Spherical Roller Bearings
ULTAGE Series
[Type EA, Type EM]

CAT.No.3033-5/E

CAT.No.3033-5/E 22.05.005 DS/DS

Up to
3.7 times
longer
service life

【Type EA・Type EM】

ULTAGE™

Up to
20 % higher
allowable
speed

Longer service life and higher rotational speed improve ease-of-use while contributing to more eco-friendly operation.

ULTAGE Series spherical roller bearings are products developed to provide longer service life, higher rotational speed, and improved ease-of-use required for any industrial machinery.

Longer Service Life

- Larger rollers provide the industry's highest load capacity.
- Extended maintenance intervals
- Lighter and more compact design
- Withstands operating temperatures up to 200°C.

Higher Rotational Speed

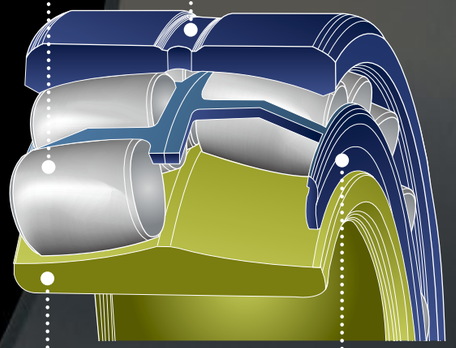
- The industry's highest allowable rotational speed
- Type EA has a simple window-type configuration employs a pressed steel cage.

Improved Ease-of-Use

- Unique structure readily accepts lubricant.
- Improved application of grease

Rollers
- Larger rollers
- Maximum number of rollers

Outer ring
- With oil inlets and oil groove
- Optimal curvature



【Type EA】

Inner ring
- No rib
- Optimal curvature

Cage
- Window-type pressed steel cage
- Cage end faces function as guides.

ULTAGE™ "ULTAGE" (a name created from the combination of "ultimate," signifying refinement, and "stage," signifying NTN's intention that this series of products be employed in diverse applications) is the general name for NTN's new generation of bearings that are noted for their industry-leading performance.

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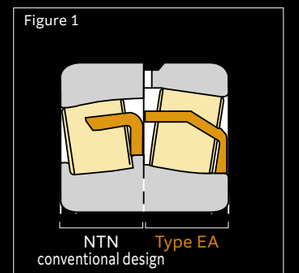
ULTAGE™ The ULTAGE Advantage【Type EA】

1 The industry's highest load capacity

These bearings have a significantly increased roller diameter and incorporate the maximum number of rollers, thus achieving both a high load capacity and a longer service life. Maintenance intervals can also be extended.

① Basic dynamic load rating: up to 50 % greater than the **NTN** conventional design
② Basic static load rating: up to 35 % greater than the **NTN** conventional design
③ Service life: up to 3.7 times longer than the **NTN** conventional design

Figure 1



2 The industry's highest allowable speed

The new pressed steel cage results in allowable rotational speed up to 20 % greater than **NTN**'s conventional design.

3 Pressed steel cage provided as standard.

The window-type pressed steel cage provides higher rigidity. Each roller pocket is provided with four tabs.

① The guide system employs a back-to-back cage system.
② Four tabs in each cage pocket stabilize the roller position.
③ The innovative cage pocket shape ensures a stable supply of lubricating oil or grease into the bearing.
④ A special surface treatment enhances wear resistance.

Figure 2

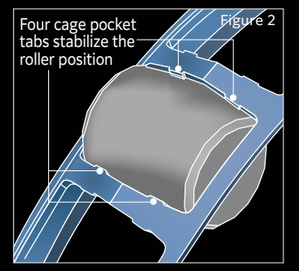
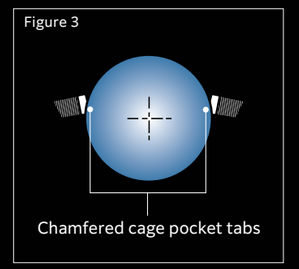


Figure 3



4 Compact, lightweight design

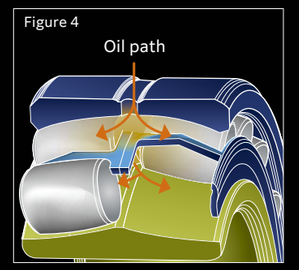
The increased load capacity contributes to a lighter and more compact design.

Benchmarks

Model No.	Load rating (kN) C_r	Load rating (kN) C_{0r}	Boundary dimensions (mm)	Bearing volume (cm³)	Mass (kg)
22220B	350	415	ϕ100×ϕ180×46	810	4.95
22218EA	384	398	ϕ90×ϕ160×40	550	3.34

Results in approximately a 30 % reduction in volume ratio and mass ratio

Figure 4



5 Improved ease-of-use

Adoption of a simple window-type pressed steel cage improves ease of assembly/disassembly and grease application.

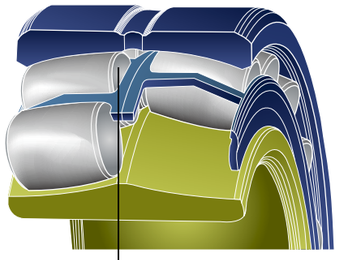
① Improved application of grease to the roller surface
② Improved roller retention contributes to easier assembly/disassembly

【Bearing Number】

222	20	EA	K	D1	C3
Dimension series code	Bore diameter code	Type code EA: Window-type pressed steel cage EM: One-piece machined high-tension brass cage	Raceway configuration code No code: Cylindrical bore K: Tapered bore	Oil inlet/oil groove code D1: With oil inlet/oil groove W33: With oil inlet/oil groove (Made in Europe)	Internal clearance code No code: Normal clearance C3: C3 clearance

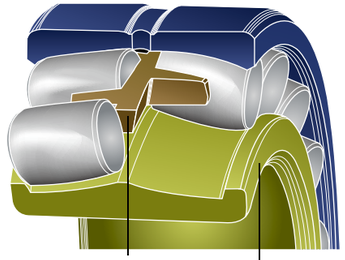
For applications that expose bearings to severe vibration and impact, we recommend Type EM bearings, which incorporate a high-tension brass cage machined from a single piece. (Type EM differs from Type EA in the shape of the inner ring.)

Type EA



Window-type pressed steel cage

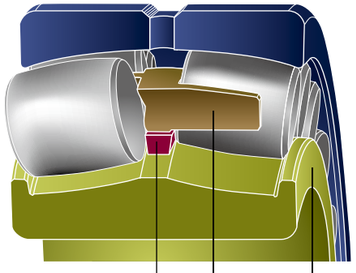
Type EM



One-piece machined cage

Inner ring rib

Type EM (Large size)



Guide ring

Inner ring rib

One-piece machined cage

【Allowable Misalignment】

- **Normal or heavy load** ····· 1/115
- **Light load** ····· 1/30

*If the installed misalignment is greater than recommended, there is a risk of roller/cage protrusion and impact to surrounding components.

1 Bearing Tolerances

1.1 Dimensional accuracy and running accuracy

(1) Inner ring

unit : μm

Nominal bore diameter d mm		Dimensional tolerance of mean bore diameter in single plane Δ_{dmp} Class 0		Radial runout K_{ia} Class 0	Width deviation Δ_{Bs} Class 0		Width variation V_{Bs} Class 0
Over	Including	High	Low	Max	High	Low	Max
-	30	0	-10	13	0	-120	20
30	50	0	-12	15	0	-120	20
50	80	0	-15	20	0	-150	25
80	120	0	-20	25	0	-200	25
120	150	0	-25	30	0	-250	30
150	180	0	-25	30	0	-250	30
180	250	0	-30	40	0	-300	30
250	315	0	-35	50	0	-350	35
315	400	0	-40	60	0	-400	40
400	500	0	-45	65	0	-450	50

(2) Outer ring

unit : μm

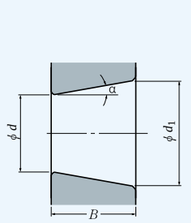
Nominal outside diameter D mm		Dimensional tolerance of mean outside diameter in single plane Δ_{Dmp} Class 0		Radial runout K_{ea} Class 0	Width deviation Δ_{Cs} Class 0		Width variation V_{Cs} Class 0
Over	Including	High	Low	Max	High	Low	Max
50	80	0	-13	25	Same as Δ_{Bs} and V_{Bs} of bearings of same nominal bore diameterd.		
80	120	0	-15	35			
120	150	0	-18	40			
150	180	0	-25	45			
180	250	0	-30	50			
250	315	0	-35	60			
315	400	0	-40	70			
400	500	0	-45	80			
500	630	0	-50	100			

1.2 Tolerance of tapered bore

(1) Taper ratio 1:12 (Class 0)

unit : μm

Nominal bore diameter d mm		Dimensional tolerance of mean bore diameter in single plane Δ_{dmp}		$\Delta_{d1mp} - \Delta_{dmp}$		Bore diameter variation V_{dsp}
Over	Including	High	Low	High	Low	Max
-	30	+33	0	+21	0	13
30	50	+39	0	+25	0	16
50	80	+46	0	+30	0	19
80	120	+54	0	+35	0	22
120	180	+63	0	+40	0	40
180	250	+72	0	+46	0	46
250	315	+81	0	+52	0	52
315	400	+89	0	+57	0	57
400	500	+97	0	+63	0	63



Theoretical tapered bore

Tapered bore with dimensional tolerance of mean bore diameter in single plane

(2) Taper ratio 1:30 (Class 0)

