EAE4**	***21308EAKE4**	49	55	81	75	1.5	0.25	3.9	2.7	2.6	0.73
	90	33	1.5	170 000	153 000	5 600	9 000	5 300	***22308EAE4**	***22308EAKE4**	49	52	81	77	1.5	0.35	2.8	1.9	1.9	0.98
45	85	23	1.1	118 000	111 000	6 300	11 000	6 000	***22209EAE4**	***22209EAKE4**	52	55	78	75	1	0.25	3.9	2.7	2.6	0.55
	100	25	1.5	149 000	144 000	6 000	9 000	5 000	***21309EAE4**	***21309EAKE4**	54	65	91	89	1.5	0.23	4.3	2.9	2.8	0.96
	100	36	1.5	207 000	195 000	5 000	8 000	4 500	***22309EAE4**	***22309EAKE4**	54	60	91	86	1.5	0.34	2.9	2.0	1.9	1.34
50	90	23	1.1	124 000	119 000	6 000	9 500	5 600	***22210EAE4**	***22210EAKE4**	57	60	83	81	1	0.24	4.3	2.9	2.8	0.61
	110	27	2	178 000	174 000	5 300	8 000	4 500	***21310EAE4**	***21310EAKE4**	60	72	100	98	2	0.23	4.4	3.0	2.9	1.21
	110	40	2	246 000	234 000	4 800	7 100	4 300	***22310EAE4**	***22310EAKE4**	60	64	100	93	2	0.35	2.8	1.9	1.9	1.78
55	100	25	1.5	149 000	144 000	5 300	9 000	5 300	***22211EAE4**	***22211EAKE4**	64	65	91	89	1.5	0.23	4.3	2.9	2.8	0.81
	120	29	2	178 000	174 000	5 300	8 000	4 500	***21311EAE4**	***21311EAKE4**	65	72	110	98	2	0.23	4.4	3.0	2.9	1.58
	120	43	2	292 000	292 000	4 300	6 000	3 800	***22311EAE4**	***22311EAKE4**	65	73	110	103	2	0.34	2.9	2.0	1.9	2.3

Note ([1]) Suffix K represents bearings with tapered bores (taper 1:12).

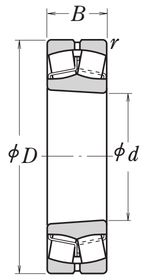
Remarks
1. Bearings denoted by an asterisk (*) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings. In this case, light loads are defined as $\leqq 0.05C_r$ normal loads as 0.05 to $0.10C_r$, and heavy loads as $> 0.10C_r$.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C348 – C349 and C356.

SPHERICAL ROLLER BEARINGS

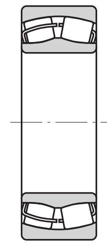
Bore Diameter 60 – 90 mm



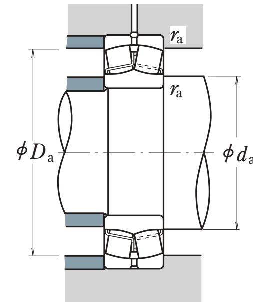
Cylindrical Bore



Tapered Bore



Without an Oil Groove or Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

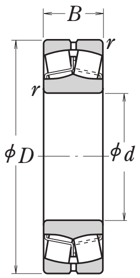
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Designations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
						Thermal Reference Speed	Limiting Speeds													
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore	Tapered Bore(1)	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
60	95	26	1.1	98 500	141 000	4 800	—	3 600	23012CE4	23012CKE4	67	68	88	85	1	0.26	3.9	2.6	2.5	0.68
	110	28	1.5	178 000	174 000	5 300	8 000	4 800	*22212EAE4	*22212EAKE4	69	72	101	98	1.5	0.23	4.4	3.0	2.9	1.1
	130	31	2.1	238 000	244 000	4 800	6 700	3 800	*21312EAE4	*21312EAKE4	72	87	118	117	2	0.22	4.5	3.0	3.0	1.98
	130	46	2.1	340 000	340 000	4 000	5 600	3 600	*22312EAE4	*22312EAKE4	72	79	118	111	2	0.34	3.0	2.0	1.9	2.89
65	120	31	1.5	221 000	230 000	4 800	7 500	4 300	*22213EAE4	*22213EAKE4	74	80	111	107	1.5	0.24	4.2	2.8	2.7	1.51
	140	33	2.1	264 000	275 000	4 500	6 000	3 600	*21313EAE4	*21313EAKE4	77	94	128	126	2	0.22	4.6	3.1	3.0	2.45
	140	48	2.1	375 000	380 000	3 800	5 000	3 200	*22313EAE4	*22313EAKE4	77	84	128	119	2	0.34	3.0	2.0	2.0	3.52
70	125	31	1.5	225 000	232 000	4 500	7 100	4 000	*22214EAE4	*22214EAKE4	79	84	116	111	1.5	0.23	4.3	2.9	2.8	1.58
	150	35	2.1	310 000	325 000	4 300	5 600	3 200	*21314EAE4	*21314EAKE4	82	101	138	135	2	0.22	4.6	3.1	3.0	3.0
	150	51	2.1	425 000	435 000	3 600	4 800	3 000	*22314EAE4	*22314EAKE4	82	91	138	129	2	0.33	3.0	2.0	2.0	4.28
75	130	31	1.5	238 000	244 000	4 300	6 700	4 000	*22215EAE4	*22215EAKE4	84	87	121	117	1.5	0.22	4.5	3.0	3.0	1.64
	160	37	2.1	310 000	325 000	4 000	5 600	3 200	*21315EAE4	*21315EAKE4	87	101	148	134	2	0.22	4.6	3.1	3.0	3.64
	160	55	2.1	485 000	505 000	3 400	4 300	2 800	*22315EAE4	*22315EAKE4	87	97	148	137	2	0.33	3.0	2.0	2.0	5.26
80	140	33	2	264 000	275 000	4 000	6 000	3 600	*22216EAE4	*22216EAKE4	90	94	130	126	2	0.22	4.6	3.1	3.0	2.01
	170	39	2.1	355 000	375 000	3 800	4 800	3 000	*21316EAE4	*21316EAKE4	92	109	158	146	2	0.23	4.4	3.0	2.9	4.32
	170	58	2.1	540 000	565 000	3 200	3 800	2 600	*22316EAE4	*22316EAKE4	92	103	158	145	2	0.33	3.0	2.0	2.0	6.23
85	150	36	2	310 000	325 000	4 000	5 600	3 400	*22217EAE4	*22217EAKE4	95	101	140	135	2	0.22	4.6	3.1	3.0	2.54
	180	41	3	360 000	395 000	3 800	5 000	3 000	*21317EAE4	*21317EAKE4	99	108	166	142	2.5	0.24	4.3	2.9	2.8	5.2
	180	60	3	600 000	630 000	3 000	3 400	2 400	*22317EAE4	*22317EAKE4	99	110	166	155	2.5	0.33	3.1	2.1	2.0	7.23
90	160	40	2	360 000	395 000	3 800	5 000	3 200	*22218EAE4	*22218EAKE4	100	108	150	142	2	0.24	4.3	2.9	2.8	3.3
	160	52.4	2	340 000	490 000	2 800	—	1 800	23218CE4	23218CKE4	100	105	150	138	2	0.32	3.2	2.1	2.1	4.51
	190	43	3	415 000	450 000	3 600	4 500	2 800	*21318EAE4	*21318EAKE4	104	115	176	152	2.5	0.24	4.3	2.9	2.8	6.1
	190	64	3	665 000	705 000	2 800	3 000	2 400	*22318EAE4	*22318EAKE4	104	115	176	163	2.5	0.33	3.1	2.1	2.0	8.56

Note (1) Suffix K represents bearings with tapered bores (taper 1:12).

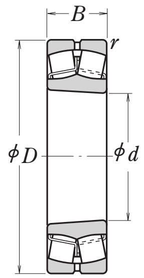
Remarks
1. Bearings denoted by an asterisk (*) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings. In this case, light loads are defined as ≦0.05C_r normal loads as 0.05 to 0.10C_r, and heavy loads as > 0.10C_r.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C349 – C350 and C356.

