7. SPHERICAL ROLLER BEARINGS

TECHNICAL DATA

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SPHERICAL ROLLER BEARINGS

DESIGNS, TYPES AND FEATURES

High load capacity designs EA, C, CD and CA, shown in the figures are available. Types EA, C and CD have pressed steel cages, and type CA has machined brass cage. The EA type bearings listed here are classified as NSKHPS bearings, which offer particularly high load-carrying capacity, high limiting speeds and are highly functional under high-temperature operating conditions of up to 200°C.

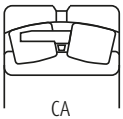
An oil groove and holes are provided in the outer ring to supply lubricant and the bearing numbers are suffixed with E4.

To use bearings with oil grooves and holes, it is recommended to provide an oil groove in the housing bore, since the depth of the groove in the bearing is limited. The number and dimensions of the oil groove and holes are shown in Tables 1 and 2.

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


EA


C and CD


CA

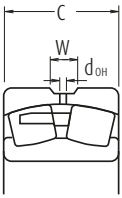


Table 1 Dimensions of Oil Grooves and Holes

Units : mm

Nominal Outer Ring Width C		Oil Groove Width W	Hole Diameter d_{OH}
over	incl.		
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 Diameter D (mm)		Number of Holes
over	incl.	
—	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

	Table	Pages
Tolerance and Running Accuracy	7.2	A 128 to A 131
Recommended Fits	8.3	A 164
	8.5	A 165
Internal Clearance	8.16	A 172

PERMISSIBLE MISALIGNMENT

The permissible misalignment of spherical roller bearings varies depending on the size and load, but it 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 conditions. Also, 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'(listed in the bearing tables), slippage occurs between the rollers and raceways, which may result in smearing. The higher the weight of the rollers and cage, 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.

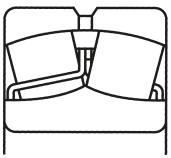
TECHNICAL DATA

Free Space of Spherical Roller Bearings

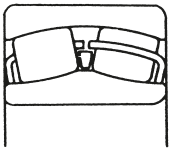
The spherical roller bearing has self-aligning ability and capacity to carry substantially large radial and bi-axial loads. For these reasons, this bearing is used widely in many applications. Application problems include a long span, which causes substantial deflection of the shaft, as well as installation errors and axial misalignment. These bearings may be exposed to a 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 considering the housing internal space.

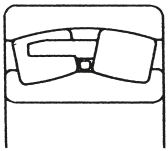
As a reference, the bearing free space for conventional types plus four other types (EA, C, CD, and CA) is shown in Table 1. Under general operating conditions, it is appropriate to pack a large quantity of grease into the bearing internal space and to pack grease into the housing internal space other than the bearing itself, to the extent of 1/3 to 2/3 that of the free space.



EA type



C, CD type



CA type

Table 1 Free Space of Spherical Roller Bearing (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, 22311 to 22324 are EA Type Bearings.
23122 to 23148, 23218 to 23244 are C Type Bearings.
23022 to 23036, 22228 to 22236 are CD Type Bearings.
23038 to 23060, 23152 to 23160, 22238 to 22260,
23248 to 23260, and 22326 to 22360 are CA Type Bearing.

Measurement of Bearing Clearance

For the bearing mounting, the measurement of internal bearing clearance is a most important task. Before handling the bearing and measuring the internal bearing clearance, be sure to wear thin rubber gloves. (If a bearing is touched by a bare hand, the touched part may rust.) When measuring the internal bearing clearance, pay careful attention so that the rollers are positioned correctly.

1. Measurement of Bearing Clearance

To measure only internal bearing clearance, set the bearing standing upright (vertically) on a flat surface, while holding its outer ring with one hand. While paying attention not to incline the inner and outer rings, stabilize the rollers by turning the inner ring to the right and left by about one half to one full rotation. Adjust rollers until one randomly chosen roller of the double rows is positioned to be exactly at the top. Now, the internal clearance is measured with a thickness gauge. The measurement position and measured point vary slightly depending on the size of the outer ring outside diameter.

1.1 Bearing Outside Diameter Is Smaller Than 200 mm

Insert the thickness gauge between rollers of 2 rows which have a roller positioned exactly at the top of the bearing and outer ring. Now, measure the internal clearance (Δ_r). (Fig. 1)

1.2 Bearing Outside Diameter Is Larger Than 200 mm

Insert the thickness gauge between the rollers of the 2 rows, which each have been positioned to be exactly at the top, and outer ring and between 2 rows of bearing at symmetrical position relative to the bearing center, then measure the respective internal clearance of the bearing. (Fig. 2). For the internal bearing clearance (Δ_r), take that value measured between 2 rows of just top of bearing and outer ring as respectively Δ_{rT1} and Δ_{rT2} and that value measured just at top of the bearing as Δ_{rT}.

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

Among internal clearances between 2 rows of rollers that are symmetrical relative to the bearing center and outer ring, take that measurement between 2 rows of rollers of left side respectively as Δ_{rL1} and Δ_{rL2}. The internal clearance on the left side of the bearing is Δ_{rL}:

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

Take that measurement between 2 rows of rollers of right side respectively as Δ_{rR1} and Δ_{rR2}. The internal clearance of the right side of the bearing is Δ_{rR}:

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

The internal bearing clearance (Δ_r) is given by the following equation:

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

2. Measuring Bearing Clearance When Mounted on Shaft or Sleeve

Basically, the measurement of the clearance istaken when the outer ring of bearing hangs down from rollers. At first, while holding the bearing up-right, rotate the outer ring in the clockwise and counter-clockwise directions by one half to one full rotation until both rows have a randomly chosen roller positioned exactly at the bottom. The clearance is measured with a thickness gauge butdiameter.

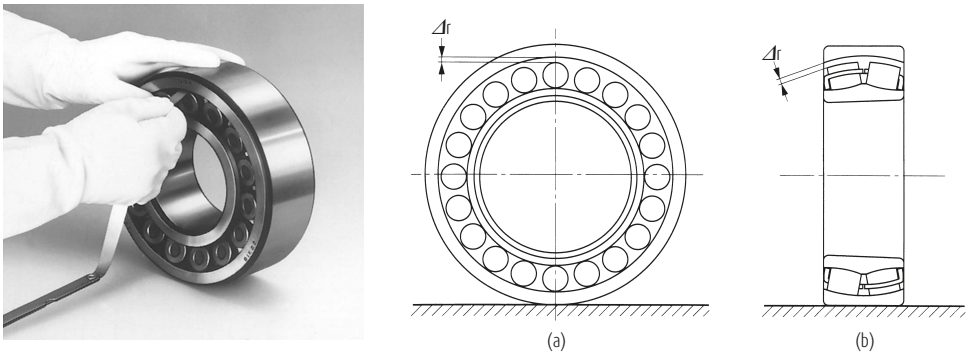


Fig. 1 Clearance Measurement Point (Bearing Outside Diameter: Less Than 200 mm)

the measurement point varies slightly depending on the size of the outer ring outside diameter.

2.1 Bearing Outside Diameter Is Smaller Than 200 mm

Insert the thickness gauge between rollers of 2 rows of just at the bottom of the bearing and outer ring and measure the internal clearance (Δ_{rS}).(Fig. 3)

2.2 Bearing Outside Diameter Is Larger Than 200 mm

Insert the thickness gauge between rollers of 2 rows that are positioned just at the bottom of bearing and outer ring and between 2 rows of bearing rollers symmetrical relative to the bearing center, then, measure the respective internal clearance of the bearing. (Fig. 3) For the internal bearing clearance (Δ_r), take the measurement when the roller is positioned exactly at the bottom, since the bearing has 2 rows, two values must be measured. The bearing internal clearance is Δ_{rS1} and Δ_{rS2} while that value measured at the exact bottom of the bearing is Δ_{rS}.

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

Among internal clearances between 2 rows of rollers symmetrical relative to the bearing center and outer ring, take that value measured between 2 rows of rollers of left side respectively as Δ_{rL1} and Δ_{rL2} and the internal clearance of left side of bearing as Δ_{rL}.

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

The internal clearances measured between 2 rows of rollers on the right side respectively as Δ_{rR1} and Δ_{rR2}. The internal clearance of right side of bearing is Δ_{rR}.

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

The internal bearing clearance (Δ_r) is given by the following equation:

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

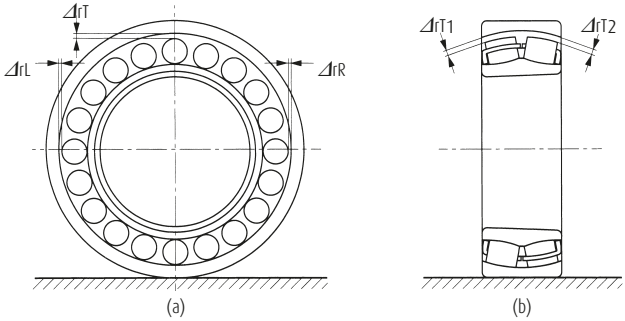


Fig. 2 Clearance Measurement Point (Bearing Outside Diameter: Larger Than 200 mm)

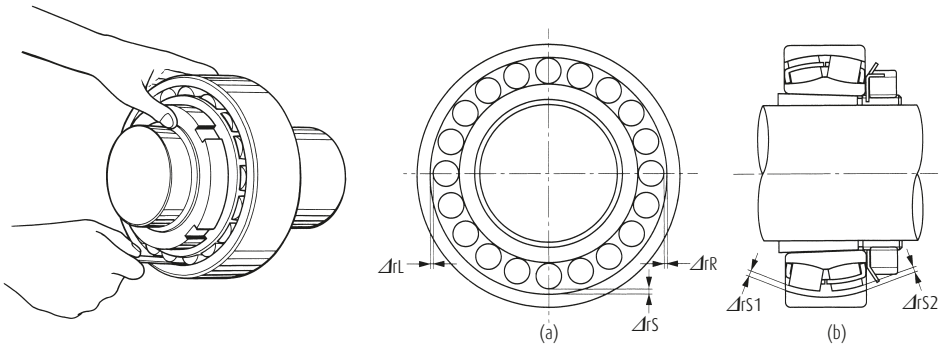


Fig. 3 Clearance Measurement Point

3. Temperature Equilibrium When Taking Measurements

To ensure accurate bearing measurement of the internal clearance or dimensions, the temperature of the measurement instrument and that of the components to be measured must be brought to the same temperature. Especially, if the bearing is mounted by using an oil heating tank or induction heater, then measure the internal clearance only after a complete cool down. For example, if a bearing is brought from the warehouse to the measurement place, the temperature of the stored bearing may still be high, thus, if the clearance or dimension were measured wihtout confirming the bearing temperature, the measured value may be wrong.

For a large bearing with an outer ring outside diameter that is larger than 400 mm, if a clearance or dimension measurement is necessary, it is recommended to leave the unpacked bearing for about 24 hours on the surface plate, before making a clearance or dimension measurement. Put the end face of the bearing on a surface plate prior to measurement to ensure a measurement with both objects at the same temperature.

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

Mount the bearing with its inner ring having a tapered bore to the tapered shaft or sleeve (adapter, removable sleeve). When pushing in the bearing to the tapered shaft or sleeve, the inner ring of bearing is widened resulting in increase of "interference" and reduction of internal clearance. It is important to give proper interference and internal clearance when mounting the bearing. Next, we show the reduction amount of the clearance to achieve the proper mounting.

(Mounting of spherical roller bearings having tapered bore Table 2)

When mounting a bearing, each time the bearing is pushed further onto the tapered shaft or sleeve, measure the variation of internal clearance and repeat the above procedure until the clearance reduction amount to the specified value listed in the Table 2 is attained. This procedure is called "Clearance adjustment" and when the clearance reduction amount is attained, the clearance necessary for bearing running is secured. The confirmation of the clearance reduction amount by measurement with a thickness gauge is very important. Depending on the method of clearance adjustment, the measured value obtained with the thickness gauge may not be correct. Therefore, the following corrective procedure must be executed.

1. In case to heat

When the temperatures of bearing and shaft are both at the same room temperature, measure again the clearance with the thickness gauge to confirm that the specified value is secured.

2. In case that a lock-washer is used as a turning stopper of the lock nut.

Prior to bending the tooth of the lock-washer into cutout of lock nut, measure again the clearance with the thickness gauge to confirm that the specified value is secured.