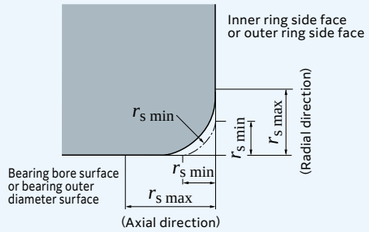
unit : μm

Nominal bore diameter d mm		Dimensional tolerance of mean bore diameter in single plane Δ_{dmp}		$\Delta_{d1mp} - \Delta_{dmp}$		Bore diameter variation V_{dsp}
Over	Including	High	Low	High	Low	Max
80	120	+20	0	+35	0	22
120	180	+25	0	+40	0	40
180	250	+30	0	+46	0	46
250	315	+35	0	+52	0	52
315	400	+40	0	+57	0	57
400	500	+45	0	+63	0	63

2 Chamfer Dimensions

unit : mm

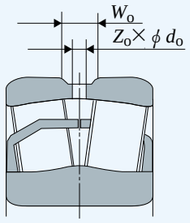
$r_{s\,min}$	Nominal bore diameter d		$r_{s\,max}$	
	Over	Including	Radial direction	Axial direction
1	-	50	1.5	3
	50	-	1.9	3
1.1	-	120	2	3.5
	120	-	2.5	4
1.5	-	120	2.3	4
	120	-	3	5
2	-	80	3	4.5
	80	220	3.5	5
	220	-	3.8	6
2.1	-	280	4	6.5
	280	-	4.5	7
2.5	-	100	3.8	6
	100	280	4.5	6
	280	-	5	7
3	-	280	5	8
	280	-	5.5	8
4	-	-	6.5	9
5	-	-	8	10
6	-	-	10	13



3 Number of Oil Inlets for Outer Ring Outside Diameter

Nominal outside diameter D mm		Number of oil inlets	
		D1	W33 (Made in Europe)
Min	Less than	Z_o	Z_o
-	320	4	3
320	600	8	3

Note:See the dimension table for information on the oil groove width W_o and oil inlet diameter d_o.



4 Internal Clearance

(1) Data for cylindrical bore bearings

unit : μm

Nominal bore diameter d mm		C2		CN		C3		C4	
Over	Including	Min	Max	Min	Max	Min	Max	Min	Max
-	30	15	25	25	40	40	55	55	75
30	40	15	30	30	45	45	60	60	80
40	50	20	35	35	55	55	75	75	100
50	65	20	40	40	65	65	90	90	120
65	80	30	50	50	80	80	110	110	145
80	100	35	60	60	100	100	135	135	180
100	120	40	75	75	120	120	160	160	210
120	140	50	95	95	145	145	190	190	240
140	160	60	110	110	170	170	220	220	280
160	180	65	120	120	180	180	240	240	310
180	200	70	130	130	200	200	260	260	340
200	225	80	140	140	220	220	290	290	380
225	250	90	150	150	240	240	320	320	420
250	280	100	170	170	260	260	350	350	460
280	315	110	190	190	280	280	370	370	500
315	355	120	200	200	310	310	410	410	550
355	400	130	220	220	340	340	450	450	600
400	450	140	240	240	370	370	500	500	660

(2) Data for tapered bore bearings

unit : μm

Nominal bore diameter d mm		C2		CN		C3		C4	
Over	Including	Min	Max	Min	Max	Min	Max	Min	Max
-	30	20	30	30	40	40	55	55	75
30	40	25	35	35	50	50	65	65	85
40	50	30	45	45	60	60	80	80	100
50	65	40	55	55	75	75	95	95	120
65	80	50	70	70	95	95	120	120	150
80	100	55	80	80	110	110	140	140	180
100	120	65	100	100	135	135	170	170	220
120	140	80	120	120	160	160	200	200	260
140	160	90	130	130	180	180	230	230	300
160	180	100	140	140	200	200	260	260	340
180	200	110	160	160	220	220	290	290	370
200	225	120	180	180	250	250	320	320	410
225	250	140	200	200	270	270	350	350	450
250	280	150	220	220	300	300	390	390	490
280	315	170	240	240	330	330	430	430	540
315	355	190	270	270	360	360	470	470	590
355	400	210	300	300	400	400	520	520	650
400	450	230	330	330	440	440	570	570	720

5 Installing Tapered Bore Bearings

unit : mm

Nominal bore diameter d		Reduction in radial internal clearance		Axial displacement drive-up				Nut rotation angle, deg. (approx.)				Minimum residual radial internal clearance		
				Taper ratio 1:12		Taper ratio 1:30		Taper ratio 1:12		Taper ratio 1:30				
Over	Including	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	CN	C3	C4
24	30	0.010	0.015	0.15	0.20	—	—	36	48	—	—	0.015	0.025	0.040
30	40	0.015	0.020	0.25	0.30	—	—	60	72	—	—	0.015	0.030	0.045
40	50	0.020	0.025	0.35	0.40	—	—	84	96	—	—	0.020	0.035	0.055
50	65	0.025	0.030	0.40	0.45	—	—	72	81	—	—	0.025	0.045	0.065
65	80	0.035	0.040	0.50	0.60	—	—	90	108	—	—	0.030	0.055	0.080
80	100	0.040	0.050	0.60	0.70	—	—	108	126	—	—	0.030	0.060	0.090
100	120	0.055	0.065	0.80	0.90	1.80	2.30	144	162	324	414	0.035	0.070	0.105
120	140	0.065	0.075	0.90	1.00	1.95	2.70	162	180	351	486	0.045	0.085	0.125
140	150	0.075	0.090	1.00	1.20	2.35	3.10	180	216	423	558	0.040	0.090	0.140
150	160	0.075	0.090	1.00	1.20	2.35	3.10	120	144	282	372	0.040	0.090	0.140
160	180	0.080	0.100	1.10	1.40	2.80	3.55	132	168	336	426	0.040	0.100	0.160
180	200	0.090	0.110	1.20	1.50	3.20	3.95	144	180	384	474	0.050	0.110	0.180
200	225	0.110	0.130	1.50	1.80	3.85	4.60	135	162	347	414	0.050	0.120	0.190
225	250	0.120	0.140	1.60	1.90	4.20	4.95	144	171	378	446	0.060	0.130	0.210
250	280	0.130	0.160	1.60	2.10	4.25	5.40	144	189	383	486	0.060	0.140	0.230
280	305	0.150	0.180	1.90	2.40	4.45	5.70	171	216	401	513	0.060	0.150	0.250
305	315	0.150	0.180	1.90	2.40	4.45	5.70	137	173	320	410	0.060	0.150	0.250
315	355	0.160	0.190	2.10	2.50	5.10	6.10	151	180	367	439	0.080	0.170	0.280
355	400	0.180	0.220	2.30	3.00	5.75	7.50	166	216	414	540	0.080	0.180	0.300
400	450	0.210	0.250	3.00	3.60	—	—	216	259	—	—	0.080	0.190	0.320

Note: The nut rotation angle may only be applied when a nut having the same inner diameter code as the bearing is used.

6 Bearing Fits

(1) Tolerance class of normally used shaft

Conditions		Shaft diameter (mm) Over	Including	Tolerance zone of shaft	Remarks
Cylindrical bore bearing (class 0)					
Rotating inner ring load or indefinite-direction load	Light load[1] or normal load[1] or varying load	18	25	k5	
		25	40	m5	
		40	60	n5	
		60	100	n6	
		100	200	p6	
		200	500	r6	
	Heavy load[1] or impact load	50	70	n5	Use a bearing with an internal clearance greater than the CN clearance.
		70	140	p6	
		140	200[2]	r6	
Static inner ring load	Inner ring should slide smoothly on shaft.	All shaft diameters		g6	For larger bearings, tolerance zone f6 may be applied to ensure the bearing slides smoothly on the shaft.
	Inner ring need not slide smoothly on shaft.	All shaft diameters		h6	
Tapered bore bearing (Class 0; complete with adaptor or removable sleeve.)					
All types of loads		All shaft diameters		h9/IT5[3]	h10/IT7[3] will suffice for power transmitting shafts.

1) Criteria for light loads, normal loads, and heavy loads.

Light loads : Dynamic equivalent radial loads $\leq 0.05C_r$

Normal loads : $0.05C_r$ < Dynamic equivalent radial loads $\leq 0.10C_r$

Heavy loads : $0.10C_r$ < Dynamic equivalent radial loads

2) When using shaft diameter over 200 mm with heavy load or impact load, please contact **NTN** Engineering.

3) "IT5" or "IT7" means that the shaft form tolerance (circularity, cylidricity, etc.) must satisfy tolerance class IT5 or IT7.

Note 1 : The above table applies to solid steel shafts.

2 : When calculating the necessary interference, use the following expressions. Determine the value to 1/1000 the shaft diameter at maximum:

When $F_r \leq 0.3C_{0r}$ Necessary interference Δd_F (μm) is $\Delta d_F = 0.08\ (d \cdot F_r/B)^{1/2}$

When $F_r > 0.3C_{0r}$ $\Delta d_F = 0.02\ (F_r/B)$

(where, d: bearing bore diameter mm, B: inner ring width mm, F_r: radial load N, C_{0r}: basic static load rating N)

When taking into account the difference between the ambient temperature and the temperature of a running bearing, consider adopting the necessary temperature-difference-dependent effective interference Δd_T (μm).