SPHERICAL ROLLER BEARINGS

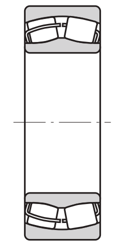
Bore Diameter 95 – 110 mm

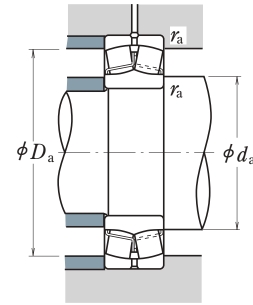


Cylindrical Bore



Tapered Bore


Without an Oil Groove or Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

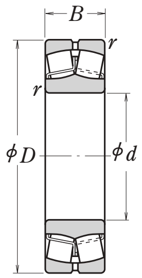
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Designations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	Thermal Reference Speed	Limiting Speeds Mechanical	Limiting Speeds Grease	Cylindrical Bore	Tapered Bore(1)	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
95	170	43	2.1	415 000	450 000	3 800	4 500	3 000	*22219EAE4	*22219EAKE4	107	115	158	152	2	0.24	4.3	2.9	2.8	4.04
	170	55.6	2.1	370 000	525 000	2 600	—	1 700	23219CAME4	23219CAMKE4	107	—	158	146	2	0.32	3.1	2.1	2.0	5.33
	200	45	3	430 000	435 000	3 600	4 800	1 500	*21319CAME4	*21319CAMKE4	109	—	186	172	2.5	0.22	4.6	3.1	3.0	6.92
	200	45	3	345 000	435 000	3 400	—	1 500	21319CE4	21319CKE4	109	127	186	172	2.5	0.22	4.6	3.1	3.0	6.92
	200	67	3	735 000	780 000	2 600	3 000	2 200	*22319EAE4	*22319EAKE4	109	121	186	172	2.5	0.33	3.1	2.1	2.0	9.91
100	150	37	1.5	212 000	335 000	3 200	—	2 200	23020CDE4	23020CDKE4	109	112	141	136	1.5	0.22	4.6	3.1	3.0	2.31
	150	50	1.5	276 000	470 000	2 800	—	1 800	24020CE4	24020CK30E4	109	110	141	132	1.5	0.30	3.4	2.3	2.2	3.08
	165	52	2	345 000	530 000	2 800	—	1 700	23120CE4	23120CKE4	110	113	155	144	2	0.30	3.4	2.3	2.2	4.38
	165	65	2	345 000	535 000	2 400	—	1 700	24120CAME4	24120CAMK30E4	110	—	155	143	2	0.35	2.9	1.9	1.9	5.42
	180	46	2.1	455 000	490 000	3 600	4 300	2 800	*22220EAE4	*22220EAKE4	112	119	168	160	2	0.24	4.3	2.9	2.8	4.84
	180	60.3	2.1	525 000	605 000	2 800	3 800	1 600	*23220CAME4	*23220CAMKE4	112	—	168	155	2	0.32	3.2	2.1	2.1	6.6
	180	60.3	2.1	420 000	605 000	2 600	—	1 600	23220CE4	23220CKE4	112	118	168	155	2	0.32	3.2	2.1	2.1	6.6
	215	47	3	495 000	485 000	3 400	4 500	1 400	*21320CAME4	*21320CAMKE4	114	—	201	184	2.5	0.23	4.4	3.0	2.9	8.46
	215	47	3	395 000	485 000	3 200	—	1 400	21320CE4	21320CKE4	114	133	201	184	2.5	0.21	4.7	3.2	3.1	8.46
	215	73	3	750 000	785 000	2 600	3 400	1 700	*22320CAME4(2)	*22320CAMKE4(2)	114	—	201	184	2.5	0.35	2.9	1.9	1.9	12.7
110	170	45	2	293 000	465 000	3 200	—	2 000	23022CDE4	23022CDKE4	120	124	160	153	2	0.24	4.2	2.8	2.8	3.76
	170	60	2	380 000	645 000	2 600	—	1 600	24022CE4	24022CK30E4	120	121	160	148	2	0.32	3.1	2.1	2.1	4.96
	180	56	2	480 000	630 000	3 200	4 000	1 600	*23122CAME4	*23122CAMKE4	120	—	170	158	2	0.28	3.5	2.4	2.3	5.7
	180	56	2	385 000	630 000	2 600	—	1 600	23122CE4	23122CKE4	120	127	170	158	2	0.28	3.5	2.4	2.3	5.7
	180	69	2	575 000	750 000	2 200	3 400	1 600	*24122CAME4	*24122CAMK30E4	120	—	170	154	2	0.36	2.8	1.9	1.8	6.84
	180	69	2	460 000	750 000	2 000	—	1 600	24122CE4	24122CK30E4	120	123	170	154	2	0.36	2.8	1.9	1.8	6.84
	200	53	2.1	605 000	645 000	3 400	3 400	2 600	*22222EAE4	*22222EAKE4	122	129	188	178	2	0.25	4.0	2.7	2.6	6.99
	200	69.8	2.1	645 000	760 000	2 600	3 400	1 500	*23222CAME4	*23222CAMKE4	122	—	188	170	2	0.34	3.0	2.0	1.9	9.54
	200	69.8	2.1	515 000	760 000	2 200	—	1 500	23222CE4	23222CKE4	122	130	188	170	2	0.34	3.0	2.0	1.9	9.54
	240	50	3	565 000	545 000	3 000	4 300	1 300	*21322CAME4	*21322CAMKE4	124	—	226	206	2.5	0.22	4.6	3.1	3.0	11.2
	240	80	3	925 000	980 000	2 200	3 000	1 500	*22322CAME4(2)	*22322CAMKE4(2)	124	—	226	206	2.5	0.35	2.9	1.9	1.9	17.6

Notes (1) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).
(2) EA bearings are also available. The load rating of EA bearings is around 10% higher than CAM bearings; please consult NSK for more information.

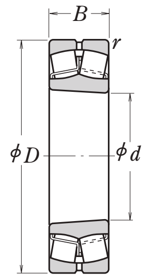
Remarks 1. Bearings denoted by an asterisk (*) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings. In this case, light loads are defined as $\leqq 0.05C_r$ normal loads as 0.05 to $0.10C_r$, and heavy loads as $> 0.10C_r$.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C351 and C357.

SPHERICAL ROLLER BEARINGS

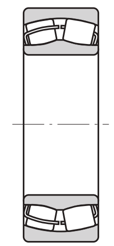
Bore Diameter 120 – 130 mm

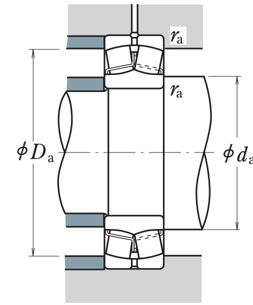


Cylindrical Bore



Tapered Bore


Without an Oil Groove or Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

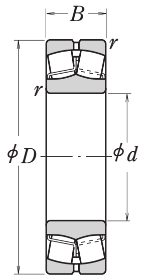
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing	Designations	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	Thermal Reference Speed	Limiting Speeds Mechanical	Limiting Speeds Grease	Cylindrical Bore	Tapered Bore(1)	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
120	180	46	2	395 000	525 000	3 200	4 500	1 800	*23024CAME4	*23024CAMKE4	130	—	170	163	2	0.22	4.5	3.0	2.9	4.11
	180	46	2	315 000	525 000	2 800	—	1 800	23024CDE4	23024CDKE4	130	134	170	163	2	0.22	4.5	3.0	2.9	4.11
	180	60	2	480 000	680 000	2 600	3 600	1 500	*24024CAME4	*24024CAMK30E4	130	—	170	158	2	0.32	3.2	2.1	2.1	5.33
	180	60	2	395 000	705 000	2 400	—	1 500	24024CE4	24024CK30E4	130	131	170	158	2	0.32	3.2	2.1	2.1	5.33
	200	62	2	580 000	720 000	2 800	3 600	1 400	*23124CAME4	*23124CAMKE4	130	—	190	175	2	0.29	3.5	2.4	2.3	7.85
	200	62	2	465 000	720 000	2 400	—	1 400	23124CE4	23124CKE4	130	138	190	175	2	0.29	3.5	2.4	2.3	7.85
	200	80	2	695 000	905 000	2 000	3 000	1 400	*24124CAME4	*24124CAMK30E4	130	—	190	171	2	0.37	2.7	1.8	1.8	10
	200	80	2	575 000	950 000	1 800	—	1 400	24124CE4	24124CK30E4	130	136	190	171	2	0.37	2.7	1.8	1.8	10
	215	58	2.1	685 000	765 000	3 200	3 000	2 400	*22224EAE4	*22224EAKE4	132	142	203	190	2	0.25	3.9	2.7	2.6	8.8
	215	76	2.1	790 000	970 000	2 200	3 000	1 300	*23224CAME4	*23224CAMKE4	132	—	203	182	2	0.34	2.9	2.0	1.9	12.1
	215	76	2.1	630 000	970 000	2 000	—	1 300	23224CE4	23224CKE4	132	140	203	182	2	0.34	2.9	2.0	1.9	12.1
	260	86	3	1060 000	1 120 000	2 000	2 800	1 400	*22324CAME4(2)	*22324CAMKE4(2)	134	—	246	222	2.5	0.35	2.9	1.9	1.9	22.2
130	200	52	2	500 000	655 000	3 000	3 800	1 700	*23026CAME4	*23026CAMKE4	140	—	190	180	2	0.23	4.3	2.9	2.8	5.98
	200	52	2	400 000	655 000	2 800	—	1 700	23026CDE4	23026CDKE4	140	147	190	180	2	0.23	4.3	2.9	2.8	5.98
	200	69	2	620 000	865 000	2 200	3 200	1 400	*24026CAME4	*24026CAMK30E4	140	—	190	175	2	0.31	3.2	2.2	2.1	7.84
	200	69	2	495 000	865 000	2 200	—	1 400	24026CE4	24026CK30E4	140	143	190	175	2	0.31	3.2	2.2	2.1	7.84
	210	64	2	630 000	825 000	2 600	3 400	1 300	*23126CAME4	*23126CAMKE4	140	—	200	184	2	0.28	3.6	2.4	2.4	8.69
	210	64	2	505 000	825 000	2 200	—	1 300	23126CE4	23126CKE4	140	149	200	184	2	0.28	3.6	2.4	2.4	8.69
	210	80	2	735 000	1 010 000	1 800	2 800	1 300	*24126CAME4	*24126CAMK30E4	140	—	200	180	2	0.37	2.7	1.8	1.8	10.7
	210	80	2	590 000	1 010 000	1 600	—	1 300	24126CE4	24126CK30E4	140	146	200	180	2	0.35	2.9	1.9	1.9	10.7
	230	64	3	820 000	940 000	2 800	2 600	2 200	*22226EAE4	*22226EAKE4	144	152	216	204	2.5	0.26	3.8	2.6	2.5	11
	230	80	3	875 000	1 080 000	2 000	2 800	1 200	*23226CAME4	*23226CAMKE4	144	—	216	196	2.5	0.34	2.9	2.0	1.9	14.3
	230	80	3	700 000	1 080 000	1 800	—	1 200	23226CE4	23226CKE4	144	150	216	196	2.5	0.34	2.9	2.0	1.9	14.3
	280	93	4	1 240 000	1 350 000	1 800	2 600	1 300	*22326CAME4	*22326CAMKE4	148	—	262	236	3	0.34	2.9	2.0	1.9	28.1
	280	93	4	995 000	1 350 000	1 900	—	1 300	22326CE4	22326CKE4	148	166	262	236	3	0.34	2.9	2.0	1.9	28.1

Notes (1) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).
(2) EA bearings are also available. The load rating of EA bearings is around 10% higher than CAM bearings; please consult NSK for more information.

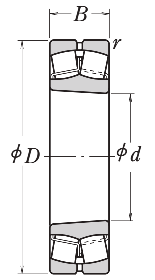
Remarks
1. Bearings denoted by an asterisk (*) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings. In this case, light loads are defined as $\leqq 0.05C_r$ normal loads as 0.05 to $0.10C_r$, and heavy loads as $> 0.10C_r$.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C351 and C357.