3. In case a hydraulic nut is used

After removal of the hydraulic nut, mount the lock nut and measure the clearance again to confirm that the specified value remains constant prior to stopping the turning.

4. In case an oil injection pump is used

Drop to zero the pressure of high pressure oil fed from the oil injection pump so that there is no pressure on bearing or sleeve fitted part. Next, measure the clearance with the thickness gauge to confirm that the specified value remains secured.

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

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

Internal Clearance Adjustment of Tapered-Bore Bearings

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

1. For measurement position and measured point, refer to Section 2.(Page B280) of this manual.
2. To mount a bearing on a tapered shaft, perform each time when the bearing is pushed in by the lock nut, end plate, end cap or hydraulic nut.
3. When using an adapter sleeve, perform each time when the bearing is pushed in by the lock nut or hydraulic nut.
4. When using a removable sleeve, perform each time when the removable sleeve is pushed in by the lock nut or hydraulic nut.

When measuring the clearance during those operations, as the outer ring of bearing is hanging down from of rollers, turn the outer ring to right and left by one half to one full rotation while keeping the bearing in its correct posture.

Position one randomly chosen roller from each row of rollers to the exact bottom position. Then, insert the thickness gauge to an appropriate place depending on size of the outer ring outside diameter to measure the internal clearance. For the clearance adjustment, the measured value of each clearance measurement shall be recorded.

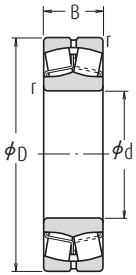
Table 2 Mounting of Spherical Roller Bearings with Tapered Bores

Units : mm

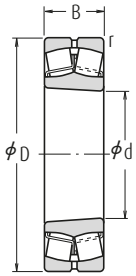
Bearing Bore Diameter d (mm)		Reduction in Radial Clearance		Axial Movement				Minimum Permissible Residual Clearance		
				Taper 1:12		Taper 1:30				
over	incl.	min.	max.	min.	max.	min.	max.	CN	C3	C4
30	40	0.025	0.030	0.40	0.45	—	—	0.010	0.025	0.035
40	50	0.030	0.035	0.45	0.55	—	—	0.015	0.030	0.045
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	1 000	0.340	0.460	5.5	7.4	14.0	18.5	0.310	0.470	0.730
1 000	1 120	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 for the reduction in radial internal clearance.

Bore Diameter 20 – 55 mm



Cylindrical Bore
EA

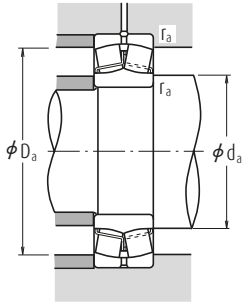


Tapered Bore
EA

Without an Oil Groove or Holes
CD

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
20	52	15	1.1	29 300	26 900	10 000	–	6 300	**21304CDE4**
25	52	18	1.0	37 500	37 000	10 000	–	7 100	**22205CE4**
	62	17	1.1	43 000	40 500	9 000	–	5 300	**21305CDE4**
30	62	20	1.0	50 000	50 000	8 500	–	6 000	**22206CE4**
	72	19	1.1	55 000	54 000	7 500	–	4 500	**21306CDE4**
35	72	23	1.1	69 000	71 000	7 500	–	5 300	**22207CE4**
	80	21	1.5	71 500	76 000	7 100	–	4 000	**21307CDE4**
40	80	23	1.1	113 000	99 000	7 100	12 000	6 700	**22208EAE4***
	90	23	1.5	118 000	111 000	6 700	11 000	6 000	**21308EAE4***
	90	33	1.5	170 000	153 000	5 600	9 000	5 300	**22308EAE4***
45	85	23	1.1	118 000	111 000	6 300	11 000	6 000	**22209EAE4***
	100	25	1.5	149 000	144 000	6 000	9 000	5 000	**21309EAE4***
	100	36	1.5	207 000	195 000	5 000	8 000	4 500	**22309EAE4***
50	90	23	1.1	124 000	119 000	6 000	9 500	5 600	**22210EAE4***
	110	27	2.0	178 000	174 000	5 300	8 000	4 500	**21310EAE4***
	110	40	2.0	246 000	234 000	4 800	7 100	4 300	**22310EAE4***
55	100	25	1.5	149 000	144 000	5 300	9 000	5 300	**22211EAE4***
	120	29	2.0	178 000	174 000	5 300	8 000	4 500	**21311EAE4***
	120	43	2.0	292 000	292 000	4 300	6 000	3 800	**22311EAE4***

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



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

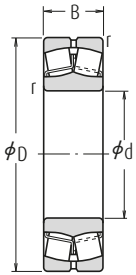
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
	d_a		D_a		r_a					
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
21304CDKE4	27	28	45	42	1.0	0.31	3.2	2.1	2.1	0.17
22205CKE4	31	31	46	45	1.0	0.35	2.9	1.9	1.9	0.17
21305CDKE4	32	34	55	51	1.0	0.29	3.4	2.3	2.3	0.26
22206CKE4	36	37	56	54	1.0	0.33	3.1	2.1	2.0	0.27
21306CDKE4	37	40	65	59	1.0	0.28	3.6	2.4	2.3	0.39
22207CKE4	42	43	65	63	1.0	0.32	3.1	2.1	2.0	0.42
21307CDKE4	44	47	71	67	1.5	0.28	3.6	2.4	2.4	0.53
22208EAKE4*	47	49	73	70	1.0	0.28	3.6	2.4	2.4	0.50
21308EAKE4*	49	54	81	75	1.5	0.25	3.9	2.7	2.6	0.73
22308EAKE4*	49	52	81	77	1.5	0.35	2.8	1.9	1.9	0.98
22209EAKE4*	52	54	78	75	1.0	0.25	3.9	2.7	2.6	0.55
21309EAKE4*	54	65	91	89	1.5	0.23	4.3	2.9	2.8	0.96
22309EAKE4*	54	59	91	86	1.5	0.34	2.9	2.0	1.9	1.34
22210EAKE4*	57	60	83	81	1.0	0.24	4.3	2.9	2.8	0.61
21310EAKE4*	60	72	100	98	2.0	0.23	4.4	3.0	2.9	1.21
22310EAKE4*	60	64	100	93	2.0	0.35	2.8	1.9	1.9	1.78
22211EAKE4*	64	65	91	89	1.5	0.23	4.3	2.9	2.8	0.81
21311EAKE4*	65	72	110	98	2.0	0.23	4.4	3.0	2.9	1.58
22311EAKE4*	65	73	110	103	2.0	0.34	2.9	2.0	1.9	2.3

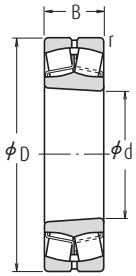
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B376 – B377, and B384**.

Bore Diameter 60 – 90 mm



Cylindrical Bore
EA

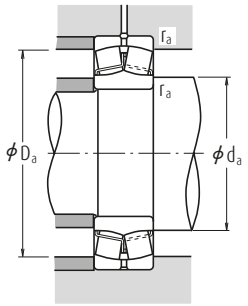


Tapered Bore
EA

Without an Oil Groove or Holes
CD

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
60	95	26.0	1.1	98 500	141 000	4 800	–	3 600	**23012CE4**
	110	28.0	1.5	178 000	174 000	5 300	8 000	4 800	**22212EAE4***
	130	31.0	2.1	238 000	244 000	4 800	6 700	3 800	**21312EAE4***
	130	46.0	2.1	340 000	340 000	4 000	5 600	3 600	**22312EAE4***
65	120	31.0	1.5	221 000	230 000	4 800	7 500	4 300	**22213EAE4***
	140	33.0	2.1	264 000	275 000	4 500	6 000	3 600	**21313EAE4***
	140	48.0	2.1	375 000	380 000	3 800	5 000	3 200	**22313EAE4***
70	125	31.0	1.5	225 000	232 000	4 500	7 100	4 000	**22214EAE4***
	150	35.0	2.1	310 000	325 000	4 300	5 600	3 200	**21314EAE4***
	150	51.0	2.1	425 000	435 000	3 600	4 800	3 000	**22314EAE4***
75	130	31.0	1.5	238 000	244 000	4 300	6 700	4 000	**22215EAE4***
	160	37.0	2.1	310 000	325 000	4 000	5 600	3 200	**21315EAE4***
	160	55.0	2.1	485 000	505 000	3 400	4 300	2 800	**22315EAE4***
80	140	33.0	2.0	264 000	275 000	4 000	6 000	3 600	**22216EAE4***
	170	39.0	2.1	355 000	375 000	3 800	4 800	3 000	**21316EAE4***
	170	58.0	2.1	540 000	565 000	3 200	3 800	2 600	**22316EAE4***
85	150	36.0	2.0	310 000	325 000	4 000	5 600	3 400	**22217EAE4***
	180	41.0	3.0	360 000	395 000	3 800	5 000	3 000	**21317EAE4***
	180	60.0	3.0	600 000	630 000	3 000	3 400	2 400	**22317EAE4***
90	160	40.0	2.0	360 000	395 000	3 800	5 000	3 200	**22218EAE4***
	160	52.4	2.0	340 000	490 000	2 800	–	1 800	**23218CE4**
	190	43.0	3.0	415 000	450 000	3 600	4 500	2 800	**21318EAE4***
	190	64.0	3.0	665 000	705 000	2 800	3 000	2 400	**22318EAE4***

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



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

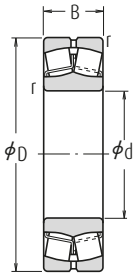
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
	d_a		D_a		r_a					
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
23012CKE4	67	68	88	85	1	0.26	3.9	2.6	2.5	0.68
22212EAKE4*	69	72	101	98	1.5	0.23	4.4	3.0	2.9	1.1
21312EAKE4*	72	87	118	117	2	0.22	4.5	3.0	3.0	1.98
22312EAKE4*	72	79	118	111	2	0.34	3.0	2.0	1.9	2.89
22213EAKE4*	74	80	111	107	1.5	0.24	4.2	2.8	2.7	1.51
21313EAKE4*	77	94	128	126	2	0.22	4.6	3.1	3.0	2.45
22313EAKE4*	77	84	128	119	2	0.33	3.0	2.0	2.0	3.52
22214EAKE4*	79	84	116	111	1.5	0.23	4.3	2.9	2.8	1.58
21314EAKE4*	82	101	138	135	2	0.22	4.6	3.1	3.0	3.0
22314EAKE4*	82	91	138	129	2	0.33	3.0	2.0	2.0	4.28
22215EAKE4*	84	87	121	117	1.5	0.22	4.5	3.0	3.0	1.64
21315EAKE4*	87	101	148	134	2	0.22	4.6	3.1	3.0	3.64
22315EAKE4*	87	97	148	137	2	0.33	3.0	2.0	2.0	5.26
22216EAKE4*	90	94	130	126	2	0.22	4.6	3.1	3.0	2.01
21316EAKE4*	92	109	158	146	2	0.23	4.4	3.0	2.9	4.32
22316EAKE4*	92	103	158	145	2	0.33	3.0	2.0	2.0	6.23
22217EAKE4*	95	101	140	135	2	0.22	4.6	3.1	3.0	2.54
21317EAKE4*	99	108	166	142	2.5	0.24	4.3	2.9	2.8	5.2
22317EAKE4*	99	110	166	155	2.5	0.33	3.1	2.1	2.0	7.23
22218EAKE4*	100	108	150	142	2	0.24	4.3	2.9	2.8	3.3
23218CKE4	100	105	150	138	2	0.32	3.2	2.1	2.1	4.51
21318EAKE4*	104	115	176	152	2.5	0.24	4.3	2.9	2.8	6.1
22318EAKE4*	104	115	176	163	2.5	0.33	3.1	2.1	2.0	8.56

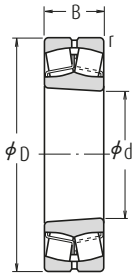
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B376 – B379, and B384 – B385**.