$\Delta d_T = 0.0015 \cdot d \cdot \Delta T$

(where, ΔT: difference between bearing temperature and ambient temperature in ℃)

(2) Tolerance class of normally used housing bore

Conditions				Tolerance class of housing bore	Remarks
Housing	Load type, etc.		Axial movement of outer ring		
One-piece housing or two-piece housing	Static outer ring load	All types of loads	Movable	H7	When a large bearing is used or a large temperature difference exists across the outer ring and housing, tolerance zone G7 may be applied.
		Light load[1] or normal load[1]	Movable	H8	——
		Shaft and inner ring become very hot.	Easily movable	G7	When a large bearing is used or a large temperature difference exists across the outer ring and housing, tolerance zone F7 may be applied.
One-piece housing		Precision rotation must be possibleunder light or normal load.	Generally immovable	K6	——
			Movable	JS6	——
		Quiet running required.	Movable	H6	——
	Indefinite-direction load	Light or normal load	Movable	JS7	——
		Normal or heavy load[1]	Generally immovable	K7	——
		High-impact load	Immovable	M7	——
	Rotating outer ring load	Light or varying load	Immovable	M7	——
		Normal or heavy load	Immovable	N7	——
		Heavy or high-impact loads on thin-walled housings	Immovable	P7	——

1) Criteria for light loads, normal loads, and heavy loads.

Light loads : Dynamic equivalent radial loads $\leq 0.05C_r$

Normal loads : $0.05C_r$ < Dynamic equivalent radial loads $\leq 0.10C_r$

Heavy loads : $0.10C_r$ < Dynamic equivalent radial loads

Note : The above table applies to steel or cast iron housings.

7 Allowable Axial Load

Spherical roller bearings carry a radial load, a bidirectional axial load, or a combination of both. They are suitable for applications involving vibration and impact loads. However , if spherical roller bearings are mounted on a vertical shaft or under an excessive axial load, the load on the rollers of the row not receiving the axial load will be reduced and the rollers in this row move with a sliding motion, possibly leading to lubrication failure and other problems. In case that the ratio of axial load to radial load exceeds Constant e which is in the dimension table ($F_a/F_r > e$), please contact **NTN** Engineering.

F_a : Axial load. F_r : Radial load. e : Constant (See dimension table)

8 Fatigue Load Limit (C_u)

The fatigue load limit is the applied load on a bearing that results in just reaching the fatigue stress limit at the maximum loaded raceway contact. This depends on the bearing type, internal specifications, quality, and material strength. In ISO 281:2007, 1.5 GPa is recommended as the fatigue stress limit corresponding to C_u for bearings made of commonly used high quality material and good manufacturing quality. Values for the fatigue load limit with respect to the **NTN** bearing numbers are provided in the dimensional table. The life modification factor, a_{ISO}, should be evaluated considering the fatigue load limit. For details see catalog "Ball and Roller Bearings (CAT. No.2203/E) section 3.4 Modified rating life".

9 Allowable Speed

Higher rotational speed results in higher bearing temperatures caused by friction. When the bearing temperature exceeds a specific limit, lubricant performance deteriorates significantly, leading to abnormally high temperatures and bearing seizure.

The limiting factors that affect allowable rotational speed include the following:

(1) Bearing type

(2) Bearing size

(3) Lubrication system (grease, circulating lubrication, oil bath, etc.)

(4) Bearing internal clearance (internal clearance of running bearing)

(5) Bearing load

(6) Dimensional accuracy with shaft, housing, etc.

The allowable speeds indicated in the bearing dimension table are for reference only and apply only when bearings are lubricated and heat is efficiently drawn away from the bearing. The allowable speeds in this catalog are categorized as follows:

【Oil-lubricated bearings】

The rotational speed at which the outer ring temperature reaches 80 ℃ when the bearing is allowed to run at 5 % basic static load rating C_{0r} while lubricated with oil (viscosity ISO VG32) which is assimilated to room temperature and fed at a rate of 1 liter/min (circulating lubrication)

【Grease-lubricated bearings】

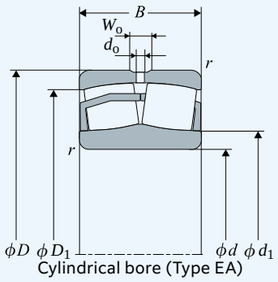
The rotational speed at which the outer ring temperature reaches 80 ℃ when the bearing, which has undergone running-in operation, is allowed to run at 5 % basic static load rating C_{0r} with the bearing's internal free volume 20 to 30 % pre-filled with lithium grease (consistency: NLGI3)

With either lubrication system, the bearing temperature rise profile varies with the operating conditions (operating load, rotational speed, lubricating conditions, etc.) in which the bearing is used. Therefore, select the optimal bearing by allowing sufficient margin for the allowable speed for that particular bearing as indicated in the catalog.

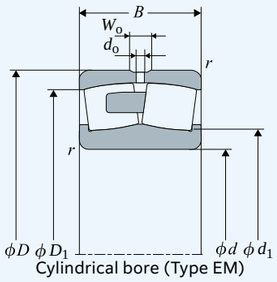
Contact **NTN** Engineering for technical assistance if the rotational speed in the intended application exceeds 80 % of the allowable speed indicated in the bearing dimension table, or if the intended bearing is to be used under severe operating conditions involving vibration and impact.

10 Dimension Table

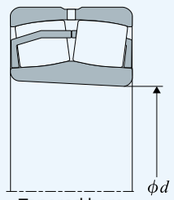
Type EA·Type EM



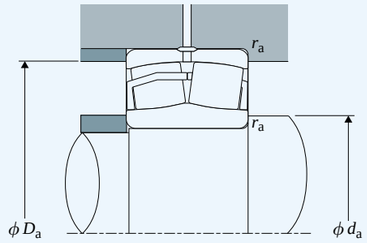
Cylindrical bore (Type EA)



Cylindrical bore (Type EM)



Tapered bore



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$P_{0r} = F_r + Y_0 F_a$

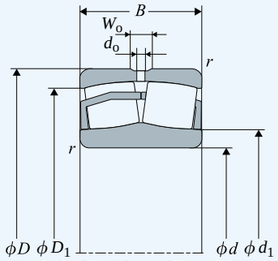
For values e, Y_1, Y_2 and Y_0 see the following table.