SPHERICAL ROLLER BEARINGS

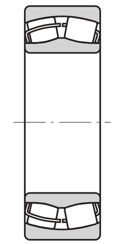
Bore Diameter 140 – 150 mm



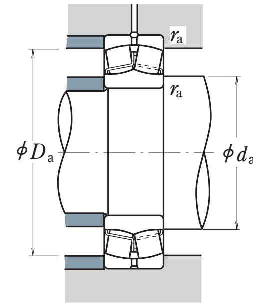
Cylindrical Bore



Tapered Bore



Without an Oil Groove or Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

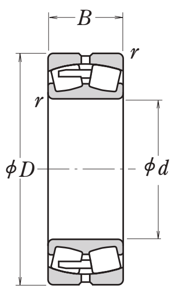
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Designations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	Thermal Reference Speed	Limiting Speeds Mechanical	Limiting Speeds Grease	Cylindrical Bore	Tapered Bore(1)	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
140	210	53	2	525 000	715 000	2 800	3 800	1 600	*23028CAME4	*23028CAMKE4	150	—	200	190	2	0.22	4.5	3.0	2.9	6.49
	210	53	2	420 000	715 000	2 400	—	1 600	23028CDE4	23028CDKE4	150	157	200	190	2	0.22	4.5	3.0	2.9	6.49
	210	69	2	635 000	905 000	2 200	3 000	1 300	*24028CAME4	*24028CAMK30E4	150	—	200	186	2	0.31	3.4	2.3	2.2	8.37
	210	69	2	525 000	945 000	2 000	—	1 300	24028CE4	24028CK30E4	150	154	200	186	2	0.29	3.4	2.3	2.2	8.37
	225	68	2.1	725 000	945 000	2 400	3 200	1 200	*23128CAME4	*23128CAMKE4	152	—	213	198	2	0.28	3.6	2.4	2.3	10.5
	225	68	2.1	580 000	945 000	2 000	—	1 200	23128CE4	23128CKE4	152	158	213	198	2	0.28	3.6	2.4	2.3	10.5
	225	85	2.1	835 000	1 160 000	1 600	2 600	1 200	*24128CAME4	*24128CAMK30E4	152	—	213	193	2	0.37	2.7	1.8	1.8	13
	225	85	2.1	670 000	1 160 000	1 500	—	1 200	24128CE4	24128CK30E4	152	156	213	193	2	0.35	2.9	1.9	1.9	13
	250	68	3	835 000	945 000	2 600	3 200	1 400	*22228CAME4	*22228CAMKE4	154	—	236	221	2.5	0.26	3.9	2.6	2.5	14.5
	250	68	3	645 000	930 000	2 400	—	1 400	22228CDE4	22228CDKE4	154	167	236	219	2.5	0.25	4.0	2.7	2.6	14.5
	250	88	3	1 040 000	1 300 000	1 800	2 600	1 100	*23228CAME4	*23228CAMKE4	154	—	236	213	2.5	0.35	2.9	1.9	1.9	18.8
	250	88	3	835 000	1 300 000	1 600	—	1 100	23228CE4	23228CKE4	154	163	236	213	2.5	0.35	2.9	1.9	1.9	18.8
	300	102	4	1 450 000	1 590 000	1 700	2 400	1 200	*22328CAME4	*22328CAMKE4	158	—	282	253	3	0.35	2.9	1.9	1.9	35.4
	300	102	4	1 160 000	1 590 000	1 700	—	1 200	22328CE4	22328CKE4	158	177	282	253	3	0.35	2.9	1.9	1.9	35.4
150	225	56	2.1	590 000	815 000	2 600	3 600	1 400	*23030CAME4	*23030CAMKE4	162	—	213	203	2	0.22	4.6	3.1	3.0	7.9
	225	56	2.1	470 000	815 000	2 200	—	1 400	23030CDE4	23030CDKE4	162	168	213	203	2	0.22	4.6	3.1	3.0	7.9
	225	75	2.1	740 000	1 090 000	1 900	3 000	1 200	*24030CAME4	*24030CAMK30E4	162	—	213	198	2	0.30	3.4	2.3	2.2	10.5
	225	75	2.1	590 000	1 090 000	1 800	—	1 200	24030CE4	24030CK30E4	162	165	213	198	2	0.30	3.4	2.3	2.2	10.5
	250	80	2.1	905 000	1 180 000	2 200	2 800	1 100	*23130CAME4	*23130CAMKE4	162	—	238	218	2	0.30	3.4	2.3	2.2	15.8
	250	80	2.1	725 000	1 180 000	1 800	—	1 100	23130CE4	23130CKE4	162	174	238	218	2	0.30	3.4	2.3	2.2	15.8
	250	100	2.1	1 070 000	1 450 000	1 400	2 400	1 100	*24130CAME4	*24130CAMK30E4	162	—	238	212	2	0.38	2.6	1.8	1.7	19.8
	250	100	2.1	890 000	1 530 000	1 300	—	1 100	24130CE4	24130CK30E4	162	169	238	212	2	0.38	2.6	1.8	1.7	19.8
	270	73	3	955 000	1 120 000	2 400	3 000	1 300	*22230CAME4	*22230CAMKE4	164	—	256	236	2.5	0.26	3.9	2.6	2.5	18.4
	270	73	3	765 000	1 120 000	2 200	—	1 300	22230CDE4	22230CDKE4	164	179	256	236	2.5	0.26	3.9	2.6	2.5	18.4
	270	96	3	1 220 000	1 560 000	1 700	2 400	1 100	*23230CAME4	*23230CAMKE4	164	—	256	230	2.5	0.35	2.9	1.9	1.9	24.2
	270	96	3	975 000	1 560 000	1 500	—	1 100	23230CE4	23230CKE4	164	176	256	230	2.5	0.35	2.9	1.9	1.9	24.2
	320	108	4	1 530 000	1 690 000	1 600	2 200	1 100	*22330CAME4	*22330CAMKE4	168	—	302	270	3	0.35	2.9	1.9	1.9	41.5

Note (1) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).

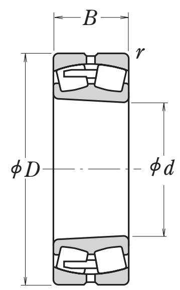
Remarks
1. Bearings denoted by an asterisk (*) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings. In this case, light loads are defined as $\leqq 0.05C_r$ normal loads as 0.05 to $0.10C_r$, and heavy loads as $> 0.10C_r$.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C352 and C357 – C358.

SPHERICAL ROLLER BEARINGS

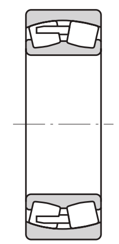
Bore Diameter 160 – 170 mm

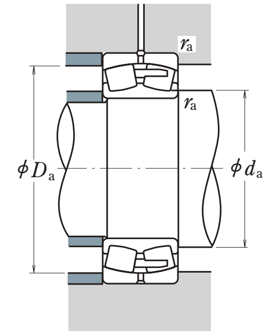


Cylindrical Bore



Tapered Bore


Without an Oil Groove and Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

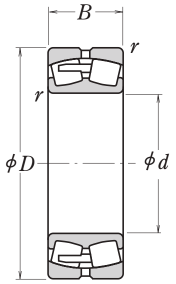
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Desginations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	Thermal Reference Speed	Limiting Speeds Mechanical	Limiting Speeds Grease	Cylindrical Bore	Tapered Bore([1])	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
160	220	45	2	450 000	675 000	3 000	3 200	1 400	*23932CAME4	*23932CAMKE4	170	—	210	203	2	0.18	5.6	3.8	3.7	4.97
	240	60	2.1	675 000	955 000	2 400	3 200	1 300	*23032CAME4	*23032CAMKE4	172	—	228	216	2	0.22	4.5	3.0	2.9	9.66
	240	60	2.1	540 000	955 000	2 200	—	1 300	23032CDE4	23032CDKE4	172	179	228	216	2	0.22	4.5	3.0	2.9	9.66
	240	80	2.1	845 000	1 260 000	1 800	2 800	1 100	*24032CAME4	*24032CAMK30E4	172	—	228	212	2	0.30	3.4	2.3	2.2	12.7
	240	80	2.1	680 000	1 260 000	1 700	—	1 100	24032CE4	24032CK30E4	172	177	228	212	2	0.30	3.4	2.3	2.2	12.7
	270	86	2.1	1 070 000	1 400 000	2 000	2 600	1 000	*23132CAME4	*23132CAMKE4	172	—	258	234	2	0.30	3.4	2.3	2.2	20.3
	270	86	2.1	855 000	1 400 000	1 700	—	1 000	23132CE4	23132CKE4	172	185	258	234	2	0.30	3.4	2.3	2.2	20.3
	270	109	2.1	1 240 000	1 670 000	1 300	2 200	1 000	*24132CAME4	*24132CAMK30E4	172	—	258	229	2	0.39	2.6	1.7	1.7	25.4
	270	109	2.1	1 040 000	1 760 000	1 200	—	1 000	24132CE4	24132CK30E4	172	179	258	229	2	0.39	2.6	1.7	1.7	25.4
	290	80	3	1 140 000	1 320 000	2 200	2 800	1 200	*22232CAME4	*22232CAMKE4	174	—	276	255	2.5	0.26	3.8	2.6	2.5	23.1
	290	80	3	910 000	1 320 000	2 000	—	1 200	22232CDE4	22232CDKE4	174	190	276	255	2.5	0.26	3.8	2.6	2.5	23.1
	290	104	3	1 370 000	1 770 000	1 500	2 200	1 000	*23232CAME4	*23232CAMKE4	174	—	276	245	2.5	0.34	2.9	2.0	1.9	30.5
	290	104	3	1 100 000	1 770 000	1 400	—	1 000	23232CE4	23232CKE4	174	189	276	245	2.5	0.34	2.9	2.0	1.9	30.5
	340	114	4	1 700 000	1 900 000	1 400	2 200	1 100	*22332CAME4	*22332CAMKE4	178	—	322	287	3	0.35	2.9	1.9	1.9	49.3
170	230	45	2	450 000	680 000	3 000	3 600	1 400	*23934CAME4	*23934CAMKE4	180	—	220	213	2	0.17	5.8	3.9	3.8	5.38
	260	67	2.1	795 000	1 090 000	2 200	3 000	1 200	*23034CAME4	*23034CAMKE4	182	—	248	233	2	0.23	4.3	2.9	2.8	13
	260	67	2.1	640 000	1 090 000	2 000	—	1 200	23034CDE4	23034CDKE4	182	191	248	233	2	0.23	4.3	2.9	2.8	13
	260	90	2.1	1 030 000	1 520 000	1 600	2 400	1 000	*24034CAME4	*24034CAMK30E4	182	—	248	228	2	0.31	3.2	2.2	2.1	17.3
	260	90	2.1	825 000	1 520 000	1 500	—	1 000	24034CE4	24034CK30E4	182	188	248	228	2	0.31	3.2	2.2	2.1	17.3
	280	88	2.1	1 180 000	1 570 000	1 800	2 600	1 000	*23134CAME4	*23134CAMKE4	182	—	268	245	2	0.29	3.5	2.3	2.3	21.8
	280	88	2.1	940 000	1 570 000	1 500	—	1 000	23134CE4	23134CKE4	182	194	268	245	2	0.29	3.5	2.3	2.3	21.8
	280	109	2.1	1 280 000	1 770 000	1 200	2 200	1 000	*24134CAME4	*24134CAMK30E4	182	—	268	239	2	0.38	2.7	1.8	1.7	26.6
	280	109	2.1	1 080 000	1 860 000	1 100	—	1 000	24134CE4	24134CK30E4	182	190	268	239	2	0.37	2.7	1.8	1.8	26.6
	310	86	4	1 240 000	1 500 000	2 000	2 600	1 100	*22234CAME4	*22234CAMKE4	188	—	292	270	3	0.26	3.8	2.6	2.5	28.8
	310	86	4	990 000	1 500 000	1 800	—	1 100	22234CDE4	22234CDKE4	188	206	292	270	3	0.26	3.8	2.6	2.5	28.8
	310	110	4	1 500 000	1 910 000	1 400	2 200	900	*23234CAME4	*23234CAMKE4	188	—	292	261	3	0.35	2.9	1.9	1.9	36.4
	310	110	4	1 200 000	1 910 000	1 300	—	900	23234CE4	23234CKE4	188	201	292	261	3	0.34	2.9	2.0	1.9	36.4
	360	120	4	1 970 000	2 110 000	1 300	2 000	1 000	*22334CAME4	*22334CAMKE4	188	—	342	304	3	0.35	2.9	1.9	1.9	57.9

Note ([1]) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).