Bore Diameter 95 – 110 mm



Cylindrical Bore
EA

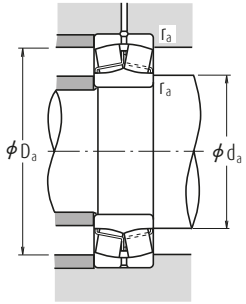


Tapered Bore
EA

Without an Oil Groove or Holes
CD

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
95	170	43.0	2.1	415 000	450 000	3 800	4 500	3 000	**22219EAE4***
	170	55.6	2.1	370 000	525 000	2 600	—	1 700	**23219CAME4**
	200	45.0	3.0	430 000	435 000	3 600	—	1 500	**21319CAME4***
	200	45.0	3.0	430 000	435 000	3 600	—	1 500	**21319CE4**
	200	67.0	3.0	735 000	780 000	2 600	3 000	2 200	**22319EAE4***
100	150	37.0	1.5	212 000	335 000	3 200	—	2 200	**23020CDE4**
	150	50.0	1.5	276 000	470 000	2 800	—	1 800	**24020CE4**
	165	52.0	2.0	345 000	530 000	2 800	—	1 700	**23120CE4**
	165	65.0	2.0	345 000	535 000	2 400	—	1 700	**24120CAME4**
	180	46.0	2.1	455 000	490 000	3 600	4 300	2 800	**22220EAE4***
	180	60.3	2.1	525 000	605 000	2 800	3 800	1 600	**23220CAME4***
	180	60.3	2.1	525 000	605 000	2 800	—	1 600	**23220CE4**
	215	47.0	3.0	495 000	485 000	3 400	4 500	1 400	**21320CAME4***
	215	47.0	3.0	495 000	485 000	3 400	—	1 400	**21320CE4**
	215	73.0	3.0	750 000	785 000	2 600	3 400	1 700	**22320CAME4(2)***
110	170	45.0	2.0	293 000	465 000	3 200	—	2 000	**23022CDE4**
	170	60.0	2.0	380 000	645 000	2 800	—	1 600	**24022CE4**
	180	56.0	2.0	480 000	630 000	3 200	4 000	1 600	**23122CAME4***
	180	56.0	2.0	480 000	630 000	3 200	—	1 600	**23122CE4**
	180	69.0	2.0	575 000	750 000	2 200	3 400	1 600	**24122CAME4***
	180	69.0	2.0	575 000	750 000	2 200	—	1 600	**24122CE4**
	200	53.0	2.1	605 000	645 000	3 400	3 400	2 600	**22222EAE4***
	200	69.8	2.1	645 000	760 000	2 600	3 400	1 500	**23222CAME4***
	200	69.8	2.1	645 000	760 000	2 200	—	1 500	**23222CE4**
	240	50.0	3.0	450 000	545 000	3 000	—	1 300	**21322CAE4**
	240	50.0	3.0	565 000	545 000	3 000	4 300	1 300	**21322CAME4***
	240	80.0	3.0	1 030 000	1 120 000	2 200	—	1 500	**22322EAE4***
	240	80.0	3.0	925 000	980 000	2 200	3 000	1 500	**22322CAME4(2)***

Notes (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).
(2) EA is also available. Load rating of EA is around 10% higher than CAM's, please consult NSK.



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

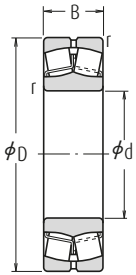
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
	d_a		D_a		r_a					
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
22219EAKE4*	107	115	158	152	2	0.24	4.3	2.9	2.8	4.04
23219CAME4	107	—	158	146	2	0.32	3.1	2.1	2.0	5.33
21319CAME4*	109	127	186	172	2.5	0.22	4.6	3.1	3.0	6.92
21319CKE4	109	127	186	172	2.5	0.22	4.6	3.1	3.0	6.92
22319EAE4*	109	121	186	172	2.5	0.33	3.1	2.1	2.0	9.91
23020CDKE4	109	112	141	136	1.5	0.22	4.6	3.1	3.0	2.31
24020CK30E4	109	110	141	132	1.5	0.30	3.4	2.3	2.2	3.08
23120CKE4	110	113	155	144	2	0.30	3.4	2.3	2.2	4.38
24120CAMK30E4	110	—	155	143	2	0.35	2.9	1.9	1.9	5.42
22220EAKE4*	112	119	168	160	2	0.24	4.3	2.9	2.8	4.84
23220CAMKE4*	112	118	168	155	2	0.32	3.2	2.1	2.1	6.6
23220CKE4	112	118	168	155	2	0.32	3.2	2.1	2.1	6.6
21320CAMKE4*	114	133	201	184	2.5	0.21	4.7	3.2	3.1	8.46
21320CKE4	114	133	201	184	2.5	0.21	4.7	3.2	3.1	8.46
22320CAMKE4(2)*	114	130	201	184	2.5	0.33	3.0	2.0	2.0	12.7
23022CDKE4	120	124	160	153	2	0.24	4.2	2.8	2.8	3.76
24022CK30E4	120	121	160	148	2	0.32	3.1	2.1	2.1	4.96
23122CAMKE4*	120	127	170	158	2	0.28	3.5	2.4	2.3	5.7
23122CKE4	120	127	170	158	2	0.29	3.6	2.4	2.3	5.8
24122CAMK30E4*	120	123	170	154	2	0.36	2.8	1.9	1.8	6.84
24122CK30E4	120	123	170	154	2	0.37	2.9	1.9	1.8	6.85
22222EAKE4*	122	129	188	178	2	0.25	4.0	2.7	2.6	6.99
23222CAMKE4*	122	130	188	170	2	0.34	3.0	2.0	1.9	9.54
23222CKE4	122	130	188	170	2	0.35	3.1	2.1	1.10	9.55
21322CAKE4	124	—	226	206	2.5	0.22	4.6	3.1	3.0	11.2
21322CAMKE4*	124	—	226	206	2.5	0.22	4.6	3.1	3.0	11.2
22322EAKE4*	124	145	226	206	2.5	0.33	3.1	2.1	2.0	17.6
22322CAMKE4(2)*	124	145	226	206	2.5	0.33	3.1	2.1	2.0	17.6

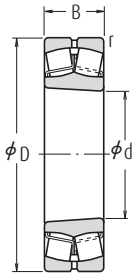
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of Shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B379 and B385.**

Bore Diameter 120 – 130 mm



Cylindrical Bore
EA

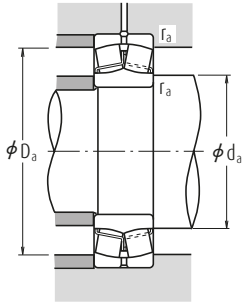


Tapered Bore
EA

Without an Oil Groove or Holes
CD

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
120	180	46.0	2.0	395 000	525 000	3 200	4 500	1 800	**23024CAME4** *
	180	46.0	2.0	395 000	525 000	3 200	—	1 800	**23024CDE4**
	180	60.0	2.0	480 000	680 000	2 600	3 600	1 500	**24024CAME4** *
	180	60.0	2.0	480 000	680 000	2 600	—	1 500	**24024CE4**
	200	62.0	2.0	580 000	720 000	2 800	3 600	1 400	**23124CAME4** *
	200	62.0	2.0	580 000	720 000	2 800	—	1 400	**23124CE4**
	200	80.0	2.0	695 000	905 000	2 000	3 000	1 400	**24124CAME4** *
	200	80.0	2.0	695 000	905 000	2 000	—	1 400	**24124CE4**
	215	58.0	2.1	685 000	765 000	3 200	3 000	2 400	**22224EAE4** *
	215	76.0	2.1	790 000	970 000	2 200	3 000	1 300	**23224CAME4** *
	215	76.0	2.1	790 000	970 000	2 000	—	1 300	**23224CE4**
	260	86.0	3.0	1 190 000	1 320 000	—	—	—	**22324EAE4***
	260	86.0	3.0	1 060 000	1 120 000	1 900	2 800	1 400	**22324CAME4**(2) *
130	200	52.0	2.0	500 000	655 000	3 000	3 800	1 700	**23026CAME4** *
	200	52.0	2.0	500 000	655 000	3 000	—	1 700	**23026CDE4**
	200	69.0	2.0	620 000	865 000	2 200	3 200	1 400	**24026CAME4** *
	200	69.0	2.0	620 000	865 000	2 200	—	1 400	**24026CE4**
	210	64.0	2.0	630 000	825 000	2 200	3 400	1 300	**23126CAME4** *
	210	64.0	2.0	630 000	825 000	2 600	—	1 300	**23126CE4**
	210	80.0	2.0	735 000	1 010 000	1 800	2 800	1 300	**24126CAME4** *
	210	80.0	2.0	735 000	1 010 000	1 800	—	1 300	**24126CE4**
	230	64.0	3.0	820 000	940 000	2 800	2 600	2 200	**22226EAE4** *
	230	80.0	3.0	875 000	1 080 000	2 000	2 800	1 200	**23226CAME4** *
	230	80.0	3.0	875 000	1 080 000	2 000	—	1 200	**23226CE4**
	280	93.0	4.0	1 240 000	1 350 000	1 800	2 600	1 300	**22326CAME4** *
	280	93.0	4.0	1 240 000	1 350 000	1 800	—	1 300	**22326CE4**

Notes (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).
(2) EA is also available. Load rating of EA is around 10% higher than CAM's, please consult NSK.



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

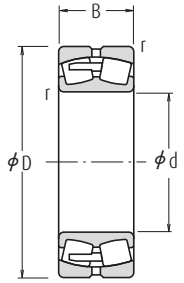
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
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.
23024CAMKE4 *	130	134	170	163	2	0.22	4.5	3.0	2.9	4.11
23024CDKE4	130	134	170	163	2	0.22	4.5	3.0	2.9	4.11
24024CAMK30E4 *	130	131	170	158	2	0.32	3.2	2.1	2.1	5.33
24024CK30E4	130	131	170	158	2	0.32	3.2	2.1	2.1	5.33
23124CAMKE4 *	130	138	190	175	2	0.29	3.5	2.4	2.3	7.85
23124CKE4	130	138	190	175	2	0.29	3.5	2.4	2.3	7.85
24124CAMK30E4 *	130	136	190	171	2	0.37	2.7	1.8	1.8	10
24124CK30E4	130	136	190	171	2	0.37	2.7	1.8	1.8	10
22224EAKE4 *	132	142	203	190	2	0.25	3.9	2.7	2.6	8.8
23224CAMKE4 *	132	140	203	182	2	0.34	2.9	2.0	1.9	12.1
23224CKE4	132	140	203	182	2	0.34	2.9	2.0	1.9	12.1
22324EAKE4*	134	157	246	222	2.5	0.32	3.1	2.1	2.0	22.2
22324CAMKE4(2) *	134	157	246	222	2.5	0.32	3.1	2.1	2.0	22.2
23026CAMKE4 *	140	147	190	180	2	0.23	4.3	2.9	2.8	5.98
23026CDKE4	140	147	190	180	2	0.23	4.3	2.9	2.8	5.98
24026CAMK30E4 *	140	143	190	175	2	0.31	3.2	2.2	2.1	7.84
24026CK30E4	140	143	190	175	2	0.31	3.2	2.2	2.1	7.84
23126CAMKE4 *	140	149	200	184	2	0.28	3.6	2.4	2.4	8.69
23126CKE4	140	149	200	184	2	0.28	3.6	2.4	2.4	8.69
24126CAMK30E4 *	140	146	200	180	2	0.35	2.9	1.9	1.9	10.7
24126CK30E4	140	146	200	180	2	0.35	2.9	1.9	1.9	10.7
22226EAKE4 *	144	152	216	204	2.5	0.26	3.8	2.6	2.5	11
23226CAMKE4 *	144	150	216	196	2.5	0.34	2.9	2.0	1.9	14.3
23226CKE4	144	150	216	196	2.5	0.34	2.9	2.0	1.9	14.3
22326CAMKE4 *	148	166	262	236	3	0.34	2.9	2.0	1.9	28.1
22326CKE4	148	166	262	236	3	0.34	2.9	2.0	1.9	28.1

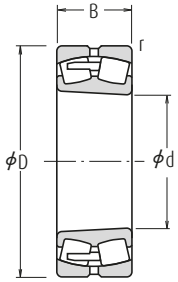
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of Shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B380 and B385.**