Boundary dimensions mm						Basic dynamic load rating kN	Basic static load rating kN	Fatigue load limit kN	Allowable speed min^{-1}		Bearing number		Abutment and fillet dimensions mm					Constant				Mass (approx.) kg	
d	D	B	$r_{s\,min}$[2]	W_o	d_o	C_r	C_{0r}	C_u	Grease	Oil	Cylindrical bore	Tapered bore[1]	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
25	52	18	1	3	1.5	57.3	46.1	3.23	10 400	13 000	22205EAW33	22205EAKW33	30	30	46	46	1	0.34	2.00	2.98	1.96	0.173	0.169
	52	18	1	3	1.5	57.3	46.1	3.23	10 400	13 000	22205EMW33	22205EMKW33	30	30	46	46	1	0.34	2.00	2.98	1.96	0.174	0.171
30	62	20	1	4	2	75.7	64.5	4.58	8 800	11 000	22206EAW33	22206EAKW33	37	36	56	55	1	0.31	2.15	3.20	2.10	0.278	0.272
	62	20	1	4	2	75.7	64.5	4.58	8 800	11 000	22206EMW33	22206EMKW33	37	36	56	55	1	0.31	2.15	3.20	2.10	0.281	0.275
35	72	23	1.1	5	2	100	92.0	6.11	7 500	9 400	22207EAW33	22207EAKW33	45	42	65	63	1.1	0.31	2.21	3.29	2.16	0.438	0.43
	72	23	1.1	5	2	100	92.0	6.11	7 500	9 400	22207EMW33	22207EMKW33	45	42	65	63	1.1	0.31	2.21	3.29	2.16	0.442	0.433
40	80	23	1.1	5	2.5	116	105	7.78	6 800	8 500	22208EAD1	22208EAKD1	50	47	73	71	1.1	0.27	2.47	3.67	2.41	0.528	0.518
	80	23	1.1	5	2.5	110	98.0	7.29	6 800	8 500	22208EMD1	22208EMKD1	50	47	73	71	1.1	0.27	2.47	3.67	2.41	0.529	0.519
	90	33	1.5	6	3	169	152	9.36	5 400	6 600	22308EAD1	22308EAKD1	52	49	81	78	1.5	0.36	1.87	2.79	1.83	1.02	1
	90	33	1.5	6	3	169	152	9.36	5 400	6 600	22308EMD1	22308EMKD1	52	49	81	78	1.5	0.36	1.87	2.79	1.83	1.03	1.01
45	85	23	1.1	6	2.5	121	113	8.76	6 100	7 700	22209EAD1	22209EAKD1	54	52	78	76	1.1	0.26	2.64	3.93	2.58	0.572	0.561
	85	23	1.1	6	2.5	116	106	8.24	6 100	7 700	22209EMD1	22209EMKD1	54	52	78	76	1.1	0.26	2.64	3.93	2.58	0.577	0.566
	100	36	1.5	6	3	206	187	11.8	4 600	5 700	22309EAD1	22309EAKD1	58	54	91	87	1.5	0.36	1.90	2.83	1.86	1.37	1.34
	100	36	1.5	6	3	206	187	11.8	4 600	5 700	22309EMD1	22309EMKD1	58	54	91	87	1.5	0.36	1.90	2.83	1.86	1.38	1.35
50	90	23	1.1	6	2.5	130	124	10.1	5 700	7 200	22210EAD1	22210EAKD1	59	57	83	81	1.1	0.24	2.84	4.23	2.78	0.614	0.602
	90	23	1.1	6	2.5	125	117	9.54	5 700	7 200	22210EMD1	22210EMKD1	59	57	83	81	1.1	0.24	2.84	4.23	2.78	0.616	0.604
	110	40	2	7	3.5	250	232	14.0	4 300	5 300	22310EAD1	22310EAKD1	63	61	99	95	2	0.36	1.87	2.79	1.83	1.82	1.79
	110	40	2	7	3.5	250	232	14.0	4 300	5 300	22310EMD1	22310EMKD1	63	61	99	95	2	0.36	1.87	2.79	1.83	1.84	1.8
	100	25	1.5	6	3	155	148	12.6	5 300	6 700	22211EAD1	22211EAKD1	66	64	91	90	1.5	0.23	2.95	4.40	2.89	0.83	0.814
55	100	25	1.5	6	3	148	140	11.9	5 300	6 700	22211EMD1	22211EMKD1	66	64	91	90	1.5	0.23	2.95	4.40	2.89	0.827	0.811
	120	43	2	8	3.5	296	274	17.4	3 900	4 800	22311EAD1	22311EAKD1	68	66	109	104	2	0.36	1.87	2.79	1.83	2.31	2.26
	120	43	2	8	3.5	296	274	17.4	3 900	4 800	22311EMD1	22311EMKD1	68	66	109	104	2	0.36	1.87	2.79	1.83	2.34	2.29
60	110	28	1.5	7	3	187	181	15.4	4 800	6 000	22212EAD1	22212EAKD1	71	69	101	99	1.5	0.24	2.84	4.23	2.78	1.14	1.12
	110	28	1.5	7	3	179	171	14.6	4 800	6 000	22212EMD1	22212EMKD1	71	69	101	99	1.5	0.24	2.84	4.23	2.78	1.15	1.13
	130	46	2.1	9	4	340	319	20.3	3 600	4 600	22312EAD1	22312EAKD1	75	72	118	113	2.1	0.35	1.95	2.90	1.91	2.86	2.8
	130	46	2.1	9	4	340	319	20.3	3 600	4 600	22312EMD1	22312EMKD1	75	72	118	113	2.1	0.35	1.95	2.90	1.91	2.91	2.85
65	120	31	1.5	8	3.5	226	224	18.2	4 400	5 500	22213EAD1	22213EAKD1	78	74	111	107	1.5	0.24	2.79	4.15	2.73	1.52	1.49
	120	31	1.5	8	3.5	217	212	17.2	4 400	5 500	22213EMD1	22213EMKD1	78	74	111	107	1.5	0.24	2.79	4.15	2.73	1.53	1.5
	140	48	2.1	9	4	369	343	23.4	3 300	4 100	22313EAD1	22313EAKD1	81	77	128	122	2.1	0.33	2.06	3.06	2.01	3.48	3.41
	140	48	2.1	9	4	369	343	23.4	3 300	4 100	22313EMD1	22313EMKD1	81	77	128	122	2.1	0.33	2.06	3.06	2.01	3.5	3.43
70	125	31	1.5	7	3.5	235	240	20.1	4 100	5 200	22214EAD1	22214EAKD1	84	79	116	113	1.5	0.22	3.01	4.48	2.94	1.61	1.58
	125	31	1.5	7	3.5	235	240	20.1	4 100	5 200	22214EMD1	22214EMKD1	84	79	116	113	1.5	0.22	3.01	4.48	2.94	1.64	1.6
	150	51	2.1	10	5	420	396	26.0	3 000	3 800	22314EAD1	22314EAKD1	85	82	138	131	2.1	0.34	2.00	2.98	1.96	4.25	4.16
	150	51	2.1	10	5	420	396	26.0	3 000	3 800	22314EMD1	22314EMKD1	85	82	138	131	2.1	0.34	2.00	2.98	1.96	4.31	4.22
75	130	31	1.5	7	3.5	244	249	21.1	4 000	5 000	22215EAD1	22215EAKD1	88	84	121	118	1.5	0.22	3.14	4.67	3.07	1.67	1.64
	130	31	1.5	7	3.5	244	249	21.1	4 000	5 000	22215EMD1	22215EMKD1	88	84	121	118	1.5	0.22	3.14	4.67	3.07	1.71	1.67
	160	55	2.1	10	5	491	467	29.8	2 900	3 600	22315EAD1	22315EAKD1	91	87	148	139	2.1	0.34	2.00	2.98	1.96	5.18	5.07
	160	55	2.1	10	5	491	467	29.8	2 900	3 600	22315EMD1	22315EMKD1	91	87	148	139	2.1	0.34	2.00	2.98	1.96	5.27	5.16
80	140	33	2	8	3.5	278	287	24.0	3 700	4 600	22216EAD1	22216EAKD1	94	91	129	127	2	0.22	3.14	4.67	3.07	2.09	2.05
	140	33	2	8	3.5	267	272	22.8	3 700	4 600	22216EMD1	22216EMKD1	94	91	129	127	2	0.22	3.14	4.67	3.07	2.11	2.07
	170	58	2.1	10	5	541	522	32.5	2 700	3 400	22316EAD1	22316EAKD1	98	92	158	148	2.1	0.34	2.00	2.98	1.96	6.12	5.99
	170	58	2.1	10	5	541	522	32.5	2 700	3 400	22316EMD1	22316EMKD1	98	92	158	148	2.1	0.34	2.00	2.98	1.96	6.28	6.15
85	150	36	2	8	3.5	324	330	27.1	3 400	4 300	22217EAD1	22217EAKD1	100	96	139	137	2	0.22	3.07	4.57	3.00	2.59	2.54
	150	36	2	8	3.5	324	330	27.1	3 400	4 300	22217EMD1	22217EMKD1	100	96	139	137	2	0.22	3.07	4.57	3.00	2.67	2.62
	180	60	3	11	5	599	604	36.4	2 600	3 200	22317EAD1	22317EAKD1	107	99	166	157	3	0.32	2.09	3.11	2.04	7.18	7.04
	180	60	3	11	5	599	604	36.4	2 600	3 200	22317EMD1	22317EMKD1	107	99	166	157	3	0.32	2.09	3.11	2.04	7.29	7.15

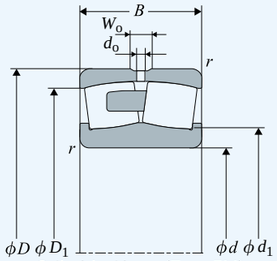
1)"K" indicates bearings have taperd bore with a taper ratio of 1:12.
2)Smallest allowable dimension for chamfer dimension r.

10 Dimension Table

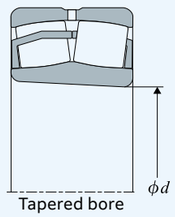
Type EA·Type EM



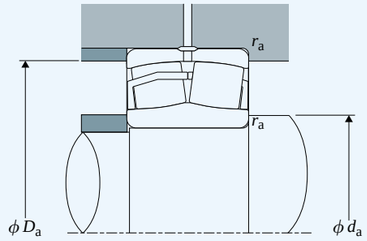
Cylindrical bore (Type EA)



Cylindrical bore (Type EM)



Tapered bore



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$P_{0r} = F_r + Y_0 F_a$

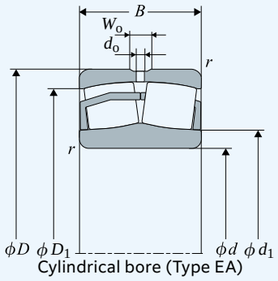
For values e, Y_1, Y_2 and Y_0 see the following table.