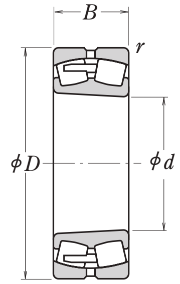
Remarks
1. Bearings denoted by an asterisk (*) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings.
   In this case, light loads are defined as $\leqq 0.05C_r$ normal loads as 0.05 to $0.10C_r$, and heavy loads as $> 0.10C_r$.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C352 and C358.

SPHERICAL ROLLER BEARINGS

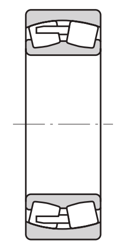
Bore Diameter 180 – 190 mm



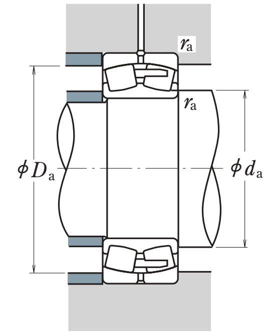
Cylindrical Bore



Tapered Bore



Without an Oil Groove and Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

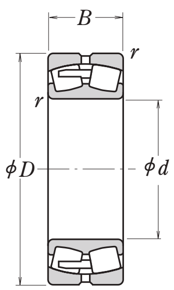
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Desginations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
						Thermal Reference Speed	Limiting Speeds													
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore	Tapered Bore(¹)	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
180	250	52	2	590 000	890 000	2 600	3 000	1 200	∗23936CAME4	∗23936CAMKE4	190	—	240	230	2	0.18	5.5	3.7	3.6	7.64
	280	74	2.1	935 000	1 270 000	2 000	2 800	1 200	∗23036CAME4	∗23036CAMKE4	192	—	268	249	2	0.24	4.2	2.8	2.8	17.1
	280	74	2.1	750 000	1 270 000	1 900	—	1 200	23036CDE4	23036CDKE4	192	202	268	249	2	0.24	4.2	2.8	2.8	17.1
	280	100	2.1	1 210 000	1 750 000	1 500	2 200	950	∗24036CAME4	∗24036CAMK30E4	192	—	268	245	2	0.32	3.1	2.1	2.0	22.7
	280	100	2.1	965 000	1 750 000	1 400	—	950	24036CE4	24036CK30E4	192	200	268	245	2	0.32	3.1	2.1	2.0	22.7
	300	96	3	1 320 000	1 760 000	1 700	2 200	900	∗23136CAME4	∗23136CAMKE4	194	—	286	260	2.5	0.31	3.3	2.2	2.2	27.5
	300	96	3	1 050 000	1 760 000	1 400	—	900	23136CE4	23136CKE4	194	206	286	260	2.5	0.30	3.4	2.3	2.2	27.5
	300	118	3	1 490 000	2 040 000	1 100	2 000	900	∗24136CAME4	∗24136CAMK30E4	194	—	286	255	2.5	0.37	2.7	1.8	1.8	33.1
	300	118	3	1 190 000	2 040 000	1 000	—	900	24136CE4	24136CK30E4	194	202	286	255	2.5	0.37	2.7	1.8	1.8	33.1
	320	86	4	1 280 000	1 540 000	2 000	2 600	1 100	∗22236CAME4	∗22236CAMKE4	198	—	302	278	3	0.26	3.9	2.6	2.6	30.2
	320	86	4	1 020 000	1 540 000	1 800	—	1 100	22236CDE4	22236CDKE4	198	212	302	278	3	0.26	3.9	2.6	2.6	30.2
	320	112	4	1 620 000	2 110 000	1 300	2 000	850	∗23236CAME4	∗23236CAMKE4	198	—	302	274	3	0.35	2.9	1.9	1.9	38.9
	320	112	4	1 300 000	2 110 000	1 200	—	850	23236CE4	23236CKE4	198	211	302	274	3	0.33	3.0	2.0	2.0	38.9
	380	126	4	2 170 000	2 340 000	1 200	2 000	950	∗22336CAME4	∗22336CAMKE4	198	—	362	322	3	0.34	2.9	2.0	1.9	67
190	260	52	2	575 000	875 000	2 600	3 000	1 200	∗23938CAME4	∗23938CAMKE4	200	—	250	240	2	0.18	5.7	3.8	3.7	8.03
	290	75	2.1	970 000	1 350 000	2 000	2 600	1 100	∗23038CAME4	∗23038CAMKE4	202	—	278	261	2	0.24	4.2	2.8	2.8	17.6
	290	100	2.1	1 220 000	1 840 000	1 400	2 200	900	∗24038CAME4	∗24038CAMK30E4	202	—	278	253	2	0.32	3.1	2.1	2.0	24
	290	100	2.1	975 000	1 840 000	1 400	—	900	24038CE4	24038CK30E4	202	210	278	253	2	0.31	3.2	2.2	2.1	24
	320	104	3	1 480 000	2 020 000	1 600	2 200	850	∗23138CAME4	∗23138CAMKE4	204	—	306	276	2.5	0.31	3.2	2.2	2.1	34.5
	320	104	3	1 190 000	2 020 000	1 300	—	850	23138CE4	23138CKE4	204	219	306	276	2.5	0.31	3.3	2.2	2.2	34.5
	320	128	3	1 710 000	2 330 000	1 000	1 900	850	∗24138CAME4	∗24138CAMK30E4	204	—	306	269	2.5	0.40	2.5	1.7	1.6	41.5
	320	128	3	1 370 000	2 330 000	950	—	850	24138CE4	24138CK30E4	204	211	306	269	2.5	0.40	2.5	1.7	1.6	41.5
	340	92	4	1 420 000	1 730 000	1 800	2 400	1 000	∗22238CAME4	∗22238CAMKE4	208	—	322	296	3	0.26	3.8	2.6	2.5	35.5
	340	120	4	1 800 000	2 350 000	1 200	1 900	800	∗23238CAME4	∗23238CAMKE4	208	—	322	288	3	0.35	2.8	1.9	1.9	47.6
	340	120	4	1 440 000	2 350 000	1 100	—	800	23238CE4	23238CKE4	208	222	322	288	3	0.35	2.9	1.9	1.9	47.6
	400	132	5	2 370 000	2 590 000	1 200	1 900	900	∗22338CAME4	∗22338CAMKE4	212	—	378	338	4	0.34	2.9	2.0	1.9	77.6

Note (¹) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).

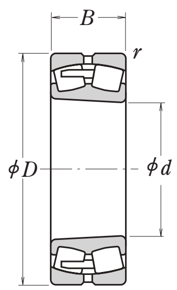
Remarks
1. Bearings denoted by an asterisk (∗) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings. In this case, light loads are defined as ≦0.05C_r normal loads as 0.05 to 0.10C_r, and heavy loads as > 0.10C_r.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C352 and C358.