Bore Diameter 140 – 150 mm



Cylindrical Bore
CA

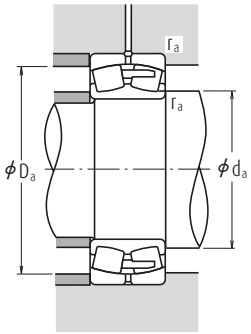


Tapered Bore
CA

Without an Oil Groove or Holes
CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
140	210	53	2	525 000	715 000	2 800	3 800	1 600	**23028CAME4** *
	210	53	2	420 000	715 000	2 800	–	1 600	**23028CDE4**
	210	69	2	635 000	905 000	2 200	3 000	1 300	**24028CAME4** *
	210	69	2	525 000	945 000	2 200	–	1 300	**24028CE4**
	225	68	2.1	725 000	945 000	2 400	3 200	1 200	**23128CAME4** *
	225	68	2.1	580 000	945 000	2 400	–	1 200	**23128CE4**
	225	85	2.1	835 000	1 160 000	1 600	2 600	1 200	**24128CAME4** *
	225	85	2.1	670 000	1 160 000	1 600	–	1 200	**24128CE4**
	250	68	3	835 000	945 000	2 600	3 200	1 400	**22228CAME4** *
	250	68	3	645 000	930 000	2 600	–	1 400	**22228CDE4**
	250	88	3	1 040 000	1 300 000	1 800	2 600	1 100	**23228CAME4** *
	250	88	3	835 000	1 300 000	1 800	–	1 100	**23228CE4**
	300	102	4	1 450 000	1 590 000	1 700	2 400	1 200	**22328CAME4** *
	300	102	4	1 160 000	1 590 000	1 700	–	1 200	**22328CE4**
150	225	56	2.1	590 000	815 000	2 600	3 600	1 400	**23030CAME4** *
	225	56	2.1	470 000	815 000	2 600	–	1 400	**23030CDE4**
	225	75	2.1	740 000	1 090 000	1 900	3 000	1 200	**24030CAME4** *
	225	75	2.1	590 000	1 090 000	1 900	–	1 200	**24030CE4**
	250	80	2.1	905 000	1 180 000	2 200	2 800	1 100	**23130CAME4** *
	250	80	2.1	725 000	1 180 000	2 200	–	1 100	**23130CE4**
	250	100	2.1	1 070 000	1 450 000	1 400	2 400	1 100	**24130CAME4** *
	250	100	2.1	890 000	1 530 000	1 400	–	1 100	**24130CE4**
	270	73	3	955 000	1 120 000	2 400	3 000	1 300	**22230CAME4** *
	270	73	3	765 000	1 120 000	2 400	–	1 300	**22230CDE4**
	270	96	3	1 220 000	1 560 000	1 700	2 400	1 100	**23230CAME4** *
	270	96	3	975 000	1 560 000	1 700	–	1 100	**23230CE4**
	320	108	4	1 530 000	1 690 000	1 600	2 200	1 100	**22330CAME4** *

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

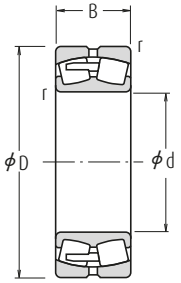
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
	d_a		D_a		r_a					
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
23028CAMKE4 *	150	157	200	190	2	0.22	4.5	3.0	2.9	6.49
23028CDKE4	150	157	200	190	2	0.22	4.5	3.0	2.9	6.49
24028CAMK30E4 *	150	154	200	186	2	0.29	3.4	2.3	2.2	8.37
24028CK30E4	150	154	200	186	2	0.29	3.4	2.3	2.2	8.37
23128CAMKE4 *	152	158	213	198	2	0.28	3.6	2.4	2.3	10.5
23128CKE4	152	158	213	198	2	0.28	3.6	2.4	2.3	10.5
24128CAMK30E4 *	152	156	213	193	2	0.35	2.9	1.9	1.9	13
24128CK30E4	152	156	213	193	2	0.35	2.9	1.9	1.9	13
22228CAMKE4 *	154	167	236	219	2.5	0.25	4.0	2.7	2.6	14.5
22228CDKE4	154	167	236	219	2.5	0.25	4.0	2.7	2.6	14.5
23228CAMKE4 *	154	163	236	213	2.5	0.35	2.9	1.9	1.9	18.8
23228CKE4	154	163	236	213	2.5	0.35	2.9	1.9	1.9	18.8
22328CAMKE4 *	158	177	282	253	3	0.35	2.9	1.9	1.9	35.4
22328CKE4	158	177	282	253	3	0.35	2.9	1.9	1.9	35.4
23030CAMKE4 *	162	168	213	203	2	0.22	4.6	3.1	3.0	7.9
23030CDKE4	162	168	213	203	2	0.22	4.6	3.1	3.0	7.9
24030CAMK30E4 *	162	165	213	198	2	0.30	3.4	2.3	2.2	10.5
24030CK30E4	162	165	213	198	2	0.30	3.4	2.3	2.2	10.5
23130CAMKE4 *	162	174	238	218	2	0.30	3.4	2.3	2.2	15.8
23130CKE4	162	174	238	218	2	0.30	3.4	2.3	2.2	15.8
24130CAMK30E4 *	162	169	238	212	2	0.38	2.6	1.8	1.7	19.8
24130CK30E4	162	169	238	212	2	0.38	2.6	1.8	1.7	19.8
22230CAMKE4 *	164	179	256	236	2.5	0.26	3.9	2.6	2.5	18.4
22230CDKE4	164	179	256	236	2.5	0.26	3.9	2.6	2.5	18.4
23230CAMKE4 *	164	176	256	230	2.5	0.35	2.9	1.9	1.9	24.2
23230CKE4	164	176	256	230	2.5	0.35	2.9	1.9	1.9	24.2
22330CAMKE4 *	164	—	302	270	3	0.35	2.9	1.9	1.9	41.5

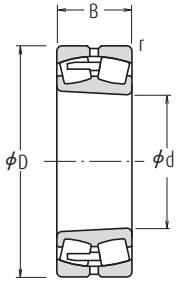
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B380 and B386**.

Bore Diameter 160 – 170 mm



Cylindrical Bore
CA

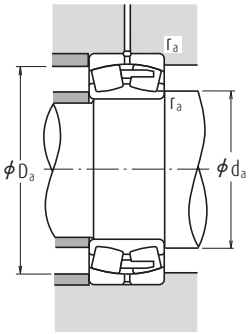


Tapered Bore
CA

Without an Oil Groove and Holes
CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
160	220	45	2	450 000	675 000	3 000	3 200	1 400	**23932CAME4** *
	220	45	2	360 000	675 000	3 000	–	1 400	**23932CAE4**
	240	60	2.1	675 000	955 000	2 400	3 200	1 300	**23032CAME4** *
	240	60	2.1	540 000	955 000	2 400	–	1 300	**23032CDE4**
	240	80	2.1	845 000	1 260 000	1 800	2 800	1 100	**24032CAME4** *
	240	80	2.1	680 000	1 260 000	1 800	–	1 100	**24032CE4**
	270	86	2.1	1 070 000	1 400 000	2 000	2 600	1 000	**23132CAME4** *
	270	86	2.1	855 000	1 400 000	2 000	–	1 000	**23132CE4**
	270	109	2.1	1 240 000	1 670 000	1 300	2 200	1 000	**24132CAME4** *
	270	109	2.1	1 040 000	1 760 000	1 300	–	1 000	**24132CE4**
	290	80	3	1 140 000	1 320 000	2 200	2 800	1 200	**22232CAME4** *
	290	80	3	910 000	1 320 000	2 200	–	1 200	**22232CDE4**
	290	104	3	1 370 000	1 770 000	1 500	2 200	1 000	**23232CAME4** *
	290	104	3	1 100 000	1 770 000	1 500	–	1 000	**23232CE4**
	340	114	4	1 700 000	1 900 000	1 400	2 200	1 100	**22332CAME4** *
170	230	45	2	450 000	680 000	3 000	3 600	1 400	**23934CAME4** *
	260	67	2.1	795 000	1 090 000	2 200	3 000	1 200	**23034CAME4** *
	260	67	2.1	640 000	1 090 000	2 200	–	1 200	**23034CDE4**
	260	90	2.1	1 030 000	1 520 000	1 600	2 400	1 000	**24034CAME4** *
	260	90	2.1	825 000	1 520 000	1 600	–	1 000	**24034CE4**
	280	88	2.1	1 180 000	1 570 000	1 800	2 600	1 000	**23134CAME4** *
	280	88	2.1	940 000	1 570 000	1 800	–	1 000	**23134CE4**
	280	109	2.1	1 280 000	1 770 000	1 200	2 200	1 000	**24134CAME4** *
	280	109	2.1	1 080 000	1 860 000	1 200	–	1 000	**24134CE4**
	310	86	4	1 240 000	1 500 000	2 000	2 600	1 100	**22234CAME4** *
	310	86	4	990 000	1 500 000	2 000	–	1 100	**22234CDE4**
	310	110	4	1 500 000	1 910 000	1 400	2 200	900	**23234CAME4** *
	310	110	4	1 200 000	1 910 000	1 400	–	900	**23234CE4**
	360	120	4	1 970 000	2 110 000	1 300	2 000	1 000	**22334CAME4** *

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

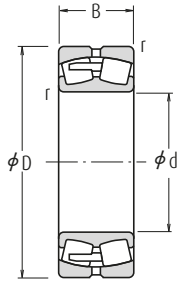
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
	d_a		D_a		r_a					
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
23932CAMKE4 *	170	—	210	203	2	0.18	5.6	3.8	3.7	4.97
23932CAKE4	170	—	210	203	2	0.18	5.6	3.8	3.7	4.97
23032CAMKE4 *	172	179	228	216	2	0.22	4.5	3.0	2.9	9.66
23032CDKE4	172	179	228	216	2	0.22	4.5	3.0	2.9	9.66
24032CAMK30E4 *	172	177	228	212	2	0.30	3.4	2.3	2.2	12.7
24032CK30E4	172	177	228	212	2	0.30	3.4	2.3	2.2	12.7
23132CAMKE4 *	172	185	258	234	2	0.30	3.4	2.3	2.2	20.3
23132CKE4	172	185	258	234	2	0.30	3.4	2.3	2.2	20.3
24132CAMK30E4 *	172	179	258	229	2	0.39	2.6	1.7	1.7	25.4
24132CK30E4	172	179	258	229	2	0.39	2.6	1.7	1.7	25.4
22232CAMKE4 *	174	190	276	255	2.5	0.26	3.8	2.6	2.5	23.1
22232CDKE4	174	190	276	255	2.5	0.26	3.8	2.6	2.5	23.1
23232CAMKE4 *	174	189	276	245	2.5	0.34	2.9	2.0	1.9	30.5
23232CKE4	174	189	276	245	2.5	0.34	2.9	2.0	1.9	30.5
22332CAMKE4 *	178	—	322	287	3	0.35	2.9	1.9	1.9	49.3
23934CAMKE4 *	180	—	220	213	2	0.17	5.8	3.9	3.8	5.38
23034CAMKE4 *	182	191	248	233	2	0.23	4.3	2.9	2.8	13
23034CDKE4	182	191	248	233	2	0.23	4.3	2.9	2.8	13
24034CAMK30E4 *	182	188	248	228	2	0.31	3.2	2.2	2.1	17.3
24034CK30E4	182	188	248	228	2	0.31	3.2	2.2	2.1	17.3
23134CAMKE4 *	182	194	268	245	2	0.29	3.5	2.3	2.3	21.8
23134CKE4	182	194	268	245	2	0.29	3.5	2.3	2.3	21.8
24134CAMK30E4 *	182	190	268	239	2	0.37	2.7	1.8	1.8	26.6
24134CK30E4	182	190	268	239	2	0.37	2.7	1.8	1.8	26.6
22234CAMKE4 *	188	206	292	270	3	0.26	3.8	2.6	2.5	28.8
22234CDKE4	188	206	292	270	3	0.26	3.8	2.6	2.5	28.8
23234CAMKE4 *	188	201	292	261	3	0.34	2.9	2.0	1.9	36.4
23234CKE4	188	201	292	261	3	0.34	2.9	2.0	1.9	36.4
22334CAMKE4 *	188	—	342	304	3	0.35	2.9	1.9	1.9	57.9

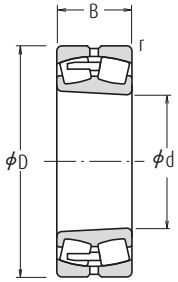
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B380 and B386**.