Boundary dimensions mm						Basic dynamic load rating kN	Basic static load rating kN	Fatigue load limit kN	Allowable speed min^{-1}		Bearing number		Abutment and fillet dimensions mm					Constant				Mass (approx.) kg	
d	D	B	$r_{s\,min}$[2]	W_o	d_o	C_r	C_{0r}	C_u	Grease	Oil	Cylindrical bore	Tapered bore[1]	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
90	160	40	2	10	4.5	384	398	30.2	3 200	4 000	22218EAD1	22218EAKD1	105	101	149	144	2	0.23	2.90	4.31	2.83	3.34	3.27
	160	40	2	10	4.5	384	398	30.2	3 200	4 000	22218EMD1	22218EMKD1	105	101	149	144	2	0.23	2.90	4.31	2.83	3.43	3.37
	160	52.4	2	9	4	467	513	30.0	2 600	3 200	23218EMD1	23218EMKD1	104	101	149	141	2	0.30	2.25	3.34	2.20	4.43	4.31
	190	64	3	12	5	668	652	40.0	2 500	3 000	22318EAD1	22318EAKD1	110	104	176	166	3	0.33	2.06	3.06	2.01	8.42	8.25
	190	64	3	12	5	668	652	40.0	2 500	3 000	22318EMD1	22318EMKD1	110	104	176	166	3	0.33	2.06	3.06	2.01	8.53	8.35
95	170	43	2.1	10	4.5	416	417	33.4	3 000	3 800	22219EAD1	22219EAKD1	110	107	158	153	2.1	0.23	2.95	4.40	2.89	3.98	3.9
	170	43	2.1	10	4.5	416	417	33.4	3 000	3 800	22219EMD1	22219EMKD1	110	107	158	153	2.1	0.23	2.95	4.40	2.89	4.06	3.98
	200	67	3	12	6	732	751	43.4	2 300	2 800	22319EAD1	22319EAKD1	120	109	186	174	3	0.32	2.09	3.11	2.04	9.91	9.71
	200	67	3	12	6	732	751	43.4	2 300	2 800	22319EMD1	22319EMKD1	120	109	186	174	3	0.32	2.09	3.11	2.04	10	9.82
100	165	52	2	8	4	464	563	30.7	2 400	3 000	23120EAD1	23120EAKD1	114	111	154	147	2	0.28	2.39	3.56	2.34	4.37	4.24
	165	52	2	8	4	480	590	32.1	2 400	3 000	23120EMD1	23120EMKD1	114	111	154	147	2	0.28	2.39	3.56	2.34	4.45	4.32
	180	46	2.1	11	5	472	495	36.9	2 800	3 600	22220EAD1	22220EAKD1	118	112	168	161	2.1	0.24	2.84	4.23	2.78	4.9	4.8
	180	46	2.1	11	5	472	495	36.9	2 800	3 600	22220EMD1	22220EMKD1	118	112	168	161	2.1	0.24	2.84	4.23	2.78	5.02	4.93
	180	60.3	2.1	9	4.5	586	661	36.3	2 300	2 900	23220EMD1	23220EMKD1	118	112	168	159	2.1	0.31	2.18	3.24	2.13	6.51	6.33
	215	73	3	13	6	827	844	50.1	2 100	2 600	22320EAD1	22320EAKD1	127	114	201	187	3	0.34	1.98	2.94	1.93	12.6	12.3
	215	73	3	13	6	827	844	50.1	2 100	2 600	22320EMD1	22320EMKD1	127	114	201	187	3	0.34	1.98	2.94	1.93	12.9	12.7
110	170	45	2	8	3.5	417	517	32.1	2 600	3 300	23022EAD1	23022EAKD1	123	119	161	155	2	0.23	2.95	4.40	2.89	3.66	3.55
	170	45	2	8	3.5	417	517	32.1	2 600	3 300	23022EMD1	23022EMKD1	123	119	161	155	2	0.23	2.95	4.40	2.89	3.66	3.55
	180	56	2	9	4	547	669	36.2	2 200	2 800	23122EAD1	23122EAKD1	125	121	169	161	2	0.28	2.43	3.61	2.37	5.66	5.49
	180	56	2	9	4	547	669	36.2	2 200	2 800	23122EMD1	23122EMKD1	125	121	169	161	2	0.28	2.43	3.61	2.37	5.53	5.36
	180	69	2	8	4	622	769	35.7	2 200	2 700	24122EMD1	24122EMK30D1	121	121	169	158	2	0.36	1.90	2.83	1.86	6.75	6.65
	200	53	2.1	12	6	602	643	45.0	2 600	3 300	22222EAD1	22222EAKD1	130	122	188	179	2.1	0.25	2.69	4.00	2.63	7.1	6.95
	200	53	2.1	12	6	602	643	45.0	2 600	3 300	22222EMD1	22222EMKD1	130	122	188	179	2.1	0.25	2.69	4.00	2.63	7.3	7.15
	200	69.8	2.1	11	5	752	869	43.9	2 100	2 600	23222EMD1	23222EMKD1	130	122	188	176	2.1	0.32	2.12	3.15	2.07	9.41	9.14
	240	80	3	16	7	975	972	59.0	2 000	2 400	22322EAD1	22322EAKD1	139	124	226	209	3	0.32	2.09	3.11	2.04	17	16.6
	240	80	3	16	7	975	972	59.0	2 000	2 400	22322EMD1	22322EMKD1	139	124	226	209	3	0.32	2.09	3.11	2.04	17.4	17.1
120	180	46	2	8	3.5	446	577	35.8	2 400	3 100	23024EAD1	23024EAKD1	134	129	171	165	2	0.22	3.14	4.67	3.07	4.02	3.9
	180	46	2	8	3.5	446	577	35.8	2 400	3 100	23024EMD1	23024EMKD1	134	129	171	165	2	0.22	3.14	4.67	3.07	4.02	3.9
	180	60	2	8	3.5	526	726	34.4	2 100	2 600	24024EMD1	24024EMK30D1	132	129	171	161	2	0.29	2.32	3.45	2.26	5.28	5.21
	200	62	2	10	4.5	663	820	43.4	2 000	2 500	23124EAD1	23124EAKD1	138	131	189	179	2	0.28	2.43	3.61	2.37	7.72	7.49
	200	62	2	10	4.5	663	820	43.4	2 000	2 500	23124EMD1	23124EMKD1	138	131	189	179	2	0.28	2.43	3.61	2.37	7.77	7.54
	200	80	2	10	4.5	756	991	41.3	1 900	2 500	24124EMD1	24124EMK30D1	136	131	189	173	2	0.37	1.84	2.74	1.80	10	9.87
	215	58	2.1	12	6	688	753	49.9	2 400	3 000	22224EAD1	22224EAKD1	141	132	203	193	2.1	0.25	2.74	4.08	2.68	8.88	8.68
	215	58	2.1	12	6	688	753	49.9	2 400	3 000	22224EMD1	22224EMKD1	141	132	203	193	2.1	0.25	2.74	4.08	2.68	9.01	8.82
	215	76	2.1	11	5	857	998	49.8	1 900	2 400	23224EMD1	23224EMKD1	139	132	203	190	2.1	0.32	2.09	3.11	2.04	11.7	11.3
	260	86	3	18	8	1 170	1 280	68.4	1 800	2 200	22324EAD1	22324EAKD1	156	134	246	225	3	0.32	2.09	3.11	2.04	22.3	21.9
	260	86	3	18	8	1 170	1 280	68.4	1 800	2 200	22324EMD1	22324EMKD1	156	134	246	225	3	0.32	2.09	3.11	2.04	22.7	22.2
130	200	52	2	9	4	565	721	44.2	2 200	2 900	23026EAD1	23026EAKD1	145	139	191	183	2	0.22	3.01	4.48	2.94	5.88	5.71
	200	52	2	9	4	565	721	44.2	2 200	2 900	23026EMD1	23026EMKD1	145	139	191	183	2	0.22	3.01	4.48	2.94	5.9	5.73
	200	69	2	9	4	682	936	42.2	1 900	2 400	24026EMD1	24026EMK30D1	143	139	191	178	2	0.31	2.20	3.27	2.15	7.82	7.71
	210	64	2	10	4.5	710	906	47.1	1 900	2 400	23126EAD1	23126EAKD1	148	141	199	189	2	0.27	2.51	3.74	2.45	8.45	8.19
	210	64	2	10	4.5	710	906	47.1	1 900	2 400	23126EMD1	23126EMKD1	148	141	199	189	2	0.27	2.51	3.74	2.45	8.51	8.25
	210	80	2	10	4.5	803	1 080	45.0	1 800	2 400	24126EMD1	24126EMK30D1	146	141	199	183	2	0.34	1.96	2.92	1.92	10.7	10.5
	230	64	3	13	6	808	898	56.6	2 200	2 800	22226EAD1	22226EAKD1	151	144	216	206	3	0.25	2.69	4.00	2.63	11	10.7
	230	64	3	13	6	808	898	56.6	2 200	2 800	22226EMD1	22226EMKD1	151	144	216	206	3	0.25	2.69	4.00	2.63	11.1	10.9
	230	80	3	12	5	958	1 130	55.4	1 700	2 300	23226EMD1	23226EMKD1	150	144	216	203	3	0.32	2.12	3.15	2.07	13.8	13.4
	280	93	4	19	9	1 330	1 400	77.8	1 600	2 000	22326EAD1	22326EAKD1	164	147	263	243	4	0.33	2.06	3.06	2.01	27.2	26.6
	280	93	4	19	9	1 330	1 400	77.8	1 600	2 000	22326EMD1	22326EMKD1	164	147	263	243	4	0.33	2.06	3.06	2.01	28	27.5

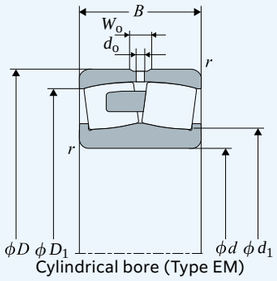
1) Bearings appended with "K" have a tapered bore ratio of 1:12; bearings append with "K30" have a tapered bore ratio 1:30.
2) Smallest allowable dimension for chamfer dimension r.

10 Dimension Table

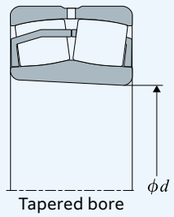
Type EA·Type EM



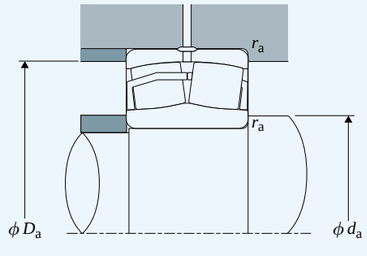
Cylindrical bore (Type EA)



Cylindrical bore (Type EM)



Tapered bore



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$P_{0r} = F_r + Y_0 F_a$

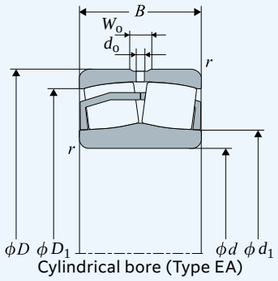
For values e, Y_1, Y_2 and Y_0 see the following table.