SPHERICAL ROLLER BEARINGS

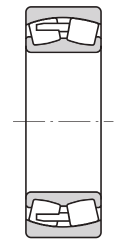
Bore Diameter 200 – 220 mm



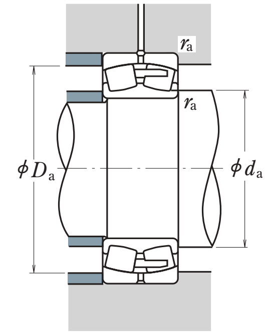
Cylindrical Bore



Tapered Bore



Without an Oil Groove and Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

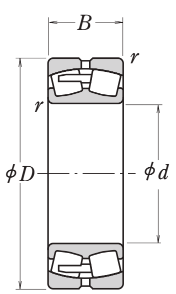
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Desginations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
						Thermal Reference Speed	Limiting Speeds													
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore	Tapered Bore([1])	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
200	280	60	2.1	710 000	1 060 000	2 400	2 600	1 100	∗23940CAME4	∗23940CAMKE4	212	—	268	258	2	0.20	5.1	3.4	3.3	11
	310	82	2.1	1 180 000	1 700 000	1 800	2 400	1 000	∗23040CAME4	∗23040CAMKE4	212	—	298	279	2	0.25	4.0	2.7	2.6	22.6
	310	109	2.1	1 420 000	2 120 000	1 300	2 000	850	∗24040CAME4	∗24040CAMK30E4	212	—	298	271	2	0.33	3.0	2.0	2.0	30.4
	310	109	2.1	1 140 000	2 120 000	1 300	—	850	24040CE4	24040CK30E4	212	223	298	271	2	0.32	3.1	2.1	2.0	30.4
	340	112	3	1 700 000	2 330 000	1 500	2 000	800	∗23140CAME4	∗23140CAMKE4	214	—	326	293	2.5	0.32	3.2	2.1	2.1	42.7
	340	112	3	1 360 000	2 330 000	1 200	—	800	23140CE4	23140CKE4	214	232	326	293	2.5	0.31	3.2	2.2	2.1	42.7
	340	140	3	1 960 000	2 660 000	950	1 800	800	∗24140CAME4	∗24140CAMK30E4	214	—	326	290	2.5	0.39	2.5	1.7	1.7	51.3
	340	140	3	1 570 000	2 670 000	900	—	800	24140CE4	24140CK30E4	214	226	326	290	2.5	0.39	2.6	1.8	1.7	51.3
	360	98	4	1 620 000	2 010 000	1 700	2 200	950	∗22240CAME4	∗22240CAMKE4	218	—	342	315	3	0.26	3.8	2.6	2.5	42.6
	360	128	4	2 070 000	2 750 000	1 100	1 800	750	∗23240CAME4	∗23240CAMKE4	218	—	342	307	3	0.35	2.9	1.9	1.9	57.1
	360	128	4	1 660 000	2 750 000	1 000	—	750	23240CE4	23240CKE4	218	237	342	307	3	0.34	2.9	2.0	1.9	57.1
	420	138	5	2 500 000	2 990 000	1 100	1 700	850	∗22340CAME4	∗22340CAMKE4	222	—	398	352	4	0.34	2.9	2.0	1.9	92.6
220	300	60	2.1	785 000	1 240 000	2 200	2 600	1 000	∗23944CAME4	∗23944CAMKE4	232	—	288	278	2	0.18	5.7	3.8	3.7	12.2
	340	90	3	1 360 000	1 980 000	1 600	2 200	950	∗23044CAME4	∗23044CAMKE4	234	—	326	302	2.5	0.24	4.1	2.8	2.7	29.7
	340	118	3	1 640 000	2 490 000	1 200	1 900	750	∗24044CAME4	∗24044CAMK30E4	234	—	326	296	2.5	0.32	3.2	2.1	2.1	40.5
	340	118	3	1 360 000	2 600 000	1 100	—	750	24044CE4	24044CK30E4	234	244	326	296	2.5	0.31	3.2	2.1	2.1	40.5
	370	120	4	1 960 000	2 710 000	1 300	1 800	710	∗23144CAME4	∗23144CAMKE4	238	—	352	320	3	0.31	3.3	2.2	2.2	53
	370	120	4	1 570 000	2 710 000	1 100	—	710	23144CE4	23144CKE4	238	254	352	320	3	0.30	3.3	2.2	2.2	53
	370	150	4	2 250 000	3 200 000	850	1 600	710	∗24144CAME4	∗24144CAMK30E4	238	—	352	313	3	0.39	2.6	1.7	1.7	66.7
	370	150	4	1 800 000	3 200 000	750	—	710	24144CE4	24144CK30E4	238	248	352	313	3	0.39	2.6	1.7	1.7	66.7
	400	108	4	1 960 000	2 430 000	1 500	2 000	850	∗22244CAME4	∗22244CAMKE4	238	—	382	348	3	0.27	3.7	2.5	2.4	59
	400	144	4	2 520 000	3 400 000	1 000	1 600	670	∗23244CAME4	∗23244CAMKE4	238	—	382	337	3	0.36	2.8	1.9	1.8	80.4
	400	144	4	2 020 000	3 400 000	850	—	670	23244CE4	23244CKE4	238	260	382	337	3	0.35	2.9	1.9	1.9	80.4
	460	145	5	2 940 000	3 400 000	950	1 600	750	∗22344CAME4	∗22344CAMKE4	242	—	438	391	4	0.33	3.0	2.0	2.0	116

Note ([1]) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).

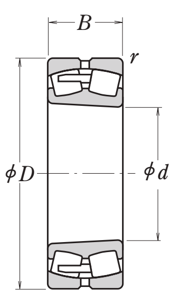
Remarks
1. Bearings denoted by an asterisk (∗) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings.
   In this case, light loads are defined as $\leqq 0.05C_r$ normal loads as 0.05 to $0.10C_r$, and heavy loads as > $0.10C_r$.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C353 and C359.

SPHERICAL ROLLER BEARINGS

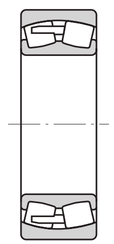
Bore Diameter 240 – 280 mm



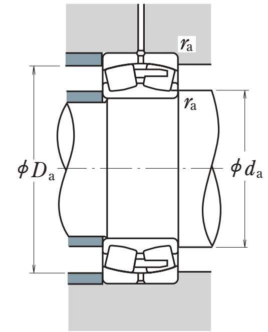
Cylindrical Bore



Tapered Bore



Without an Oil Groove and Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

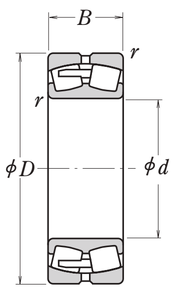
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Desginations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	Thermal Reference Speed	Limiting Speeds Mechanical	Limiting Speeds Grease	Cylindrical Bore	Tapered Bore(1)	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
240	320	60	2.1	795 000	1 300 000	1 900	2 600	950	*23948CAME4	*23948CAMKE4	252	—	308	298	2	0.17	6.0	4.0	3.9	13.3
	360	92	3	1 450 000	2 140 000	1 500	2 200	850	*23048CAME4	*23048CAMKE4	254	—	346	324	2.5	0.24	4.2	2.8	2.7	32.6
	360	118	3	1 730 000	2 730 000	1 100	1 800	710	*24048CAME4	*24048CAMK30E4	254	—	346	317	2.5	0.30	3.4	2.3	2.2	43.4
	360	118	3	1 390 000	2 730 000	1 000	—	710	24048CE4	24048CK30E4	254	265	346	317	2.5	0.29	3.4	2.3	2.2	43.4
	400	128	4	2 230 000	3 100 000	1 200	1 700	670	*23148CAME4	*23148CAMKE4	258	—	382	347	3	0.31	3.3	2.2	2.2	66.9
	400	128	4	1 790 000	3 100 000	1 000	—	670	23148CE4	23148CKE4	258	275	382	347	3	0.30	3.3	2.2	2.2	66.9
	400	160	4	2 660 000	3 800 000	750	1 500	670	*24148CAME4	*24148CAMK30E4	258	—	382	341	3	0.38	2.7	1.8	1.8	79.5
	400	160	4	2 130 000	3 800 000	670	—	670	24148CE4	24148CK30E4	258	268	382	341	3	0.38	2.7	1.8	1.8	79.5
	440	120	4	2 340 000	2 890 000	1 400	1 800	750	*22248CAME4	*22248CAMKE4	258	—	422	383	3	0.27	3.7	2.5	2.4	80.2
	440	160	4	3 050 000	4 050 000	850	1 500	630	*23248CAME4	*23248CAMKE4	258	—	422	372	3	0.37	2.7	1.8	1.8	106
	500	155	5	3 250 000	3 800 000	850	1 500	670	*22348CAME4	*22348CAMKE4	262	—	478	423	4	0.32	3.2	2.1	2.1	147
260	360	75	2.1	1 170 000	1 870 000	1 800	2 200	850	*23952CAME4	*23952CAMKE4	272	—	348	333	2	0.19	5.4	3.6	3.5	23
	400	104	4	1 780 000	2 580 000	1 300	1 900	800	*23052CAME4	*23052CAMKE4	278	—	382	356	3	0.25	4.1	2.7	2.7	46.6
	400	140	4	2 270 000	3 500 000	950	1 600	630	*24052CAME4	*24052CAMK30E4	278	—	382	348	3	0.32	3.1	2.1	2.1	62.6
	440	144	4	2 700 000	3 750 000	1 100	1 500	600	*23152CAME4	*23152CAMKE4	278	—	422	380	3	0.32	3.2	2.1	2.1	88.2
	440	180	4	3 200 000	4 700 000	630	1 300	600	*24152CAME4	*24152CAMK30E4	278	—	422	371	3	0.39	2.6	1.7	1.7	109
	480	130	5	2 720 000	3 400 000	1 200	1 700	670	*22252CAME4	*22252CAMKE4	282	—	458	418	4	0.27	3.7	2.5	2.5	104
	480	174	5	3 400 000	4 550 000	800	1 400	560	*23252CAME4	*23252CAMKE4	282	—	458	406	4	0.37	2.7	1.8	1.8	137
	540	165	6	3 900 000	4 600 000	750	1 400	630	*22352CAME4	*22352CAMKE4	288	—	512	462	5	0.32	3.2	2.1	2.1	180
280	380	75	2.1	1 160 000	1 950 000	1 600	2 000	800	*23956CAME4	*23956CAMKE4	292	—	368	351	2	0.18	5.7	3.8	3.8	24.5
	420	106	4	1 930 000	2 950 000	1 200	1 800	710	*23056CAME4	*23056CAMKE4	298	—	402	377	3	0.24	4.2	2.8	2.7	50.5
	420	140	4	2 350 000	3 800 000	850	1 500	600	*24056CAME4	*24056CAMK30E4	298	—	402	369	3	0.31	3.3	2.2	2.2	66.4
	460	146	5	2 790 000	4 000 000	1 000	1 500	560	*23156CAME4	*23156CAMKE4	302	—	438	400	4	0.30	3.3	2.2	2.2	94.3
	460	180	5	3 300 000	5 000 000	600	1 300	560	*24156CAME4	*24156CAMK30E4	302	—	438	392	4	0.37	2.7	1.8	1.8	115
	500	130	5	2 850 000	3 650 000	1 100	1 600	630	*22256CAME4	*22256CAMKE4	302	—	478	439	4	0.25	4.0	2.7	2.6	110
	500	176	5	3 600 000	4 900 000	750	1 300	530	*23256CAME4	*23256CAMKE4	302	—	478	425	4	0.35	2.9	1.9	1.9	147
	580	175	6	4 350 000	5 150 000	670	1 300	560	*22356CAME4	*22356CAMKE4	308	—	552	496	5	0.31	3.2	2.1	2.1	221

Note (1) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).

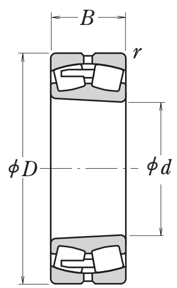
Remarks
1. Bearings denoted by an asterisk (*) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings. In this case, light loads are defined as $\leqq 0.05C_r$ normal loads as 0.05 to $0.10C_r$, and heavy loads as $> 0.10C_r$.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C353 and C359.