Bore Diameter 180 – 190 mm



Cylindrical Bore
CA

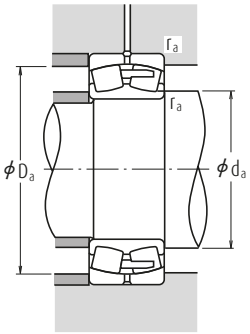


Tapered Bore
CA

Without an Oil Groove and Holes
CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
180	250	52	2	470 000	890 000	2 600	–	1 200	**23936CAE4**
	250	52	2	590 000	890 000	2 600	3 000	1 200	**23936CAME4** *
	280	74	2.1	935 000	1 270 000	2 000	2 800	1 200	**23036CAME4** *
	280	74	2.1	750 000	1 270 000	2 000	–	1 200	**23036CDE4**
	280	100	2.1	1 210 000	1 750 000	1 500	2 200	950	**24036CAME4** *
	280	100	2.1	965 000	1 750 000	1 500	–	950	**24036CE4**
	300	96	3	1 320 000	1 760 000	1 700	2 200	900	**23136CAME4** *
	300	96	3	1 050 000	1 760 000	1 700	–	900	**23136CE4**
	300	118	3	1 490 000	2 040 000	1 100	2 000	900	**24136CAME4** *
	300	118	3	1 190 000	2 040 000	1 100	–	900	**24136CE4**
	320	86	4	1 280 000	1 540 000	2 000	2 600	1 100	**22236CAME4** *
	320	86	4	1 020 000	1 540 000	2 000	–	1 100	**22236CDE4**
	320	112	4	1 620 000	2 110 000	1 300	2 000	850	**23236CAME4** *
	320	112	4	1 300 000	2 110 000	1 300	–	850	**23236CE4**
	380	126	4	2 170 000	2 340 000	1 200	2 000	950	**22336CAME4** *
190	260	52	2	575 000	875 000	2 600	3 000	1 200	**23938CAME4** *
	290	75	2.1	970 000	1 350 000	2 000	2 600	1 100	**23038CAME4** *
	290	100	2.1	1 220 000	1 840 000	1 400	2 200	900	**24038CAME4** *
	290	100	2.1	975 000	1 840 000	1 400	–	900	**24038CE4**
	320	104	3	1 480 000	2 020 000	1 600	2 200	850	**23138CAME4** *
	320	104	3	1 190 000	2 020 000	1 600	–	850	**23138CE4**
	320	128	3	1 710 000	2 330 000	1 000	1 900	850	**24138CAME4** *
	320	128	3	1 370 000	2 330 000	1 000	–	850	**24138CE4**
	340	92	4	1 420 000	1 730 000	1 800	2 400	1 000	**22238CAME4** *
	340	120	4	1 800 000	2 350 000	1 200	1 900	800	**23238CAME4** *
	340	120	4	1 440 000	2 350 000	1 200	–	800	**23238CE4**
	400	132	5	2 370 000	2 590 000	1 200	1 900	900	**22338CAME4** *

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

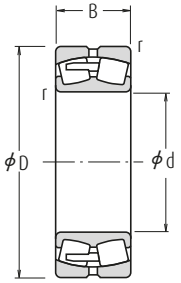
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
	d_a		D_a		r_a					
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
23936CAKE4	190	—	240	230	2	0.18	5.5	3.7	3.6	7.64
23936CAMKE4*	190	—	240	230	2	0.18	5.5	3.7	3.6	7.64
23036CAMKE4*	192	202	268	249	2	0.24	4.2	2.8	2.8	17.1
23036CDKE4	192	202	268	249	2	0.24	4.2	2.8	2.8	17.1
24036CAMK30E4*	192	200	268	245	2	0.32	3.1	2.1	2.0	22.7
24036CK30E4	192	200	268	245	2	0.32	3.1	2.1	2.0	22.7
23136CAMKE4*	194	206	286	260	2.5	0.30	3.4	2.3	2.2	27.5
23136CKE4	194	206	286	260	2.5	0.30	3.4	2.3	2.2	27.5
24136CAMK30E4*	194	202	286	255	2.5	0.37	2.7	1.8	1.8	33.1
24136CK30E4	194	202	286	255	2.5	0.37	2.7	1.8	1.8	33.1
22236CAMKE4*	198	212	302	278	3	0.26	3.9	2.6	2.6	30.2
22236CDKE4	198	212	302	278	3	0.26	3.9	2.6	2.6	30.2
23236CAMKE4*	198	211	302	274	3	0.33	3.0	2.0	2.0	38.9
23236CKE4	198	211	302	274	3	0.33	3.0	2.0	2.0	38.9
22336CAMKE4*	198	—	362	322	3	0.34	2.9	2.0	1.9	67
23938CAMKE4*	200	—	250	240	2	0.18	5.7	3.8	3.7	8.03
23038CAMKE4*	202	—	278	261	2	0.24	4.2	2.8	2.8	17.6
24038CAMK30E4*	202	210	278	253	2	0.31	3.2	2.2	2.1	24
24038CK30E4	202	210	278	253	2	0.31	3.2	2.2	2.1	24
23138CAMKE4*	204	219	306	276	2.5	0.31	3.3	2.2	2.2	34.5
23138CKE4	204	219	306	276	2.5	0.31	3.3	2.2	2.2	34.5
24138CAMK30E4*	204	211	306	269	2.5	0.40	2.5	1.7	1.6	41.5
24138CK30E4	204	211	306	269	2.5	0.40	2.5	1.7	1.6	41.5
22238CAMKE4*	208	—	322	296	3	0.26	3.8	2.6	2.5	35.5
23238CAMKE4*	208	222	322	288	3	0.35	2.9	1.9	1.9	47.6
23238CKE4	208	222	322	288	3	0.35	2.9	1.9	1.9	47.6
22338CAMKE4*	212	—	378	338	4	0.34	2.9	2.0	1.9	77.6

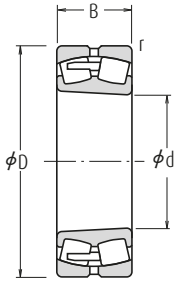
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B381, and B386 – B387**.

Bore Diameter 200 – 220 mm



Cylindrical Bore
CA

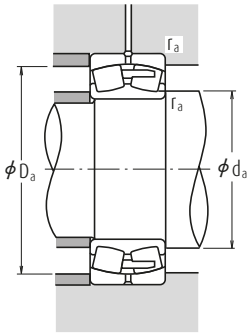


Tapered Bore
CA

Without an Oil Groove and Holes
CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
200	280	60	2.1	570 000	1 060 000	–	–	–	**23940CAE4**
	280	60	2.1	710 000	1 060 000	2 400	2 600	1 100	**23940CAME4** *
	310	82	2.1	1 180 000	1 700 000	1 800	2 400	1 000	**23040CAME4** *
	310	109	2.1	1 420 000	2 120 000	1 300	2 000	850	**24040CAME4** *
	310	109	2.1	1 140 000	2 120 000	1 300	–	850	**24040CE4**
	340	112	3	1 700 000	2 330 000	1 500	2 000	800	**23140CAME4** *
	340	112	3	1 360 000	2 330 000	1 500	–	800	**23140CE4**
	340	140	3	1 960 000	2 660 000	950	1 800	800	**24140CAME4** *
	340	140	3	1 570 000	2 670 000	950	–	800	**24140CE4**
	360	98	4	1 620 000	2 010 000	1 700	2 200	950	**22240CAME4** *
	360	128	4	2 070 000	2 750 000	1 100	1 800	750	**23240CAME4** *
	360	128	4	1 660 000	2 750 000	1 100	–	750	**23240CE4**
	420	138	5	2 500 000	2 990 000	1 000	1 700	850	**22340CAME4** *
220	300	60	2.1	785 000	1 240 000	2 200	2 600	1 000	**23944CAME4** *
	340	90	3	1 360 000	1 980 000	1 600	2 200	950	**23044CAME4** *
	340	118	3	1 640 000	2 490 000	1 200	1 900	750	**24044CAME4** *
	340	118	3	1 360 000	2 600 000	1 200	–	750	**24044CE4**
	370	120	4	1 960 000	2 710 000	1 300	1 800	710	**23144CAME4** *
	370	120	4	1 570 000	2 710 000	1 300	–	710	**23144CE4**
	370	150	4	2 250 000	3 200 000	850	1 600	710	**24144CAME4** *
	370	150	4	1 800 000	3 200 000	850	–	710	**24144CE4**
	400	108	4	1 960 000	2 430 000	1 500	2 000	850	**22244CAME4** *
	400	144	4	2 520 000	3 400 000	1 000	1 600	670	**23244CAME4** *
	400	144	4	2 020 000	3 400 000	850	–	670	**23244CE4**
	460	145	5	2 940 000	3 400 000	950	1 600	750	**22344CAME4** *

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

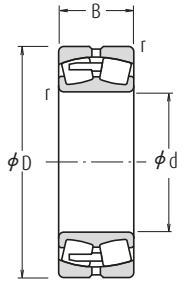
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
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.
23940CAKE4	212	—	268	258	2	0.20	5.1	3.4	3.3	11
23940CAMKE4*	212	—	268	258	2	0.20	5.1	3.4	3.3	11
23040CAMKE4*	212	—	268	279	2	0.25	4.0	2.7	2.6	22.6
24040CAMK30E4*	212	223	298	271	2	0.32	3.1	2.1	2.0	30.4
24040CK30E4	212	223	298	271	2	0.32	3.1	2.1	2.0	30.4
23140CAMKE4*	214	232	326	293	2.5	0.31	3.2	2.2	2.1	42.7
23140CKE4	214	232	326	293	2.5	0.31	3.2	2.2	2.1	42.7
24140CAMK30E4*	214	226	326	290	2.5	0.39	2.6	1.8	1.7	51.3
24140CK30E4	214	226	326	290	2.5	0.39	2.6	1.8	1.7	51.3
22240CAMKE4*	218	—	342	315	3	0.26	3.8	2.6	2.5	42.6
23240CAMKE4*	218	237	342	307	3	0.34	2.9	2.0	1.9	57.1
23240CKE4	222	237	342	307	3	0.34	2.9	2.0	1.9	57.1
22340CAMKE4*	232	—	398	352	4	0.34	2.9	2.0	1.9	92.6
23944CAMKE4*	234	—	288	278	2	0.18	5.7	3.8	3.7	12.2
23044CAMKE4*	234	—	326	302	2.5	0.24	4.1	2.8	2.7	29.7
24044CAMK30E4*	234	244	326	296	2.5	0.31	3.2	2.1	2.1	40.5
24044CK30E4	238	244	326	296	2.5	0.31	3.2	2.1	2.1	40.5
23144CAMKE4*	238	254	352	320	3	0.30	3.3	2.2	2.2	53
23144CKE4	238	254	352	320	3	0.30	3.3	2.2	2.2	53
24144CAMK30E4*	238	248	352	313	3	0.39	2.6	1.7	1.7	66.7
24144CK30E4	238	248	352	313	3	0.39	2.6	1.7	1.7	66.7
22244CAMKE4*	238	—	382	348	3	0.27	3.7	2.5	2.4	59
23244CAMKE4*	238	260	382	337	3	0.35	2.9	1.9	1.9	80.4
23244CKE4	238	260	382	337	3	0.35	2.9	1.9	1.9	80.4
22344CAMKE4*	242	—	438	391	4	0.33	3.0	2.0	2.0	116

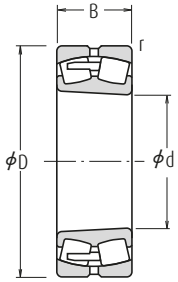
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B381 and B387**.