Boundary dimensions mm						Basic dynamic load rating kN	Basic static load rating kN	Fatigue load limit kN	Allowable speed min^{-1}		Bearing number		Abutment and fillet dimensions mm					Constant				Mass (approx.) kg	
d	D	B	$r_{s\,min}$[2]	W_o	d_o	C_r	C_{0r}	C_u	Grease	Oil	Cylindrical bore	Tapered bore[1]	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
140	210	53	2	9	4	597	783	47.5	2 100	2 700	23028EAD1	23028EAKD1	155	149	201	193	2	0.22	3.14	4.67	3.07	6.32	6.13
	210	53	2	9	4	597	783	47.5	2 100	2 700	23028EMD1	23028EMKD1	155	149	201	193	2	0.22	3.14	4.67	3.07	6.37	6.18
	210	69	2	9	4	709	990	46.0	1 800	2 200	24028EMD1	24028EMK30D1	153	149	201	188	2	0.28	2.37	3.53	2.32	8.27	8.15
	225	68	2.1	11	5	802	1 030	53.1	1 800	2 200	23128EAD1	23128EAKD1	159	152	213	203	2.1	0.26	2.55	3.80	2.50	10.3	9.94
	225	68	2.1	11	5	802	1 030	53.1	1 800	2 200	23128EMD1	23128EMKD1	159	152	213	203	2.1	0.26	2.55	3.80	2.50	10.3	10
	225	85	2.1	10	4.5	951	1 280	53.3	1 700	2 200	24128EMD1	24128EMK30D1	156	152	213	198	2.1	0.34	1.98	2.94	1.93	12.9	12.8
	250	68	3	14	7	912	1 010	65.8	2 000	2 500	22228EAD1	22228EAKD1	163	154	236	224	3	0.25	2.74	4.08	2.68	13.9	13.6
	250	68	3	14	7	912	1 010	65.8	2 000	2 500	22228EMD1	22228EMKD1	163	154	236	224	3	0.25	2.74	4.08	2.68	14.2	13.9
	250	88	3	13	6	1 140	1 370	64.2	1 600	2 100	23228EMD1	23228EMKD1	162	154	236	220	3	0.33	2.06	3.06	2.01	18.2	17.7
	300	102	4	19	9	1 540	1 720	88.8	1 500	1 900	22328EAD1	22328EAKD1	181	157	283	261	4	0.33	2.03	3.02	1.98	34.4	33.7
	300	102	4	19	9	1 540	1 720	88.8	1 500	1 900	22328EMD1	22328EMKD1	181	157	283	261	4	0.33	2.03	3.02	1.98	35.4	34.7
150	225	56	2.1	10	4.5	660	893	52.9	2 000	2 500	23030EAD1	23030EAKD1	167	161	214	207	2.1	0.21	3.20	4.77	3.13	7.68	7.45
	225	56	2.1	10	4.5	660	893	52.9	2 000	2 500	23030EMD1	23030EMKD1	167	161	214	207	2.1	0.21	3.20	4.77	3.13	7.73	7.5
	225	75	2.1	10	4.5	789	1 140	51.2	1 700	2 100	24030EMD1	24030EMK30D1	165	161	214	202	2.1	0.29	2.32	3.45	2.26	10.4	10.3
	250	80	2.1	13	6	1 060	1 350	65.1	1 600	2 000	23130EAD1	23130EAKD1	171	162	238	223	2.1	0.29	2.35	3.50	2.30	15.7	15.2
	250	80	2.1	13	6	1 060	1 350	65.1	1 600	2 000	23130EMD1	23130EMKD1	171	162	238	223	2.1	0.29	2.35	3.50	2.30	15.8	15.3
	250	100	2.1	12	6	1 180	1 590	62.8	1 600	2 000	24130EMD1	24130EMK30D1	168	162	238	216	2.1	0.36	1.85	2.76	1.81	19.7	19.4
	270	73	3	15	7	1 080	1 220	74.4	1 800	2 300	22230EAD1	22230EAKD1	177	164	256	242	3	0.25	2.74	4.08	2.68	17.6	17.3
	270	73	3	15	7	1 080	1 220	74.4	1 800	2 300	22230EMD1	22230EMKD1	177	164	256	242	3	0.25	2.74	4.08	2.68	18	17.7
	270	96	3	14	6	1 340	1 620	74.0	1 500	1 900	23230EMD1	23230EMKD1	174	164	256	237	3	0.33	2.03	3.02	1.98	23.6	22.9
	320	108	4	20	9	1 740	1 890	98.9	1 400	1 700	22330EMD1	22330EMKD1	188	167	303	279	4	0.34	2.00	2.98	1.96	42.2	41.3
160	220	45	2	9	4	455	683	45.6	1 900	2 400	23932EMD1	23932EMKD1	175	169	211	205	2	0.17	3.90	5.81	3.81	5.09	4.94
	240	60	2.1	11	5	748	1 000	59.1	1 800	2 300	23032EAD1	23032EAKD1	177	171	229	221	2.1	0.21	3.20	4.77	3.13	9.32	9.03
	240	60	2.1	11	5	748	1 000	59.1	1 800	2 300	23032EMD1	23032EMKD1	177	171	229	221	2.1	0.21	3.20	4.77	3.13	9.37	9.09
	240	80	2.1	10	5	901	1 290	56.8	1 600	2 000	24032EMD1	24032EMK30D1	175	171	229	215	2.1	0.29	2.32	3.45	2.26	12.6	12.4
	270	86	2.1	14	6	1 220	1 580	73.6	1 500	1 900	23132EAD1	23132EAKD1	185	172	258	240	2.1	0.29	2.35	3.50	2.30	20.1	19.5
	270	86	2.1	14	6	1 220	1 580	73.6	1 500	1 900	23132EMD1	23132EMKD1	185	172	258	240	2.1	0.29	2.35	3.50	2.30	20.2	19.6
	270	109	2.1	14	6	1 360	1 860	70.6	1 500	1 800	24132EMD1	24132EMK30D1	181	172	258	232	2.1	0.37	1.83	2.72	1.79	25.4	25.1
	290	80	3	17	8	1 220	1 390	84.1	1 700	2 100	22232EAD1	22232EAKD1	190	174	276	260	3	0.25	2.69	4.00	2.63	22.3	21.8
	290	80	3	17	8	1 220	1 390	84.1	1 700	2 100	22232EMD1	22232EMKD1	190	174	276	260	3	0.25	2.69	4.00	2.63	22.9	22.4
	290	104	3	15	7	1 550	1 890	83.8	1 400	1 800	23232EMD1	23232EMKD1	187	174	276	254	3	0.33	2.03	3.02	1.98	29.6	28.8
	340	114	4	20	10	1 950	2 210	109	1 300	1 600	22332EMD1	22332EMKD1	205	177	323	296	4	0.33	2.03	3.02	1.98	50.5	49.5
170	230	45	2	9	4.5	468	723	48.8	1 800	2 300	23934EMD1	23934EMKD1	185	179	221	215	2	0.16	4.11	6.12	4.02	5.39	5.23
	260	67	2.1	12	5	914	1 240	68.8	1 700	2 200	23034EAD1	23034EAKD1	190	181	249	238	2.1	0.22	3.07	4.57	3.00	12.7	12.3
	260	67	2.1	12	5	914	1 240	68.8	1 700	2 200	23034EMD1	23034EMKD1	190	181	249	238	2.1	0.22	3.07	4.57	3.00	12.8	12.4
	260	90	2.1	11	5	1 100	1 600	66.3	1 500	1 900	24034EMD1	24034EMK30D1	186	181	249	231	2.1	0.30	2.23	3.32	2.18	17.2	16.9
	280	88	2.1	14	6	1 270	1 700	77.3	1 400	1 800	23134EAD1	23134EAKD1	195	182	268	250	2.1	0.28	2.39	3.56	2.34	21.5	20.9
	280	88	2.1	14	6	1 270	1 700	77.3	1 400	1 800	23134EMD1	23134EMKD1	195	182	268	250	2.1	0.28	2.39	3.56	2.34	21.6	20.9
	280	109	2.1	14	6	1 410	1 990	74.4	1 400	1 700	24134EMD1	24134EMK30D1	193	182	268	243	2.1	0.35	1.91	2.85	1.87	26.7	26.3
	310	86	4	18	8	1 400	1 610	94.7	1 600	2 000	22234EMD1	22234EMKD1	201	187	293	277	4	0.26	2.60	3.87	2.54	28.3	27.7
	310	110	4	16	8	1 700	2 070	94.6	1 300	1 700	23234EMD1	23234EMKD1	199	187	293	272	4	0.33	2.03	3.02	1.98	35.8	34.8
	360	120	4	20	10	2 200	2 630	121	1 200	1 500	22334EMD1	22334EMKD1	223	187	343	313	4	0.32	2.09	3.11	2.04	60.3	59.1

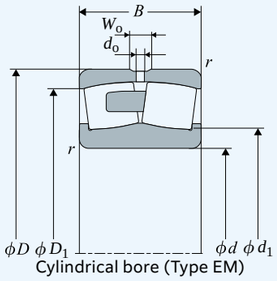
1) Bearings appended with "K" have a tapered bore ratio of 1:12; bearings append with "K30" have a tapered bore ratio 1:30.
2) Smallest allowable dimension for chamfer dimension r.