SPHERICAL ROLLER BEARINGS

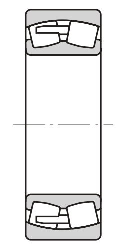
Bore Diameter 300 – 380 mm



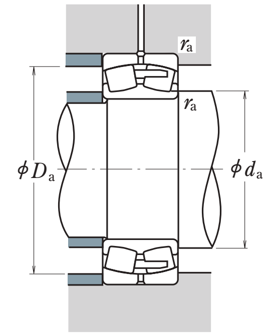
Cylindrical Bore



Tapered Bore



Without an Oil Groove and Holes



Dynamic Equivalent Load

$P=XF_r+YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0=F_r+Y_0F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

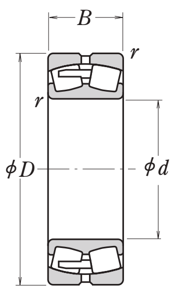
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Desginations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
						Thermal Reference Speed	Limiting Speeds													
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore	Tapered Bore([1])	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
300	420	90	3	1 540 000	2 490 000	1 500	1 800	710	*23960CAME4	*23960CAMKE4	314	—	406	386	2.5	0.19	5.2	3.5	3.4	38.2
	460	118	4	2 400 000	3 700 000	1 100	1 600	670	*23060CAME4	*23060CAMKE4	318	—	442	413	3	0.24	4.2	2.8	2.7	70.5
	460	160	4	2 890 000	4 600 000	800	1 400	530	*24060CAME4	*24060CAMK30E4	318	—	442	400	3	0.32	3.1	2.1	2.0	93.6
	500	160	5	3 350 000	4 800 000	900	1 400	500	*23160CAME4	*23160CAMKE4	322	—	478	433	4	0.31	3.3	2.2	2.2	125
	500	200	5	3 900 000	5 800 000	530	1 200	500	*24160CAME4	*24160CAMK30E4	322	—	478	423	4	0.38	2.6	1.8	1.7	152
	540	140	5	3 250 000	4 250 000	1 000	1 500	600	*22260CAME4	*22260CAMKE4	322	—	518	473	4	0.25	4.0	2.7	2.6	139
	540	192	5	4 250 000	5 900 000	670	1 200	480	*23260CAME4	*23260CAMKE4	322	—	518	458	4	0.35	2.9	1.9	1.9	189
320	440	90	3	1 620 000	2 750 000	1 400	1 700	670	*23964CAME4	*23964CAMKE4	334	—	426	406	2.5	0.18	5.5	3.7	3.6	40.6
	480	121	4	2 450 000	3 850 000	1 000	1 600	630	*23064CAME4	*23064CAMKE4	338	—	462	432	3	0.24	4.2	2.8	2.8	75.6
	480	160	4	3 050 000	5 050 000	710	1 300	500	*24064CAME4	*24064CAMK30E4	338	—	462	422	3	0.31	3.3	2.2	2.2	99.7
	540	176	5	3 850 000	5 500 000	800	1 300	480	*23164CAME4	*23164CAMKE4	342	—	518	466	4	0.31	3.2	2.1	2.1	162
	540	218	5	4 400 000	6 650 000	480	1 100	480	*24164CAME4	*24164CAMK30E4	342	—	518	456	4	0.39	2.6	1.7	1.7	196
	580	150	5	3 750 000	4 850 000	950	1 400	530	*22264CAME4	*22264CAMKE4	342	—	558	508	4	0.26	3.9	2.6	2.6	174
	580	208	5	4 850 000	6 900 000	600	1 100	450	*23264CAME4	*23264CAMKE4	342	—	558	488	4	0.36	2.8	1.9	1.8	239
340	460	90	3	1 670 000	2 840 000	1 300	1 700	630	*23968CAME4	*23968CAMKE4	354	—	446	427	2.5	0.18	5.7	3.8	3.7	42.4
	520	133	5	2 850 000	4 400 000	950	1 500	560	*23068CAME4	*23068CAMKE4	362	—	498	465	4	0.24	4.2	2.8	2.8	101
	520	180	5	3 650 000	6 050 000	670	1 200	480	*24068CAME4	*24068CAMK30E4	362	—	498	454	4	0.32	3.2	2.1	2.1	135
	580	190	5	4 500 000	6 600 000	710	1 200	430	*23168CAME4	*23168CAMKE4	362	—	558	499	4	0.31	3.2	2.1	2.1	206
	580	243	5	5 300 000	7 900 000	450	1 000	430	*24168CAME4	*24168CAMK30E4	362	—	558	489	4	0.40	2.5	1.7	1.7	257
	620	224	6	4 400 000	7 800 000	480	—	400	23268CAME4	23268CAMKE4	368	—	592	521	5	0.36	2.8	1.9	1.8	295
360	480	90	3	1 730 000	3 050 000	1 200	1 700	600	*23972CAME4	*23972CAMKE4	374	—	466	447	2.5	0.17	6.0	4.1	4.0	44.7
	540	134	5	2 990 000	4 700 000	900	1 400	530	*23072CAME4	*23072CAMKE4	382	—	518	485	4	0.24	4.2	2.8	2.8	106
	540	180	5	3 650 000	6 100 000	630	1 200	450	*24072CAME4	*24072CAMK30E4	382	—	518	476	4	0.32	3.2	2.1	2.1	139
	600	192	5	4 800 000	7 100 000	670	1 100	400	*23172CAME4	*23172CAMKE4	382	—	578	520	4	0.31	3.2	2.2	2.1	217
	600	243	5	5 250 000	8 000 000	430	1 000	400	*24172CAME4	*24172CAMK30E4	382	—	578	507	4	0.40	2.5	1.7	1.7	264
	650	232	6	4 800 000	8 550 000	450	—	380	23272CAME4	23272CAMKE4	388	—	622	549	5	0.36	2.8	1.9	1.8	342
380	520	106	4	2 340 000	4 100 000	1 100	1 500	530	*23976CAME4	*23976CAMKE4	398	—	502	482	3	0.18	5.5	3.7	3.6	65.4
	560	135	5	3 150 000	5 100 000	850	1 400	530	*23076CAME4	*23076CAMKE4	402	—	538	506	4	0.22	4.5	3.0	3.0	113
	560	180	5	3 850 000	6 600 000	600	1 200	430	*24076CAME4	*24076CAMK30E4	402	—	538	496	4	0.29	3.4	2.3	2.3	148
	620	194	5	4 000 000	7 600 000	530	—	400	23176CAME4	23176CAMKE4	402	—	598	540	4	0.30	3.3	2.2	2.2	229
	620	243	5	4 350 000	8 450 000	360	—	400	24176CAME4	24176CAMK30E4	402	—	598	529	4	0.38	2.6	1.8	1.7	275
	680	240	6	5 150 000	9 200 000	430	—	360	23276CAME4	23276CAMKE4	408	—	652	578	5	0.35	2.9	1.9	1.9	372

Note ([1]) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).

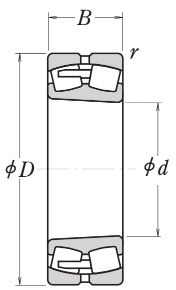
Remarks
1. Bearings denoted by an asterisk (*) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings. In this case, light loads are defined as $\leqq 0.05C_r$ normal loads as 0.05 to $0.10C_r$, and heavy loads as $> 0.10C_r$.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C354 and C360.

SPHERICAL ROLLER BEARINGS

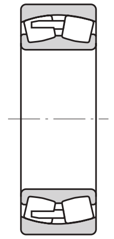
Bore Diameter 400 – 460 mm



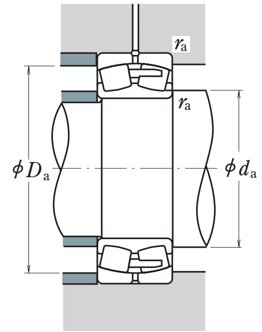
Cylindrical Bore



Tapered Bore



Without an Oil Groove and Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

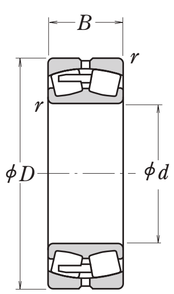
Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Designations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
						Thermal Reference Speed	Limiting Speeds													
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore	Tapered Bore(1)	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
400	540	106	4	2 370 000	4 250 000	1 000	1 400	530	*23980CAME4	*23980CAMKE4	418	—	522	501	3	0.18	5.7	3.9	3.8	69.1
	600	148	5	3 700 000	5 900 000	800	1 300	480	*23080CAME4	*23080CAMKE4	422	—	578	540	4	0.23	4.4	3.0	2.9	146
	600	200	5	4 500 000	7 600 000	560	1 100	400	*24080CAME4	*24080CAMK30E4	422	—	578	527	4	0.31	3.3	2.2	2.2	193
	650	200	6	4 150 000	7 900 000	500	—	380	23180CAME4	23180CAMKE4	428	—	622	569	5	0.29	3.4	2.3	2.3	257
	650	250	6	4 950 000	10 100 000	320	—	380	24180CAME4	24180CAMK30E4	428	—	622	551	5	0.37	2.7	1.8	1.8	316
	720	256	6	5 800 000	10 400 000	380	—	340	23280CAME4	23280CAMKE4	428	—	692	610	5	0.36	2.8	1.9	1.9	449
420	560	106	4	2 340 000	4 250 000	1 000	1 400	500	*23984CAME4	*23984CAMKE4	438	—	542	521	3	0.17	6.0	4.0	3.9	71.6
	620	150	5	2 910 000	5 850 000	670	—	450	23084CAME4	23084CAMKE4	442	—	598	562	4	0.23	4.3	2.9	2.8	151
	620	200	5	3 750 000	8 100 000	480	—	380	24084CAME4	24084CAMK30E4	442	—	598	549	4	0.31	3.2	2.2	2.1	199
	700	224	6	5 000 000	9 400 000	480	—	340	23184CAME4	23184CAMKE4	448	—	672	607	5	0.31	3.3	2.2	2.2	341
	700	280	6	6 000 000	12 000 000	280	—	340	24184CAME4	24184CAMK30E4	448	—	672	598	5	0.38	2.6	1.8	1.7	421
	760	272	7.5	6 450 000	11 700 000	360	—	320	23284CAME4	23284CAMKE4	456	—	724	644	6	0.35	2.9	1.9	1.9	534
440	600	118	4	2 190 000	4 800 000	630	—	450	23988CAME4	23988CAMKE4	458	—	582	555	3	0.18	5.7	3.9	3.8	96.3
	650	157	6	3 150 000	6 350 000	630	—	430	23088CAME4	23088CAMKE4	468	—	622	587	5	0.23	4.3	2.9	2.8	173
	650	212	6	4 150 000	9 100 000	450	—	360	24088CAME4	24088CAMK30E4	468	—	622	576	5	0.31	3.2	2.1	2.1	237
	720	226	6	5 300 000	10 300 000	430	—	320	23188CAME4	23188CAMKE4	468	—	692	627	5	0.3	3.3	2.2	2.2	360
	720	280	6	6 000 000	12 100 000	280	—	320	24188CAME4	24188CAMK30E4	468	—	692	617	5	0.37	2.7	1.8	1.8	433
	790	280	7.5	6 900 000	12 800 000	340	—	300	23288CAME4	23288CAMKE4	476	—	754	669	6	0.35	2.9	1.9	1.9	594
460	620	118	4	2 220 000	4 950 000	600	—	430	23992CAME4	23992CAMKE4	478	—	602	575	3	0.17	5.9	4.0	3.9	100
	680	163	6	3 450 000	7 100 000	600	—	400	23092CAME4	23092CAMKE4	488	—	652	615	5	0.22	4.6	3.1	3.0	201
	680	218	6	4 500 000	9 950 000	430	—	340	24092CAME4	24092CAMK30E4	488	—	652	604	5	0.29	3.4	2.3	2.3	266
	760	240	7.5	5 700 000	10 900 000	430	—	300	23192CAME4	23192CAMKE4	496	—	724	661	6	0.31	3.3	2.2	2.2	423
	760	300	7.5	6 300 000	12 400 000	280	—	300	24192CAME4	24192CAMK30E4	496	—	724	646	6	0.39	2.6	1.7	1.7	512
	830	296	7.5	7 350 000	13 700 000	320	—	280	23292CAME4	23292CAMKE4	496	—	794	702	6	0.37	2.8	1.9	1.8	691

Note (1) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).