Bore Diameter 240 – 280 mm



Cylindrical Bore
CA

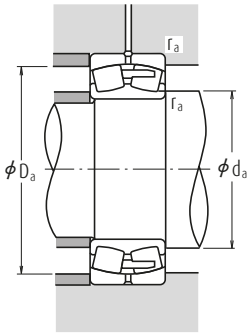


Tapered Bore
CA

Without an Oil Groove and Holes
CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
240	320	60	2.1	635 000	1 300 000	1 900	2 600	950	**23948CAE4**
	320	60	2.1	795 000	1 300 000	1 900	2 600	950	**23948CAME4**[*]
	360	92	3	1 450 000	2 140 000	1 500	2 200	850	**23048CAME4**[*]
	360	118	3	1 730 000	2 730 000	1 100	1 800	710	**24048CAME4**[*]
	360	118	3	1 390 000	2 730 000	1 100	–	710	**24048CE4**
	400	128	4	2 230 000	3 100 000	1 200	1 700	670	**23148CAME4**[*]
	400	128	4	1 790 000	3 100 000	1 200	–	670	**23148CE4**
	400	160	4	2 660 000	3 800 000	750	1 500	670	**24148CAME4**[*]
	400	160	4	2 130 000	3 800 000	750	–	670	**24148CE4**
	440	120	4	2 340 000	2 890 000	1 400	1 800	750	**22248CAME4**[*]
	440	160	4	3 050 000	4 050 000	850	1 500	630	**23248CAME4**[*]
	500	155	5	3 250 000	3 800 000	850	1 500	670	**22348CAME4**[*]
260	360	75	2.1	1 170 000	1 870 000	1 800	2 200	850	**23952CAME4**[*]
	400	104	4	1 780 000	2 580 000	1 300	1 900	800	**23052CAME4**[*]
	400	140	4	2 270 000	3 500 000	950	1 600	630	**24052CAME4**[*]
	440	144	4	2 700 000	3 750 000	1 100	1 500	600	**23152CAME4**[*]
	440	180	4	3 200 000	4 700 000	630	1 300	600	**24152CAME4**[*]
	480	130	5	2 720 000	3 400 000	1 200	1 700	670	**22252CAME4**[*]
	480	174	5	3 400 000	4 550 000	800	1 400	560	**23252CAME4**[*]
	540	165	6	3 900 000	4 600 000	750	1 400	630	**22352CAME4**[*]
280	380	75	2.1	1 160 000	1 950 000	1 600	2 000	800	**23956CAME4**[*]
	420	106	4	1 930 000	2 950 000	1 200	1 800	710	**23056CAME4**[*]
	420	140	4	2 350 000	3 800 000	850	1 500	600	**24056CAME4**[*]
	460	146	5	2 790 000	4 000 000	1 000	1 500	560	**23156CAME4**[*]
	460	180	5	3 300 000	5 000 000	600	1 300	560	**24156CAME4**[*]
	500	130	5	2 850 000	3 650 000	1 100	1 600	630	**22256CAME4**[*]
	500	176	5	3 600 000	4 900 000	750	1 300	530	**23256CAME4**[*]
	580	175	6	4 350 000	5 150 000	710	1 300	560	**22356CAME4**[*]

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

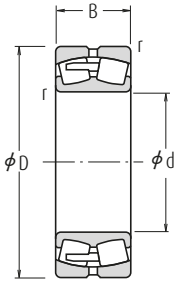
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
	d_a		D_a		r_a					
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
23948CAKE4	252	—	308	298	2	0.17	6.0	4.0	3.9	13.3
23948CAMKE4*	253	—	308	298	2	0.18	6.1	4.1	3.10	13.4
23048CAMKE4*	254	—	346	324	2.5	0.24	4.2	2.8	2.7	32.6
24048CAMK30E4*	254	265	346	317	2.5	0.29	3.4	2.3	2.2	43.4
24048CK30E4	254	265	346	317	2.5	0.29	3.4	2.3	2.2	43.4
23148CAMKE4*	258	275	382	347	3	0.30	3.3	2.2	2.2	66.9
23148CKE4	258	275	382	347	3	0.30	3.3	2.2	2.2	66.9
24148CAMK30E4*	258	268	382	341	3	0.38	2.7	1.8	1.8	79.5
24148CK30E4	258	268	382	341	3	0.38	2.7	1.8	1.8	79.5
22248CAMKE4*	258	—	422	383	3	0.27	3.7	2.5	2.4	80.2
23248CAMKE4*	258	—	422	372	3	0.37	2.7	1.8	1.8	106
22348CAMKE4*	262	—	478	423	4	0.32	3.2	2.1	2.1	147
23952CAMKE4*	272	—	348	333	2	0.19	5.4	3.6	3.5	23
23052CAMKE4*	278	—	382	356	3	0.25	4.1	2.7	2.7	46.6
24052CAMK30E4*	278	—	382	348	3	0.32	3.1	2.1	2.1	62.6
23152CAMKE4*	278	—	422	380	3	0.32	3.2	2.1	2.1	88.2
24152CAMK30E4*	278	—	422	371	3	0.39	2.6	1.7	1.7	109
22252CAMKE4*	282	—	458	418	4	0.27	3.7	2.5	2.5	104
23252CAMKE4*	282	—	458	406	4	0.37	2.7	1.8	1.8	137
22352CAMKE4*	288	—	512	462	5	0.32	3.2	2.1	2.1	180
23956CAMKE4*	292		368	351	2	0.18	5.7	3.9	3.8	24.5
23056CAMKE4*	298		402	377	3	0.24	4.2	2.8	2.7	50.5
24056CAMK30E4*	298		402	369	3	0.31	3.3	2.2	2.2	66.4
23156CAMKE4*	302		438	400	4	0.30	3.3	2.2	2.2	94.3
24156CAMK30E4*	302		438	392	4	0.37	2.7	1.8	1.8	115
22256CAMKE4*	302		478	439	4	0.25	4.0	2.7	2.6	110
23256CAMKE4*	302		478	425	4	0.35	2.9	1.9	1.9	147
22356CAMKE4*	308		552	496	5	0.31	3.2	2.1	2.1	221

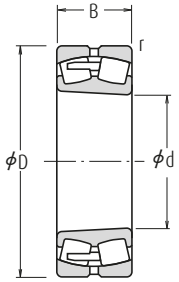
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B381, B382 and B387 – B388**.

Bore Diameter 300 – 380 mm



Cylindrical Bore
CA

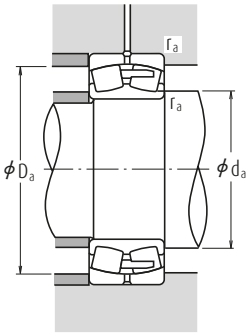


Tapered Bore
CA

Without an Oil Groove and Holes
CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
300	420	90	3	1 540 000	2 490 000	1 500	1 800	710	**23960CAME4***
	460	118	4	2 400 000	3 700 000	1 100	1 600	670	**23060CAME4***
	460	160	4	2 890 000	4 600 000	800	1 400	530	**24060CAME4***
	500	160	5	3 350 000	4 800 000	900	1 400	500	**23160CAME4***
	500	200	5	3 900 000	5 800 000	530	1 200	500	**24160CAME4***
	540	140	5	3 250 000	4 250 000	1 000	1 500	600	**22260CAME4***
	540	192	5	4 250 000	5 900 000	670	1 200	480	**23260CAME4***
320	440	90	3	1 620 000	2 750 000	1 400	1 700	670	**23964CAME4***
	480	121	4	2 450 000	3 850 000	1 000	1 600	630	**23064CAME4***
	480	160	4	3 050 000	5 050 000	710	1 300	500	**24064CAME4***
	540	176	5	3 850 000	5 500 000	800	1 300	480	**23164CAME4***
	540	218	5	4 400 000	6 650 000	500	1 100	480	**24164CAME4***
	580	150	5	3 750 000	4 850 000	950	1 400	530	**22264CAME4***
	580	208	5	4 850 000	6 900 000	600	1 100	450	**23264CAME4***
340	460	90	3	1 670 000	2 840 000	1 300	1 700	630	**23968CAME4***
	520	133	5	2 850 000	4 400 000	950	1 500	560	**23068CAME4***
	520	180	5	3 650 000	6 050 000	670	1 200	480	**24068CAME4***
	580	190	5	4 500 000	6 600 000	710	1 200	430	**23168CAME4***
	580	243	5	5 300 000	7 900 000	450	1 000	430	**24168CAME4***
	620	224	6	4 400 000	7 800 000	480	–	400	**23268CAME4**
360	480	90	3	1 730 000	3 050 000	1 200	1 700	600	**23972CAME4***
	540	134	5	2 990 000	4 700 000	900	1 400	530	**23072CAME4***
	540	180	5	3 650 000	6 100 000	630	1 200	450	**24072CAME4***
	600	192	5	4 800 000	7 100 000	670	1 100	400	**23172CAME4***
	600	243	5	5 250 000	8 000 000	430	1 000	400	**24172CAME4***
	600	232	6	4 800 000	8 550 000	450	–	380	**23272CAME4**
380	520	106	4	2 340 000	4 100 000	1 100	1 500	530	**23976CAME4***
	560	135	5	3 150 000	5 100 000	850	1 400	530	**23076CAME4***
	560	180	5	3 850 000	6 600 000	600	1 200	430	**24076CAME4***
	620	194	5	4 000 000	7 600 000	530	–	400	**23176CAME4**
	620	243	5	4 350 000	8 450 000	360	–	400	**24176CAME4**
	680	240	6	5 150 000	9 200 000	430	–	360	**23276CAME4**

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

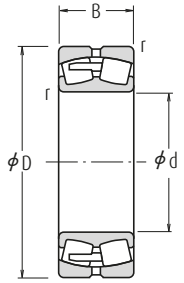
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)				Constant	Axial Load Factors			Mass (kg)
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.
23960CAMKE4*	314		406	386	2.5	0.19	5.2	3.5	3.4	38.2
23060CAMKE4*	318		442	413	3	0.24	4.2	2.8	2.7	70.5
24060CAMK30E4*	318		442	400	3	0.32	3.1	2.1	2.0	93.6
23160CAMKE4*	322		478	433	4	0.31	3.3	2.2	2.2	125
24160CAMK30E4*	322		478	423	4	0.38	2.6	1.8	1.7	152
22260CAMKE4*	322		518	473	4	0.25	4.0	2.7	2.6	139
23260CAMKE4*	322		518	458	4	0.35	2.9	1.9	1.9	189
23964CAMKE4*	334		426	406	2.5	0.18	5.5	3.7	3.6	40.6
23064CAMKE4*	338		462	432	3	0.24	4.2	2.8	2.8	75.6
24064CAMK30E4*	338		462	422	3	0.31	3.3	2.2	2.2	99.7
23164CAMKE4*	342		518	466	4	0.31	3.2	2.1	2.1	162
24164CAMK30E4*	342		518	456	4	0.39	2.6	1.7	1.7	196
22264CAMKE4*	342		558	508	4	0.26	3.9	2.6	2.6	174
23264CAMKE4*	342		558	488	4	0.36	2.8	1.9	1.8	239
23968CAMKE4*	354		446	427	2.5	0.18	5.7	3.8	3.7	42.4
23068CAMKE4*	362		498	465	4	0.24	4.2	2.8	2.8	101
24068CAMK30E4*	362		498	454	4	0.32	3.2	2.1	2.1	135
23168CAMKE4*	362		558	499	4	0.31	3.2	2.1	2.1	206
24168CAMK30E4*	362		558	489	4	0.40	2.5	1.7	1.7	257
23268CAMKE4	368		592	521	5	0.36	2.8	1.9	1.8	295
23972CAMKE4*	374		466	447	2.5	0.17	6.0	4.1	4.0	44.7
23072CAMKE4*	382		518	485	4	0.24	4.2	2.8	2.8	106
24072CAMK30E4*	382		518	476	4	0.32	3.2	2.1	2.1	139
23172CAMKE4*	382		578	520	4	0.31	3.2	2.2	2.1	217
24172CAMK30E4*	382		578	507	4	0.40	2.5	1.7	1.7	264
23272CAMKE4	388		622	549	5	0.36	2.8	1.9	1.8	342
23976CAMKE4*	398		502	482	3	0.18	5.5	3.7	3.6	65.4
23076CAMKE4*	402		538	506	4	0.22	4.5	3.0	3.0	113
24076CAMK30E4*	402		538	496	4	0.29	3.4	2.3	2.3	148
23176CAMKE4	402		598	540	4	0.30	3.3	2.2	2.2	229
24176CAMK30E4	402		598	529	4	0.38	2.6	1.8	1.7	275
23276CAMKE4	408		652	578	5	0.35	2.9	1.9	1.9	372

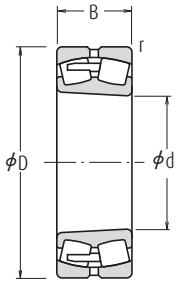
Remarks

1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B382 and B388**.