10 Dimension Table

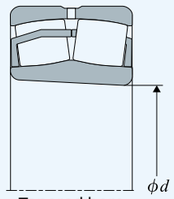
Type EA·Type EM



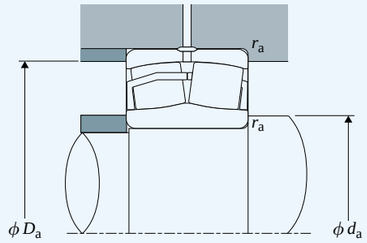
Cylindrical bore (Type EA)



Cylindrical bore (Type EM)



Tapered bore



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

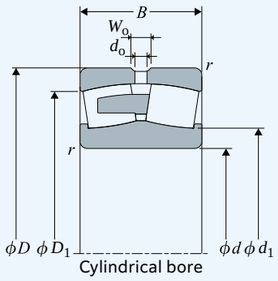
$P_{0r} = F_r + Y_0 F_a$

For values e, Y_1, Y_2 and Y_0 see the following table.

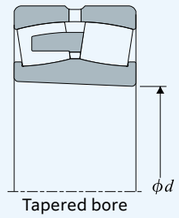
Boundary dimensions mm						Basic dynamic load rating kN	Basic static load rating kN	Fatigue load limit kN	Allowable speed min^{-1}		Bearing number		Abutment and fillet dimensions mm					Constant				Mass (approx.) kg	
d	D	B	$r_{s\,min}$[2]	W_o	d_o	C_r	C_{0r}	C_u	Grease	Oil	Cylindrical bore	Tapered bore[1]	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
180	250	52	2	10	5	573	869	57.2	1 700	2 100	23936EMD1	23936EMKD1	199	189	241	232	2	0.17	3.90	5.81	3.81	7.79	7.56
	280	74	2.1	13	6	1 080	1 450	78.6	1 600	2 000	23036EAD1	23036EAKD1	201	191	269	255	2.1	0.23	2.95	4.40	2.89	16.8	16.3
	280	74	2.1	13	6	1 080	1 450	78.6	1 600	2 000	23036EMD1	23036EMKD1	201	191	269	255	2.1	0.23	2.95	4.40	2.89	16.9	16.4
	280	100	2.1	13	6	1 310	1 880	76.0	1 400	1 800	24036EMD1	24036EMK30D1	199	191	269	248	2.1	0.31	2.15	3.20	2.10	22.8	22.4
	300	96	3	15	7	1 490	1 960	88.7	1 300	1 700	23136EAD1	23136EAKD1	205	194	286	267	3	0.29	2.32	3.45	2.26	27.2	26.4
	300	96	3	15	7	1 490	1 960	88.7	1 300	1 700	23136EMD1	23136EMKD1	205	194	286	267	3	0.29	2.32	3.45	2.26	27.4	26.5
	300	118	3	15	7	1 660	2 290	85.5	1 300	1 600	24136EMD1	24136EMK30D1	202	194	286	259	3	0.36	1.87	2.79	1.83	33.5	33
	320	86	4	18	8	1 450	1 660	101	1 500	1 900	22236EMD1	22236EMKD1	209	197	303	287	4	0.25	2.74	4.08	2.68	29.3	28.7
	320	112	4	16	8	1 800	2 270	101	1 200	1 600	23236EMD1	23236EMKD1	210	197	303	282	4	0.33	2.06	3.06	2.01	38.2	37.1
	380	126	4	21	10	2 420	2 810	132	1 100	1 400	22336EMD1	22336EMKD1	229	197	363	329	4	0.32	2.09	3.11	2.04	70.2	68.7
190	260	52	2	10	5	603	935	62.8	1 600	2 000	23938EMD1	23938EMKD1	209	199	251	243	2	0.17	4.05	6.04	3.96	8.20	7.96
	290	75	2.1	13	6	1 140	1 570	83.5	1 500	1 900	23038EAD1	23038EAKD1	213	201	279	266	2.1	0.22	3.01	4.48	2.94	17.8	17.3
	290	75	2.1	13	6	1 140	1 570	83.5	1 500	1 900	23038EMD1	23038EMKD1	213	201	279	266	2.1	0.22	3.01	4.48	2.94	17.9	17.4
	290	100	2.1	13	6	1 360	2 000	80.7	1 300	1 700	24038EMD1	24038EMK30D1	209	201	279	258	2.1	0.30	2.23	3.32	2.18	23.8	23.4
	320	104	3	17	8	1 670	2 250	100	1 200	1 600	23138EMD1	23138EMKD1	221	204	306	284	3	0.29	2.32	3.45	2.26	34.3	33.2
	320	128	3	16	8	1 900	2 700	96.8	1 200	1 500	24138EMD1	24138EMK30D1	216	204	306	275	3	0.37	1.84	2.74	1.80	42.1	41.5
	340	92	4	20	9	1 620	1 870	112	1 400	1 800	22238EMD1	22238EMKD1	222	207	323	305	4	0.25	2.74	4.08	2.68	35.6	34.9
	340	120	4	18	8	1 990	2 480	109	1 200	1 500	23238EMD1	23238EMKD1	220	207	323	299	4	0.33	2.03	3.02	1.98	46.1	44.7
	400	132	5	21	10	2 600	3 120	145	1 000	1 300	22338EMD1	22338EMKD1	247	210	380	346	5	0.32	2.12	3.15	2.07	81.5	79.9
200	280	60	2.1	12	6	766	1 190	71.8	1 500	1 900	23940EMD1	23940EMKD1	221	211	269	260	2.1	0.18	3.76	5.59	3.67	12	11.6
	310	82	2.1	15	7	1 310	1 790	94.1	1 400	1 800	23040EMD1	23040EMKD1	223	211	299	283	2.1	0.23	2.95	4.40	2.89	22.8	22.1
	310	109	2.1	14	7	1 570	2 280	91.1	1 200	1 600	24040EMD1	24040EMK30D1	221	211	299	275	2.1	0.31	2.18	3.24	2.13	30.2	29.7
	340	112	3	18	8	1 890	2 510	110	1 100	1 400	23140EMD1	23140EMKD1	231	214	326	301	3	0.30	2.25	3.34	2.20	41.9	40.6
	340	140	3	17	8	2 130	2 930	105	1 100	1 400	24140EMD1	24140EMK30D1	224	214	326	291	3	0.39	1.74	2.59	1.70	51.5	50.7
	360	98	4	20	10	1 810	2 100	124	1 400	1 700	22240EMD1	22240EMKD1	234	217	343	323	4	0.25	2.74	4.08	2.68	42.7	41.8
	360	128	4	19	9	2 250	2 840	120	1 100	1 300	23240EMD1	23240EMKD1	232	217	343	315	4	0.34	1.98	2.94	1.93	55.2	53.6
	420	138	5	21	10	2 830	3 530	158	950	1 200	22340EMD1	22340EMKD1	265	220	400	364	5	0.31	2.15	3.20	2.10	94.6	92.7
220	300	60	2.1	12	6	789	1 260	79.4	1 400	1 700	23944EMD1	23944EMKD1	241	231	289	280	2.1	0.17	4.05	6.04	3.96	12.5	12.1
	340	90	3	15	7	1 530	2 110	109	1 300	1 600	23044EMD1	23044EMKD1	246	233	327	310	3	0.23	2.95	4.40	2.89	29.9	29.1
	340	118	3	15	7	1 850	2 720	106	1 100	1 400	24044EMD1	24044EMK30D1	243	233	327	302	3	0.31	2.20	3.27	2.15	39.2	38.6
	370	120	4	19	9	2 190	2 940	128	1 000	1 300	23144EMD1	23144EMKD1	252	237	353	328	4	0.30	2.28	3.39	2.23	52.3	50.7
	370	150	4	19	9	2 540	3 620	124	1 000	1 300	24144EMD1	24144EMK30D1	247	237	353	317	4	0.38	1.78	2.65	1.74	65.2	64.3
	400	108	4	21	11	2 210	2 690	149	1 200	1 500	22244EMD1	22244EMKD1	264	237	383	358	4	0.25	2.74	4.08	2.68	59.6	58.4
	400	144	4	20	10	2 890	3 830	147	1 000	1 200	23244EMD1	23244EMKD1	261	237	383	349	4	0.34	2.00	2.98	1.96	79.4	77.1
240	320	60	2.1	12	6	815	1 350	87.7	1 300	1 600	23948EMD1	23948EMKD1	262	251	309	301	2.1	0.15	4.40	6.56	4.31	13.5	13.1
	360	92	3	16	8	1 630	2 350	120	1 100	1 400	23048EMD1	23048EMKD1	267	253	347	329	3	0.22	3.07	4.57	3.00	32	31.7
	360	118	3	16	8	1 940	2 980	116	1 000	1 300	24048EMD1	24048EMK30D1	264	253	347	322	3	0.28	2.37	3.53	2.32	42.2	41.6
	400	128	4	20	9	2 510	3 500	147	960	1 200	23148EMD1	23148EMKD1	276	257	383	356	4	0.29	2.32	3.45	2.26	65.1	63.1
	400	160	4	19	9	2 910	4 290	142	960	1 200	24148EMD1	24148EMK30D1	270	257	383	344	4	0.37	1.82	2.70	1.78	81	79.8
260	360	75	2.1	14	7	1 130	1 940	105	1 100	1 400	23952EMD1	23952EMKD1	292	271	349	335	2.1	0.17	3.90	5.81	3.81	23.9	23.1
	400	104	4	18	8	2 060	2 910	144	1 000	1 300	23052EMD1	23052EMKD1	291	275	385	366	4	0.23	2.95	4.40	2.89	47.8	46.3
	400	140	4	18	8	2 520	3 820	139	960	1 200	24052EMD1	24052EMK30D1	286	275	385	354	4	0.31	2.16	3.22	2.12	63.6	62.6
280	380	75	2.1	14	7	1 180	2 050	115	1 000	1 300	23956EMD1	23956EMKD1	310	291	369	356	2.1	0.16	4.16	6.20	4.07	25.2	24.4
	420	106	4	18	8	2 170	3 150	155	960	1 200	23056EMD1	23056EMKD1	310	295	405	386	4	0.22	3.07	4.57	3.00	51.3	49.7
	420	140	4	18	8	2 620	4 060	150	880	1 100	24056EMD1	24056EMK30D1	306	295	405	376	4	0.29	2.30	3.42	2.25	67.3	66.3

1) Bearings appended with "K" have a tapered bore ratio of 1:12; bearings append with "K30" have a tapered bore ratio 1:30.
2) Smallest allowable dimension for chamfer dimension r.