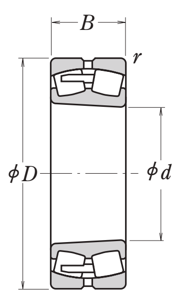
Remarks
1. Bearings denoted by an asterisk (*) are NSKHPS bearings; they come standard with an oil groove and holes.
2. The recommended fits (shaft tolerances) on Page A164 are different when selecting NSKHPS bearings. In this case, light loads are defined as ≦0.05C_r normal loads as 0.05 to 0.10C_r, and heavy loads as > 0.10C_r.
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages C354 – C355 and C360 – C361.

SPHERICAL ROLLER BEARINGS

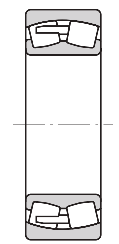
Bore Diameter 480 – 560 mm



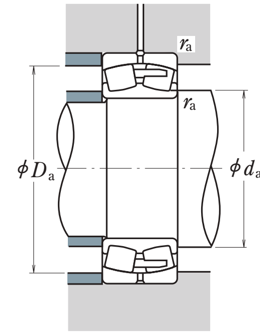
Cylindrical Bore



Tapered Bore



Without an Oil Groove and Holes



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

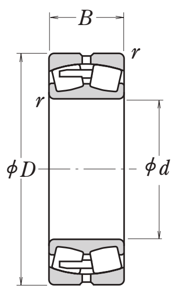
Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min⁻¹) Limiting Speeds		Bearing Designations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore	Tapered Bore([1])	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
480	650	128	5	2 580 000	5 850 000	560	—	400	**23996CAME4**	**23996CAMKE4**	502	—	628	602	4	0.18	5.7	3.8	3.7	121
	700	165	6	3 800 000	7 950 000	560	—	400	**23096CAME4**	**23096CAMKE4**	508	—	672	633	5	0.22	4.6	3.1	3.0	211
	700	218	6	4 600 000	10 200 000	400	—	320	**24096CAME4**	**24096CAMK30E4**	508	—	672	625	5	0.30	3.4	2.3	2.2	270
	790	248	7.5	6 050 000	11 700 000	400	—	300	**23196CAME4**	**23196CAMKE4**	516	—	754	688	6	0.31	3.3	2.2	2.2	475
	790	308	7.5	7 150 000	14 600 000	240	—	300	**24196CAME4**	**24196CAMK30E4**	516	—	754	670	6	0.39	2.6	1.7	1.7	567
	870	310	7.5	7 850 000	14 400 000	300	—	260	**23296CAME4**	**23296CAMKE4**	516	—	834	733	6	0.37	2.8	1.9	1.8	795
500	670	128	5	2 460 000	5 550 000	560	—	400	**239/500CAME4**	**239/500CAMKE4**	522	—	648	622	4	0.17	6.0	4.0	3.9	124
	720	167	6	3 750 000	8 100 000	530	—	380	**230/500CAME4**	**230/500CAMKE4**	528	—	692	655	5	0.21	4.8	3.2	3.1	220
	720	218	6	4 450 000	9 900 000	400	—	300	**240/500CAME4**	**240/500CAMK30E4**	528	—	692	643	5	0.30	3.4	2.3	2.2	276
	830	264	7.5	6 850 000	13 400 000	360	—	280	**231/500CAME4**	**231/500CAMKE4**	536	—	794	720	6	0.31	3.2	2.2	2.1	567
	830	325	7.5	8 000 000	16 000 000	220	—	280	**241/500CAME4**	**241/500CAMK30E4**	536	—	794	703	6	0.39	2.6	1.7	1.7	666
	920	336	7.5	9 000 000	16 600 000	280	—	260	**232/500CAME4**	**232/500CAMKE4**	536	—	884	773	6	0.38	2.7	1.8	1.8	969
530	710	136	5	2 930 000	6 800 000	500	—	360	**239/530CAME4**	**239/530CAMKE4**	552	—	688	659	4	0.17	6.0	4.0	3.9	149
	780	185	6	4 400 000	9 200 000	500	—	340	**230/530CAME4**	**230/530CAMKE4**	558	—	752	706	5	0.22	4.6	3.1	3.0	298
	780	250	6	5 400 000	11 800 000	360	—	280	**240/530CAME4**	**240/530CAMK30E4**	558	—	752	690	5	0.31	3.3	2.2	2.2	390
	870	272	7.5	7 150 000	14 100 000	340	—	260	**231/530CAME4**	**231/530CAMKE4**	566	—	834	758	6	0.30	3.3	2.2	2.2	628
	870	335	7.5	8 500 000	17 500 000	200	—	260	**241/530CAME4**	**241/530CAMK30E4**	566	—	834	740	6	0.38	2.6	1.8	1.7	773
	980	355	9.5	10 100 000	18 800 000	260	—	240	**232/530CAME4**	**232/530CAMKE4**	574	—	936	824	8	0.38	2.7	1.8	1.7	1 170
560	750	140	5	3 100 000	7 250 000	480	—	340	**239/560CAME4**	**239/560CAMKE4**	582	—	728	697	4	0.16	6.1	4.1	4.0	172
	820	195	6	5 000 000	10 700 000	450	—	320	**230/560CAME4**	**230/560CAMKE4**	588	—	792	742	5	0.22	4.5	3.0	2.9	344
	820	258	6	5 950 000	13 300 000	340	—	260	**240/560CAME4**	**240/560CAMK30E4**	588	—	792	729	5	0.30	3.3	2.2	2.2	440
	920	280	7.5	7 850 000	15 500 000	320	—	240	**231/560CAME4**	**231/560CAMKE4**	596	—	884	804	6	0.30	3.4	2.3	2.2	727
	920	355	7.5	9 400 000	19 600 000	190	—	240	**241/560CAME4**	**241/560CAMK30E4**	596	—	884	782	6	0.39	2.6	1.8	1.7	886
	1 030	365	9.5	10 900 000	20 500 000	240	—	220	**232/560CAME4**	**232/560CAMKE4**	604	—	986	870	8	0.36	2.8	1.9	1.8	1 320

Note ([1]) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).

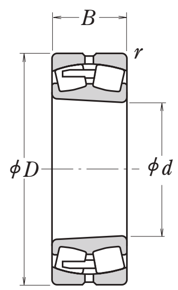
Remark For the dimensions of adapters and withdrawal sleeves, refer to Pages C355 and C361.

SPHERICAL ROLLER BEARINGS

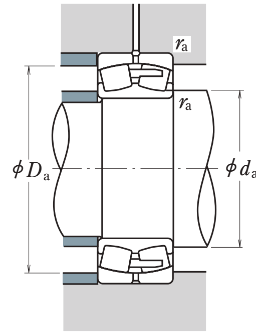
Bore Diameter 600 – 750 mm



Cylindrical Bore



Tapered Bore



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

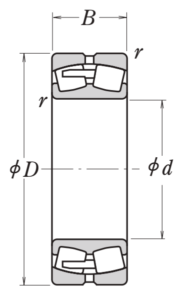
The values of e, Y_2, Y_3, and Y_0 are given in the table below.

Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Designations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
						Thermal Reference Speed	Limiting Speeds													
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore	Tapered Bore([1])	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
600	800	150	5	3 450 000	8 100 000	450	—	320	**239/600CAME4**	**239/600CAMKE4**	622	—	778	745	4	0.17	5.9	3.9	3.9	205
	870	200	6	5 450 000	12 200 000	400	—	300	**230/600CAME4**	**230/600CAMKE4**	628	—	842	794	5	0.21	4.8	3.3	3.2	389
	870	272	6	6 600 000	15 100 000	300	—	240	**240/600CAME4**	**240/600CAMK30E4**	628	—	842	772	5	0.30	3.3	2.2	2.2	529
	980	300	7.5	8 750 000	17 500 000	280	—	220	231/600CAME4	231/600CAMKE4	636	—	944	856	6	0.30	3.4	2.3	2.2	898
	980	375	7.5	10 400 000	21 900 000	170	—	220	**241/600CAME4**	**241/600CAMK30E4**	636	—	944	836	6	0.39	2.6	1.8	1.7	1 050
	1 090	388	9.5	12 700 000	24 900 000	200	—	200	**232/600CAME4**	**232/600CAMKE4**	644	—	1 046	923	8	0.36	2.8	1.9	1.8	1 590
630	850	165	6	4 000 000	9 350 000	400	—	300	**239/630CAME4**	**239/630CAMKE4**	658	—	822	786	5	0.18	5.6	3.8	3.7	259
	920	212	7.5	5 900 000	12 700 000	400	—	280	**230/630CAME4**	**230/630CAMKE4**	666	—	884	835	6	0.22	4.7	3.1	3.1	468
	920	290	7.5	7 550 000	17 700 000	280	—	220	**240/630CAME4**	**240/630CAMK30E4**	666	—	884	815	6	0.30	3.3	2.2	2.2	637
	1 030	315	7.5	9 600 000	19 400 000	260	—	200	231/630CAME4	231/630CAMKE4	666	—	994	900	6	0.30	3.4	2.3	2.2	1 040
	1 030	400	7.5	11 300 000	23 900 000	160	—	200	**241/630CAME4**	**241/630CAMK30E4**	666	—	994	876	6	0.38	2.7	1.8	1.7	1 250
	1 150	412	12	13 400 000	25 600 000	200	—	180	**232/630CAME4**	**232/630CAMKE4**	684	—	1 096	970	10	0.37	2.8	1.9	1.8	1 850
670	900	170	6	4 350 000	10 300 000	380	—	260	**239/670CAME4**	**239/670CAMKE4**	698	—	872	836	5	0.17	5.8	3.9	3.8	300
	980	230	7.5	6 850 000	15 000 000	360	—	240	**230/670CAME4**	**230/670CAMKE4**	706	—	944	891	6	0.22	4.7	3.1	3.1	571
	980	308	7.5	8 450 000	19 500 000	260	—	200	**240/670CAME4**	**240/670CAMK30E4**	706	—	944	868	6	0.30	3.3	2.2	2.2	773
	1 090	336	7.5	10 600 000	21 600 000	240	—	190	**231/670CAME4**	**231/670CAMKE4**	706	—	1 054	952	6	0.30	3.3	2.2	2.2	1 230
	1 090	412	7.5	12 400 000	26 500 000	150	—	190	**241/670CAME4**	**241/670CAMK30E4**	706	—	1 054	934	6	0.37	2.7	1.8	1.8	1 440
	1 220	438	12	14 900 000	28 700 000	180	—	170	**232/670CAME4**	**232/670CAMKE4**	724	—	1 166	1 024	10	0.37	2.7	1.8	1.8	2 210
710	950	180	6	4 800 000	11 700 000	360	—	240	**239/710CAME4**	**239/710CAMKE4**	738	—	922	883	5	0.17	5.8	3.9	3.8	352
	1 030	236	7.5	7 100 000	15 800 000	340	—	240	**230/710CAME4**	**230/710CAMKE4**	746	—	994	936	6	0.22	4.6	3.1	3.0	647
	1 030	315	7.5	8 850 000	20 700 000	240	—	190	**240/710CAME4**	**240/710CAMK30E4**	746	—	994	916	6	0.29	3.4	2.3	2.2	861
	1 150	438	9.5	13 900 000	30 500 000	130	—	170	**241/710CAME4**	**241/710CAMK30E4**	754	—	1 106	981	8	0.38	2.6	1.8	1.7	1 730
	1 280	450	12	15 700 000	30 500 000	170	—	160	**232/710CAME4**	**232/710CAMKE4**	764	—	1 226	1 080	10	0.36	2.8	1.9	1.8	2 470
750	1 000	185	6	5 250 000	12 800 000	320	—	220	**239/750CAME4**	**239/750CAMKE4**	778	—	972	931	5	0.17	6.0	4.1	4.0	398
	1 090	250	7.5	7 750 000	17 200 000	320	—	220	**230/750CAME4**	**230/750CAMKE4**	786	—	1 054	990	6	0.22	4.6	3.1	3.0	768
	1 090	335	7.5	10 100 000	24 000 000	220	—	180	**240/750CAME4**	**240/750CAMK30E4**	786	—	1 054	969	6	0.29	3.4	2.3	2.2	1 030
	1 360	475	15	17 700 000	35 500 000	150	—	140	**232/750CAME4**	**232/750CAMKE4**	814	—	1 296	1 148	12	0.36	2.8	1.9	1.8	2 980

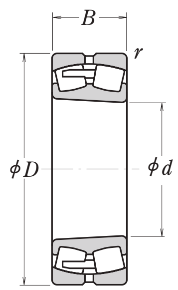
Note ([1]) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).

SPHERICAL ROLLER BEARINGS

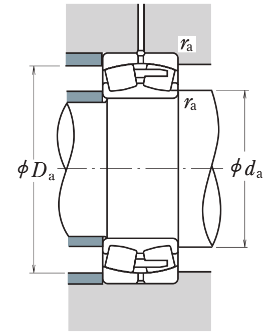
Bore Diameter 800 – 1400 mm



Cylindrical Bore



Tapered Bore



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

The values of e, Y_2, Y_3, and Y_0 are given in the table below.

Boundary Dimensions (mm)				Basic Load Ratings (N)		Speeds (min⁻¹)			Bearing Desginations		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
						Thermal Reference Speed	Limiting Speeds													
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore	Tapered Bore(¹)	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
800	1 060	195	6	5 600 000	13 700 000	300	—	220	**239/800CAME4**	**239/800CAMKE4**	828	—	1 032	987	5	0.17	6.0	4.0	3.9	462
	1 150	258	7.5	8 350 000	19 100 000	300	—	200	**230/800CAME4**	**230/800CAMKE4**	836	—	1 114	1 045	6	0.21	4.7	3.2	3.1	870
	1 150	345	7.5	10 900 000	26 300 000	200	—	160	**240/800CAME4**	**240/800CAMK30E4**	836	—	1 114	1 029	6	0.27	3.7	2.5	2.5	1 130
	1 280	375	9.5	13 800 000	29 200 000	190	—	150	231/800CAME4	231/800CAMKE4	844	—	1 236	1 127	8	0.28	3.6	2.4	2.3	1 870
	1 420	488	15	20 300 000	41 000 000	130	—	130	**232/800CAME4**	**232/800CAMKE4**	864	—	1 356	1 208	12	0.35	2.8	1.9	1.9	3 250
850	1 120	200	6	6 100 000	15 200 000	280	—	190	**239/850CAME4**	**239/850CAMKE4**	878	—	1 092	1 046	5	0.16	6.2	4.2	4.1	523
	1 220	272	7.5	9 300 000	21 400 000	280	—	180	**230/850CAME4**	**230/850CAMKE4**	886	—	1 184	1 109	6	0.21	4.8	3.2	3.1	1 020
	1 220	365	7.5	11 600 000	28 300 000	190	—	150	**240/850CAME4**	**240/850CAMK30E4**	886	—	1 184	1 093	6	0.28	3.6	2.4	2.4	1 350
	1 500	515	15	22 300 000	45 500 000	120	—	120	**232/850CAME4**	**232/850CAMKE4**	914	—	1 436	1 274	12	0.35	2.8	1.9	1.9	3 890
900	1 180	206	6	6 600 000	16 700 000	260	—	180	**239/900CAME4**	**239/900CAMKE4**	928	—	1 152	1 103	5	0.16	6.4	4.3	4.2	591
	1 280	280	7.5	9 850 000	22 800 000	260	—	160	230/900CAME4	230/900CAMKE4	936	—	1 244	1 169	6	0.20	4.9	3.3	3.2	1 160
	1 280	375	7.5	12 800 000	31 500 000	170	—	140	**240/900CAME4**	**240/900CAMK30E4**	936	—	1 244	1 147	6	0.28	3.6	2.4	2.4	1 520
	1 580	515	15	23 400 000	47 500 000	120	—	110	**232/900CAME4**	**232/900CAMKE4**	964	—	1 516	1 354	12	0.33	3.0	2.0	2.0	4 300
950	1 250	224	7.5	7 600 000	19 900 000	240	—	160	**239/950CAME4**	**239/950CAMKE4**	986	—	1 214	1 169	6	0.16	6.3	4.2	4.1	732
	1 360	300	7.5	11 300 000	26 500 000	240	—	150	**230/950CAME4**	**230/950CAMKE4**	986	—	1 324	1 241	6	0.21	4.8	3.2	3.2	1 400
	1 360	412	7.5	14 500 000	36 500 000	160	—	120	**240/950CAME4**	**240/950CAMK30E4**	986	—	1 324	1 219	6	0.28	3.6	2.4	2.3	1 880
	1 660	530	15	24 700 000	50 500 000	110	—	100	**232/950CAME4**	**232/950CAMKE4**	1 014	—	1 596	1 428	12	0.32	3.1	2.1	2.1	4 800
1 000	1 320	236	7.5	8 200 000	21 700 000	220	—	150	239/1000CAME4	239/1000CAMKE4	1 036	—	1 284	1 229	6	0.16	6.4	4.3	4.2	881
	1 420	308	7.5	11 900 000	28 100 000	220	—	140	230/1000CAME4	230/1000CAMKE4	1 036	—	1 384	1 298	6	0.20	4.9	3.3	3.2	1 560
	1 420	412	7.5	15 300 000	38 500 000	150	—	110	**240/1000CAME4**	**240/1000CAMK30E4**	1 036	—	1 384	1 275	6	0.27	3.7	2.5	2.4	2 010
1 060	1 400	250	7.5	9 300 000	24 400 000	200	—	130	**239/1060CAME4**	**239/1060CAMKE4**	1 096	—	1 364	1 302	6	0.16	6.1	4.1	4.0	1 030
	1 500	325	9.5	13 000 000	31 500 000	200	—	120	**230/1060CAME4**	**230/1060CAMKE4**	1 104	—	1 456	1 368	8	0.21	4.9	3.3	3.2	1 790
	1 500	438	9.5	16 800 000	43 000 000	140	—	100	240/1060CAME4	240/1060CAMK30E4	1 104	—	1 456	1 346	8	0.28	3.6	2.4	2.4	2 410
1 120	1 580	345	9.5	15 400 000	38 000 000	180	—	110	230/1120CAME4	230/1120CAMKE4	1 164	—	1 536	1 444	8	0.20	5.0	3.4	3.3	2 120
	1 580	462	9.5	18 700 000	49 500 000	120	—	95	**240/1120CAME4**	**240/1120CAMK30E4**	1 164	—	1 536	1 421	8	0.27	3.7	2.5	2.5	2 790
1 180	1 660	475	9.5	20 200 000	52 500 000	120	—	85	240/1180CAME4	240/1180CAMK30E4	1 224	—	1 616	1 494	8	0.27	3.7	2.5	2.4	3 180
1 250	1 750	500	9.5	21 000 000	59 500 000	110	—	75	**240/1250CAME4**	**240/1250CAMK30E4**	1 294	—	1 706	1 579	8	0.25	4.0	2.7	2.6	3 700
1 320	1 850	530	12	22 600 000	63 500 000	100	—	67	**240/1320CAME4**	**240/1320CAMK30E4**	1 374	—	1 796	1 656	10	0.26	3.9	2.6	2.6	4 400
1 400	1 950	545	12	24 500 000	65 000 000	95	—	60	**240/1400CAME4**	**240/1400CAMK30E4**	1 454	—	1 896	1 767	10	0.25	4.0	2.7	2.6	4 900

Note (¹) Suffixes K and K30 represent bearings with tapered bores (taper 1:12 or 1:30).