Bore Diameter 400 – 460 mm



Cylindrical Bore
CA

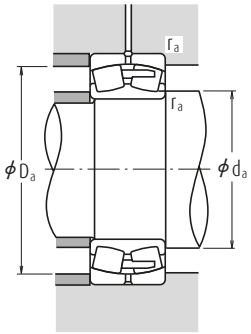


Tapered Bore
CA

Without an Oil Groove and Holes
CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
400	540	106	4	2 370 000	4 250 000	1 000	1 400	530	**23980CAME4**[1]
	600	148	5	3 700 000	5 900 000	800	1 300	480	**23080CAME4**[1]
	600	200	5	4 500 000	7 600 000	550	1 100	400	**24080CAME4**[1]
	650	200	6	4 150 000	7 900 000	500	–	380	**23180CAME4**
	650	250	6	4 950 000	10 100 000	320	–	380	**24180CAME4**
	720	256	6	5 800 000	10 400 000	380	–	340	**23280CAME4**
420	560	106	4	2 340 000	4 250 000	1 000	1 400	500	**23984CAME4**[1]
	620	150	5	2 910 000	5 850 000	670	–	450	**23084CAME4**
	620	200	5	3 750 000	8 100 000	480	–	380	**24084CAME4**
	700	224	6	5 000 000	9 400 000	480	–	340	**23184CAME4**
	700	280	6	6 000 000	12 000 000	280	–	340	**24184CAME4**
	760	272	7.5	6 450 000	11 700 000	360	–	320	**23284CAME4**
440	600	118	4	2 190 000	4 800 000	630	–	450	**23988CAME4**
	650	157	6	3 150 000	6 350 000	630	–	430	**23088CAME4**
	650	212	6	4 150 000	9 100 000	450	–	360	**24088CAME4**
	720	226	6	5 300 000	10 300 000	430	–	320	**23188CAME4**
	720	280	6	6 000 000	12 100 000	280	–	320	**24188CAME4**
	790	280	7.5	6 900 000	12 800 000	340	–	300	**23288CAME4**
460	620	118	4	2 220 000	4 950 000	600	–	430	**23992CAME4**
	680	163	6	3 450 000	7 100 000	600	–	400	**23092CAME4**
	680	218	6	4 500 000	9 950 000	430	–	340	**24092CAME4**
	760	240	7.5	5 700 000	10 900 000	430	–	300	**23192CAME4**
	760	300	7.5	6 300 000	12 400 000	280	–	300	**24192CAME4**
	830	296	7.5	7 350 000	13 700 000	320	–	280	**23292CAME4**

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

$P_0=F_r+Y_0F_a$

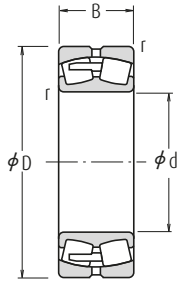
The values of e, Y_2 , Y_3 and Y_0 are given in the table below.

Numbers	Abutment and Fillet Dimensions (mm)				Constant	Axial Load Factors			Mass (kg)
	d_a		D_a	r_a					
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
23980CAMKE4*	418		522	501	3	0.18	5.7	3.9	3.8	69.1
23080CAMKE4*	422		578	540	4	0.23	4.4	3.0	2.9	146
24080CAMK30E4*	422		578	527	4	0.31	3.3	2.2	2.2	193
23180CAMKE4	428		622	569	5	0.29	3.4	2.3	2.3	257
24180CAMK30E4	428		622	551	5	0.37	2.7	1.8	1.8	316
23280CAMKE4	428		692	610	5	0.36	2.8	1.9	1.9	449
23984CAMKE4*	438		542	521	3	0.17	6.0	4.0	3.9	71.6
23084CAMKE4	442		598	562	4	0.23	4.3	2.9	2.8	151
24084CAMK30E4	442		598	549	4	0.31	3.2	2.2	2.1	199
23184CAMKE4	448		672	607	5	0.31	3.3	2.2	2.2	341
24184CAMK30E4	448		672	598	5	0.38	2.6	1.8	1.7	421
23284CAMKE4	456		724	644	6	0.35	2.9	1.9	1.9	534
23988CAMKE4	458		582	555	3	0.18	5.7	3.9	3.8	96.3
23088CAMKE4	468		622	587	5	0.23	4.3	2.9	2.8	173
24088CAMK30E4	468		622	576	5	0.31	3.2	2.1	2.1	237
23188CAMKE4	468		692	627	5	0.3	3.3	2.2	2.2	360
24188CAMK30E4	468		692	617	5	0.37	2.7	1.8	1.8	433
23288CAMKE4	476		754	669	6	0.35	2.9	1.9	1.9	594
23992CAMKE4	478		602	575	3	0.17	5.9	4.0	3.9	100
23092CAMKE4	488		652	615	5	0.22	4.6	3.1	3.0	201
24092CAMK30E4	488		652	604	5	0.29	3.4	2.3	2.3	266
23192CAMKE4	496		724	661	6	0.31	3.3	2.2	2.2	423
24192CAMK30E4	496		724	646	6	0.39	2.6	1.7	1.7	512
23292CAMKE4	496		794	702	6	0.36	2.8	1.9	1.8	691

Remarks

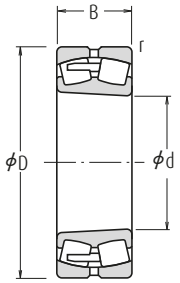
1. The bearings denoted by an asterisk (*) are NSKHPS bearings and an oil groove and holes are standard for them.
2. When making a selection of the recommended fit (Tolerance of shaft) on Page A164, in case of NSKHPS bearings, the conditions are different.
   The segmentations are: Light Loads ($\leqq 0.05C_r$); Normal Loads (0.05 to $0.10C_r$); and Heavy Loads ($>0.10C_r$).
3. For the dimensions of adapters and withdrawal sleeves, refer to Pages **B382 – B383 and B389**.

Bore Diameter 480 – 560 mm



Cylindrical Bore

CA



Tapered Bore

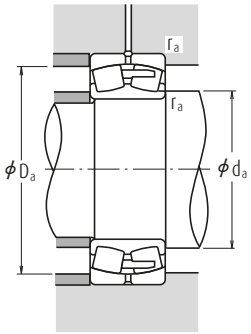
CA

Without an Oil Groove and Holes

CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
480	650	128	5	2 580 000	5 850 000	560	–	400	**23996CAME4**
	700	165	6	3 800 000	7 950 000	560	–	400	**23096CAME4**
	700	218	6	4 600 000	10 200 000	400	–	320	**24096CAME4**
	790	248	7.5	6 050 000	11 700 000	400	–	300	**23196CAME4**
	790	308	7.5	7 150 000	14 600 000	240	–	300	**24196CAME4**
	870	310	7.5	7 850 000	14 400 000	300	–	260	**23296CAME4**
500	670	128	5	2 460 000	5 550 000	560	–	400	**239/500CAME4**
	720	167	6	3 750 000	8 100 000	530	–	380	**230/500CAME4**
	720	218	6	4 450 000	9 900 000	400	–	300	**240/500CAME4**
	830	264	7.5	6 850 000	13 400 000	360	–	280	**231/500CAME4**
	830	325	7.5	8 000 000	16 000 000	220	–	280	**241/500CAME4**
	920	336	7.5	9 000 000	16 600 000	280	–	260	**232/500CAME4**
530	710	136	5	2 930 000	6 800 000	500	–	360	**239/530CAME4**
	780	185	6	4 440 000	9 200 000	500	–	340	**230/530CAME4**
	780	250	6	5 400 000	11 800 000	360	–	280	**240/530CAME4**
	870	272	7.5	7 150 000	14 100 000	340	–	260	**231/530CAME4**
	870	335	7.5	8 500 000	17 500 000	200	–	260	**241/530CAME4**
	980	355	9.5	10 100 000	18 800 000	260	–	240	**232/530CAME4**
560	750	140	5	3 100 000	7 250 000	480	–	340	**239/560CAME4**
	820	195	6	5 000 000	10 700 000	450	–	320	**230/560CAME4**
	820	258	6	5 950 000	13 300 000	340	–	260	**240/560CAME4**
	920	280	7.5	7 850 000	15 500 000	320	–	240	**231/560CAME4**
	920	355	7.5	9 400 000	19 600 000	190	–	240	**241/560CAME4**
	1 030	365	9.5	10 900 000	20 500 000	240	–	220	**232/560CAME4**

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

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

Static Equivalent Load

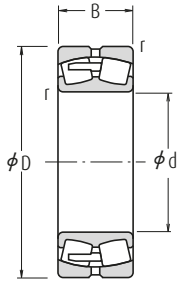
$P_0=F_r+Y_0F_a$

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

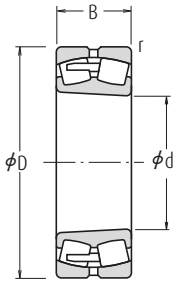
Numbers	Abutment and Fillet Dimensions (mm)				Constant	Axial Load Factors			Mass (kg)
	d_a		D_a	r_a					
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
23996CAMKE4	502		628	602	4	0.18	5.7	3.8	3.7	121
23096CAMKE4	508		672	633	5	0.22	4.6	3.1	3.0	211
24096CAMK30E4	508		672	625	5	0.30	3.4	2.3	2.2	270
23196CAMKE4	516		754	688	6	0.31	3.3	2.2	2.2	475
24196CAMK30E4	516		754	670	6	0.39	2.6	1.7	1.7	567
23296CAMKE4	516		834	733	6	0.36	2.8	1.9	1.8	795
239/500CAMKE4	522		648	622	4	0.17	6.0	4.0	3.9	124
230/500CAMKE4	528		692	655	5	0.21	4.8	3.2	3.1	220
240/500CAMK30E4	528		692	643	5	0.30	3.4	2.3	2.2	276
231/500CAMKE4	536		794	720	6	0.31	3.2	2.2	2.1	567
241/500CAMK30E4	536		794	703	6	0.39	2.6	1.7	1.7	666
232/500CAMKE4	536		884	773	6	0.38	2.7	1.8	1.8	969
239/530CAMKE4	552		688	659	4	0.17	6.0	4.0	3.9	149
230/530CAMKE4	558		752	706	5	0.22	4.6	3.1	3.0	298
240/530CAMK30E4	558		752	690	5	0.31	3.3	2.2	2.2	390
231/530CAMKE4	566		834	758	6	0.30	3.3	2.2	2.2	628
241/530CAMK30E4	566		834	740	6	0.38	2.6	1.8	1.7	773
232/530CAMKE4	574		936	824	8	0.38	2.7	1.8	1.7	1 170
239/560CAMKE4	582		728	697	4	0.16	6.1	4.1	4.0	172
230/560CAMKE4	588		792	742	5	0.22	4.5	3.0	2.9	344
240/560CAMK30E4	588		792	729	5	0.30	3.3	2.2	2.2	440
231/560CAMKE4	596		884	804	6	0.30	3.4	2.3	2.2	727
241/560CAMK30E4	596		884	782	6	0.39	2.6	1.8	1.7	886
232/560CAMKE4	604		986	870	8	0.36	2.8	1.9	1.8	1 320

Remark For the dimensions of adapters (d=470 mm) and withdrawal sleeves, refer to Pages **B383 and B389**.