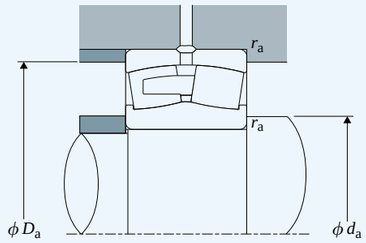
10 Dimension Table



Cylindrical bore



Tapered bore



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$P_{0r} = F_r + Y_0 F_a$

For values e, Y_1, Y_2 and Y_0 see the following table.

Type EM (Large size)

Boundary dimensions mm						Basic dynamic load rating kN	Basic static load rating kN	Fatigue load limit kN	Allowable speed min^{-1}		Bearing number		Abutment and fillet dimensions mm					Constant				Mass (approx.) kg	
d	D	B	$r_{s\,min}$[2]	W_o	d_o	C_r	C_{0r}	C_u	Grease	Oil	Cylindrical bore	Tapered bore[1]	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical bore	Tapered bore
220	460	145	5	20	12	3 010	3 560	163	850	1 090	22344EMD1	22344EMKD1	277	240	440	388	5	0.32	2.10	3.13	2.06	119	116
240	440	120	4	16	10	2 470	3 110	159	1 060	1 350	22248EMD1	22248EMKD1	288	257	423	383	4	0.27	2.53	3.77	2.47	82.6	80.9
	440	160	4	20	12	3 140	4 260	156	850	1 090	23248EMD1	23248EMKD1	284	257	423	372	4	0.36	1.86	2.77	1.82	108	105
	500	155	5	20	12	3 500	4 170	193	780	1 000	22348EMD1	22348EMKD1	299	260	480	421	5	0.32	2.12	3.15	2.07	149	146
260	440	144	4	20	12	2 780	4 020	160	860	1 090	23152EMD1	23152EMKD1	302	277	423	380	4	0.31	2.15	3.20	2.10	92.2	89.5
	440	180	4	27	16	3 290	4 880	147	850	1 090	24152EMD1	24152EMK30D1	295	277	423	371	4	0.40	1.69	2.52	1.65	111	109
	480	130	5	20	12	2 890	3 680	183	970	1 240	22252EMD1	22252EMKD1	312	280	460	415	5	0.27	2.53	3.77	2.47	108	105
	480	174	5	27	16	3 650	5 050	180	780	1 000	23252EMD1	23252EMKD1	310	280	460	405	5	0.36	1.87	2.79	1.83	143	139
	540	165	6	27	16	4 020	4 830	221	720	920	22352EMD1	22352EMKD1	324	286	514	456	6	0.31	2.16	3.22	2.12	186	183
280	460	146	5	20	12	2 980	4 400	182	810	1 030	23156EMD1	23156EMKD1	322	300	440	403	5	0.30	2.23	3.32	2.18	98.4	95.3
	460	180	5	27	16	3 550	5 450	167	810	1 030	24156EMD1	24156EMK30D1	316	300	440	394	5	0.38	1.78	2.65	1.74	118	117
	500	130	5	20	12	3 010	3 920	198	920	1 180	22256EMD1	22256EMKD1	333	300	480	437	5	0.25	2.69	4.00	2.63	113	111
	500	176	5	27	16	3 770	5 340	193	740	950	23256EMD1	23256EMKD1	331	300	480	426	5	0.35	1.95	2.90	1.91	152	148
	580	175	6	27	16	4 490	5 450	249	670	860	22356EMD1	22356EMKD1	349	306	554	489	6	0.31	2.18	3.24	2.13	228	223
300	420	90	3	14	8	1 600	2 620	145	890	1 140	23960EMD1	23960EMKD1	329	313	407	387	3	0.20	3.42	5.09	3.34	40.1	39.2
	460	118	4	16	10	2 400	3 610	176	890	1 130	23060EMD1	23060EMKD1	338	315	445	413	4	0.24	2.81	4.19	2.75	72.9	70.9
	460	160	4	20	12	3 150	5 190	166	760	970	24060EMD1	24060EMK30D1	332	315	445	401	4	0.33	2.04	3.04	2.00	98	96.9
	500	160	5	20	12	3 540	5 170	205	750	950	23160EMD1	23160EMKD1	345	320	480	436	5	0.31	2.20	3.27	2.15	129	125
	500	200	5	27	16	4 270	6 610	198	750	950	24160EMD1	24160EMK30D1	340	320	480	425	5	0.39	1.74	2.59	1.70	159	157
	540	140	5	20	12	3 470	4 590	232	860	1 080	22260EMD1	22260EMKD1	358	320	520	469	5	0.25	2.69	4.00	2.63	134	131
	540	192	5	27	16	4 520	6 280	228	690	880	23260EMD1	23260EMKD1	352	320	520	461	5	0.35	1.92	2.86	1.88	194	188
320	440	90	3	14	8	1 670	2 820	154	840	1 080	23964EMD1	23964EMKD1	350	333	427	407	3	0.19	3.62	5.39	3.54	42.1	40.8
	480	121	4	20	12	2 540	4 020	191	850	1 070	23064EMD1	23064EMKD1	360	335	465	433	4	0.23	2.92	4.35	2.86	78.9	76.6
	480	160	4	20	12	3 250	5 400	184	720	920	24064EMD1	24064EMK30D1	352	335	465	423	4	0.31	2.15	3.20	2.10	104	102
	540	176	5	27	16	4 020	6 020	227	700	880	23164EMD1	23164EMKD1	373	340	520	468	5	0.31	2.15	3.20	2.10	169	164
	540	218	5	33	20	5 010	7 720	225	690	880	24164EMD1	24164EMK30D1	363	340	520	457	5	0.39	1.71	2.54	1.67	204	201
	580	150	5	20	12	3 950	5 100	261	800	1 020	22264EMD1	22264EMKD1	383	340	560	510	5	0.25	2.69	4.00	2.63	177	174
	580	208	5	33	20	5 230	7 370	259	640	820	23264EMD1	23264EMKD1	376	340	560	493	5	0.35	1.91	2.85	1.87	245	238
340	460	90	3	14	8	1 710	2 980	162	800	1 020	23968EMD1	23968EMKD1	370	353	447	427	3	0.18	3.80	5.66	3.72	44.5	43.1
	520	133	5	20	12	2 990	4 690	219	790	1 000	23068EMD1	23068EMKD1	384	358	502	466	5	0.24	2.87	4.27	2.80	98.5	95.5
	520	180	5	27	16	3 910	6 510	206	670	860	24068EMD1	24068EMK30D1	377	358	502	456	5	0.33	2.06	3.06	2.01	140	137
	580	190	5	27	16	4 670	6 870	257	650	830	23168EMD1	23168EMKD1	393	360	560	500	5	0.32	2.12	3.15	2.07	213	206
	580	243	5	33	20	5 980	9 340	254	650	830	24168EMD1	24168EMK30D1	385	360	560	486	5	0.41	1.65	2.46	1.61	266	262
360	480	90	3	14	8	1 750	3 090	171	760	970	23972EMD1	23972EMKD1	390	373	467	447	3	0.17	4.00	5.96	3.91	46.2	44.8
	540	134	5	20	12	3 070	4 910	232	750	950	23072EMD1	23072EMKD1	405	378	522	488	5	0.23	2.98	4.44	2.92	111	108
	540	180	5	27	16	4 040	6 840	220	640	820	24072EMD1	24072EMK30D1	398	378	522	478	5	0.31	2.16	3.22	2.12	147	145
380	520	106	4	16	10	2 340	4 000	205	710	910	23976EMD1	23976EMKD1	412	395	505	481	4	0.18	3.66	5.46	3.58	68	65.9
	560	135	5	20	12	3 230	5 270	247	720	910	23076EMD1	23076EMKD1	425	398	542	509	5	0.22	3.07	4.57	3.00	117	113
	560	180	5	27	16	4 140	7 280	240	610	780	24076EMD1	24076EMK30D1	420	398	542	499	5	0.30	2.25	3.34	2.20	154	151
400	540	106	4	16	10	2 370	4 170	215	680	870	23980EMD1	23980EMKD1	433	415	525	501	4	0.18	3.80	5.66	3.72	71.4	69.2
420	560	106	4	16	10	2 390	4 320	230	650	830	23984EMD1	23984EMKD1	454	435	545	522	4	0.17	3.95	5.88	3.86	74.9	72.6

1) Bearings appended with "K" have a tapered bore ratio of 1:12; bearings append with "K30" have a tapered bore ratio 1:30.
2) Smallest allowable dimension for chamfer dimension r.

NTN corporation

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