Bore Diameter 600 – 750 mm



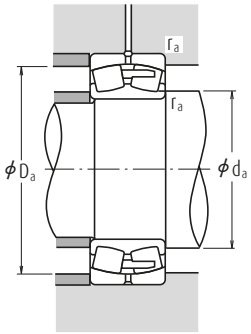
Cylindrical Bore
CA



Tapered Bore
CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
600	800	150	5	3 450 000	8 100 000	450	–	320	**239/600CAME4**
	870	200	6	5 450 000	12 200 000	400	–	300	**230/600CAME4**
	870	272	6	6 600 000	15 100 000	300	–	240	**240/600CAME4**
	980	300	7.5	8 750 000	17 500 000	280	–	220	**231/600CAME4**
	980	375	7.5	10 400 000	21 900 000	170	–	220	**241/600CAME4**
	1 090	388	9.5	12 700 000	24 900 000	200	–	200	**232/600CAME4**
630	850	165	6	4 000 000	9 350 000	400	–	300	**239/630CAME4**
	920	212	7.5	5 900 000	12 700 000	400	–	280	**230/630CAME4**
	920	290	7.5	7 550 000	17 700 000	280	–	220	**240/630CAME4**
	1 030	315	7.5	9 600 000	19 400 000	260	–	200	**231/630CAME4**
	1 030	400	7.5	11 300 000	23 900 000	160	–	200	**241/630CAME4**
	1 150	412	12	13 400 000	25 600 000	200	–	180	**232/630CAME4**
670	900	170	6	4 350 000	10 300 000	380	–	260	**239/670CAME4**
	980	230	7.5	6 850 000	15 000 000	360	–	240	**230/670CAME4**
	980	308	7.5	8 450 000	19 500 000	260	–	200	**240/670CAME4**
	1 090	336	7.5	10 600 000	21 600 000	240	–	190	**231/670CAME4**
	1 090	412	7.5	12 400 000	26 500 000	150	–	190	**241/670CAME4**
	1 220	438	12	14 900 000	28 700 000	180	–	170	**232/670CAME4**
710	950	180	6	4 800 000	11 700 000	360	–	240	**239/710CAME4**
	1 030	236	7.5	7 100 000	15 800 000	340	–	240	**230/710CAME4**
	1 030	315	7.5	8 850 000	20 700 000	240	–	190	**240/710CAME4**
	1 150	438	9.5	13 900 000	30 500 000	130	–	170	**241/710CAME4**
	1 280	450	12	15 700 000	30 500 000	170	–	160	**232/710CAME4**
750	1 000	185	6	5 250 000	12 800 000	320	–	220	**239/750CAME4**
	1 090	250	7.5	7 750 000	17 200 000	320	–	220	**230/750CAME4**
	1 090	335	7.5	10 100 000	24 000 000	220	–	180	**240/750CAME4**
	1 360	475	15	17 700 000	35 500 000	150	–	140	**232/750CAME4**

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

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

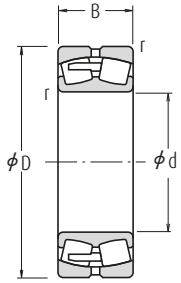
Static Equivalent Load

$P_0=F_r+Y_0F_a$

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

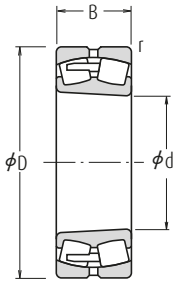
Numbers	Abutment and Fillet Dimensions (mm)				Constant	Axial Load Factors			Mass (kg)
Tapered Bore (1)	d_a min.	d_a max.	D_a max.	D_a min.	r_a max.	e	Y_2	Y_3	Y_0	approx.
239/600CAMKE4	622		778	745	4	0.17	5.9	3.9	3.9	205
230/600CAMKE4	628		842	794	5	0.21	4.8	3.3	3.2	389
240/600CAMK30E4	628		842	772	5	0.30	3.3	2.2	2.2	529
231/600CAMKE4	636		944	856	6	0.30	3.4	2.3	2.2	898
241/600CAMK30E4	636		944	836	6	0.39	2.6	1.8	1.7	1 050
232/600CAMKE4	644		1 046	923	8	0.36	2.8	1.9	1.8	1 590
239/630CAMKE4	658		822	786	5	0.18	5.6	3.8	3.7	259
230/630CAMKE4	666		884	835	6	0.22	4.7	3.1	3.1	468
240/630CAMK30E4	666		884	815	6	0.30	3.3	2.2	2.2	637
231/630CAMKE4	666		994	900	6	0.30	3.4	2.3	2.2	1 040
241/630CAMK30E4	666		994	876	6	0.38	2.7	1.8	1.7	1 250
232/630CAMKE4	684		1 096	970	10	0.36	2.8	1.9	1.8	1 850
239/670CAMKE4	698		872	836	5	0.17	5.8	3.9	3.8	300
230/670CAMKE4	706		944	891	6	0.22	4.7	3.1	3.1	571
240/670CAMK30E4	706		944	868	6	0.30	3.3	2.2	2.2	773
231/670CAMKE4	706		1 054	952	6	0.30	3.3	2.2	2.2	1 230
241/670CAMK30E4	706		1 054	934	6	0.37	2.7	1.8	1.8	1 440
232/670CAMKE4	724		1 166	1 024	10	0.37	2.7	1.8	1.8	2 210
239/710CAMKE4	738		922	883	5	0.17	5.8	3.9	3.8	352
230/710CAMKE4	746		994	936	6	0.22	4.6	3.1	3.0	647
240/710CAMK30E4	746		994	916	6	0.29	3.4	2.3	2.2	861
241/710CAMK30E4	754		1 106	981	8	0.38	2.6	1.8	1.7	1 730
232/710CAMKE4	764		1 226	1 080	10	0.36	2.8	1.9	1.8	2 470
239/750CAMKE4	778		972	931	5	0.17	6.0	4.1	4.0	398
230/750CAMKE4	786		1 054	990	6	0.22	4.6	3.1	3.0	768
240/750CAMK30E4	786		1 054	969	6	0.29	3.4	2.3	2.2	1 030
232/750CAMKE4	814		1 296	1 148	12	0.36	2.8	1.9	1.8	2 980

Bore Diameter 800 – 1400 mm



Cylindrical Bore

CA

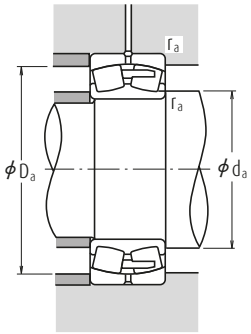


Tapered Bore

CA

Boundary Dimensions (mm)				Basic Load Ratings (N)		Thermal Reference Speed	Speeds (min^{-1})		Bearing
							Limiting Speeds		
d	D	B	r min.	C_r	C_{0r}		Mechanical	Grease	Cylindrical Bore
800	1 060	195	6	5 600 000	13 700 000	300	–	220	**239/800CAME4**
	1 150	258	7.5	8 350 000	19 100 000	300	–	200	**230/800CAME4**
	1 150	345	7.5	10 900 000	26 300 000	200	–	160	**240/800CAME4**
	1 280	375	9.5	13 800 000	29 200 000	190	–	150	**231/800CAME4**
	1 420	488	15	20 300 000	41 000 000	130	–	130	**232/800CAME4**
850	1 120	200	6	6 100 000	15 200 000	280	–	190	**239/850CAME4**
	1 220	272	7.5	9 300 000	21 400 000	280	–	180	**230/850CAME4**
	1 220	365	7.5	11 600 000	28 300 000	190	–	150	**240/850CAME4**
	1 500	515	15	22 300 000	45 500 000	120	–	120	**232/850CAME4**
900	1 180	206	6	6 660 000	16 700 000	260	–	180	**239/900CAME4**
	1 280	280	7.5	9 850 000	22 800 000	260	–	160	**230/900CAME4**
	1 280	375	7.5	12 800 000	31 500 000	170	–	140	**240/900CAME4**
	1 580	515	15	23 400 000	47 500 000	120	–	110	**232/900CAME4**
950	1 250	224	7.5	7 600 000	19 900 000	240	–	160	**239/950CAME4**
	1 360	300	7.5	11 300 000	26 500 000	240	–	150	**230/950CAME4**
	1 360	412	7.5	14 500 000	36 500 000	160	–	120	**240/950CAME4**
	1 660	530	15	24 700 000	50 500 000	110	–	100	**232/950CAME4**
1 000	1 320	236	7.5	8 200 000	21 700 000	220	–	150	**239/1000CAME4**
	1 420	308	7.5	11 900 000	28 100 000	220	–	140	**230/1000CAME4**
	1 420	412	7.5	15 300 000	38 500 000	150	–	110	**240/1000CAME4**
1 060	1 400	250	7.5	9 300 000	24 400 000	200	–	130	**239/1060CAME4**
	1 500	325	9.5	13 000 000	31 500 000	200	–	120	**230/1060CAME4**
	1 500	438	9.5	16 800 000	43 000 000	140	–	100	**240/1060CAME4**
1 120	1 580	345	9.5	15 400 000	38 000 000	180	–	110	**230/1120CAME4**
	1 580	462	9.5	18 700 000	49 500 000	120	–	95	**240/1120CAME4**
1 180	1 660	475	9.5	20 200 000	52 500 000	120	–	85	**240/1180CAME4**
1 250	1 750	500	9.5	21 000 000	59 500 000	110	–	75	**240/1250CAME4**
1 320	1 850	530	12	22 600 000	63 500 000	100	–	67	**240/1320CAME4**
1 400	1 950	545	12	24 500 000	65 000 000	95	–	60	**240/1400CAME4**

Note (1) The suffix K or K30 represents bearings with tapered bores (taper 1 : 12 or 1 : 30).



Dynamic Equivalent Load $P=XF_r+YF_a$

$F_a/F_r \leq e$		$F_a/F_r > e$	
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.

Numbers	Abutment and Fillet Dimensions (mm)				Constant	Axial Load Factors			Mass (kg)
	d_a		D_a		r_a				
Tapered Bore (1)	min.	max.	max.	min.	max.	e	Y_2	Y_3	Y_0	approx.
239/800CAMKE4	828		1 032	987	5	0.17	6.0	4.0	3.9	462
230/800CAMKE4	836		1 114	1 045	6	0.21	4.7	3.2	3.1	870
240/800CAMK30E4	836		1 114	1 029	6	0.27	3.7	2.5	2.5	1 130
231/800CAMKE4	844		1 236	1 127	8	0.28	3.6	2.4	2.3	1 870
232/800CAMKE4	864		1 356	1 208	12	0.35	2.8	1.9	1.9	3 250
239/850CAMKE4	878		1 092	1 046	5	0.16	6.2	4.2	4.1	523
230/850CAMKE4	886		1 184	1 109	6	0.21	4.8	3.2	3.1	1 020
240/850CAMK30E4	886		1 184	1 093	6	0.28	3.6	2.4	2.4	1 350
232/850CAMKE4	914		1 436	1 274	12	0.35	2.8	1.9	1.9	3 890
239/900CAMKE4	928		1 152	1 103	5	0.16	6.4	4.3	4.2	591
230/900CAMKE4	936		1 244	1 169	6	0.20	4.9	3.3	3.2	1 160
240/900CAMK30E4	936		1 244	1 147	6	0.28	3.6	2.4	2.4	1 520
232/900CAMKE4	964		1 516	1 354	12	0.33	3.0	2.0	2.0	4 300
239/950CAMKE4	986		1 214	1 169	6	0.16	6.3	4.2	4.1	732
230/950CAMKE4	986		1 324	1 241	6	0.21	4.8	3.2	3.2	1 400
240/950CAMK30E4	986		1 324	1 219	6	0.28	3.6	2.4	2.3	1 880
232/950CAMKE4	1 014		1 596	1 428	12	0.32	3.1	2.1	2.1	4 800
239/1000CAMKE4	1 036		1 284	1 229	6	0.16	6.4	4.3	4.2	881
230/1000CAMKE4	1 036		1 384	1 298	6	0.20	4.9	3.3	3.2	1 560
240/1000CAMK30E4	1 036		1 384	1 275	6	0.27	3.7	2.5	2.4	2 010
239/1060CAMKE4	1 096		1 384	1 302	6	0.16	6.1	4.1	4.0	1 030
230/1060CAMKE4	1 104		1 456	1 368	8	0.21	4.9	3.3	3.2	1 790
240/1060CAMK30E4	1 104		1 456	1 346	8	0.28	3.6	2.4	2.4	2 410
230/1120CAMKE4	1 164		1 536	1 444	8	0.20	5.0	3.4	3.3	2 120
240/1120CAMK30E4	1 164		1 536	1 421	8	0.27	3.7	2.5	2.5	2 790
240/1180CAMK30E4	1 224		1 616	1 494	8	0.27	3.7	2.5	2.4	3 180
240/1250CAMK30E4	1 294		1 706	1 579	8	0.25	4.0	2.7	2.6	3 700
240/1320CAMK30E4	1 374		1 796	1 656	10	0.26	3.9	2.6	2.6	4 400
240/1400CAMK30E4	1 454		1 896	1 767	10	0.25	4.0	2.7	2.6	4 900