

NTN[®]

ULTAGE

ULTAGE

Spherical Roller Bearings
[Type EA, Type EM]

[Type EA•

Up to
five times
longer
service life

ULT

Longer service life and higher rot while contributing to mo

Ultage Series spherical rollers bearings are innovative to provide longer service life, higher rotational speed, and



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
- Simple window-type configuration employs a pressed steel cage.
- The back face of the cage provides a guide function that eliminates the guide ring.

Improved Ease-of-Use

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

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.

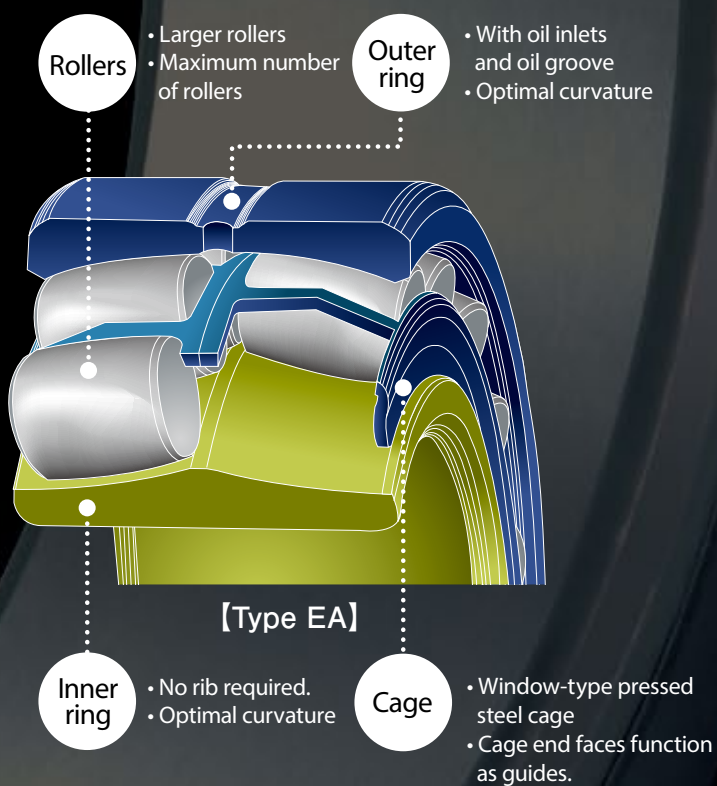
Type EM]

AGE

Up to
20% higher
allowable
speed

ational speed improve ease-of-use re eco-friendly operation.

new standard products specifically developed
improved ease-of-use required for industrial machinery.



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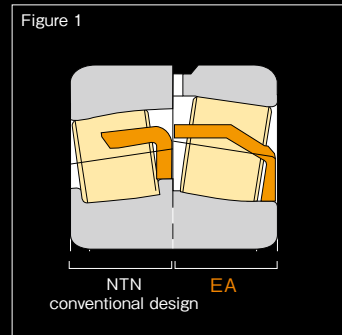
ULTAGE

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 65% 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 five times longer than the NTN conventional design



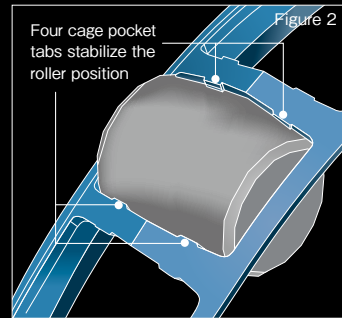
2 The industry's highest allowable speed

The new pressed steel cage results in allowable bearing speeds 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.



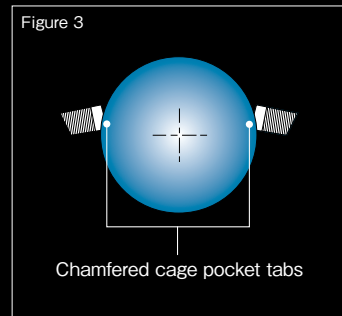
4 Compact, lightweight design

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

Benchmarks

Model No.	Load rating (kN)		Boundary dimensions (mm)	Bearing volume (cm ³)	Mass (kg)
	C _r	C _{0r}			
22220B	315	415	φ100×φ180×46	810	4.95
22218EA	385	398	φ90×φ160×40	550	3.28

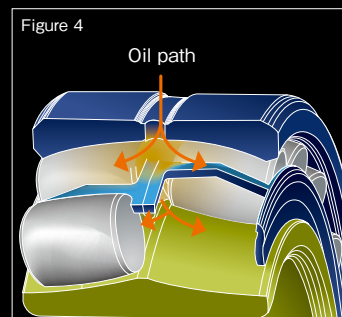
Results in approximately a 30% reduction in volume ratio and mass ratio



5 Improved ease-of-use

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

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



[Bearing Number]

222

Dimension series code

20

Bore diameter code

EA

Type code

EA: Window-type pressed steel cage
EM: One-piece machined high-tension brass cage

K

Raceway configuration code

No code: Cylindrical bore
K: Tapered bore

D1

Oil inlet/oil groove code

D1: With oil inlet/oil groove (D1 specification only)
W33: With oil inlet/oil groove (European market specification)

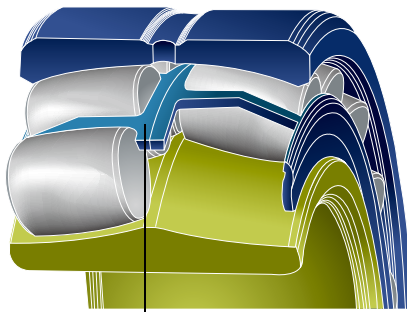
C3

Internal clearance code

No code: Normal clearance
C3: C3 clearance

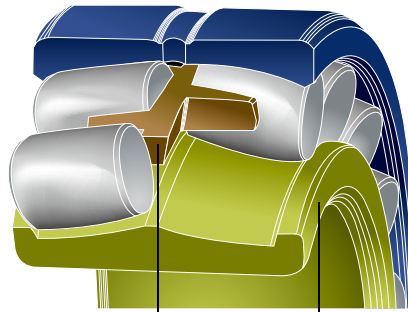
For applications that expose bearings to severe vibration and impact, we recommend Type EM bearings, which incorporate a high-tension brass cage machined from a single piece. (Type EM differs from Type EA in the shape of the inner ring.)

Type EA



Window-type pressed steel cage

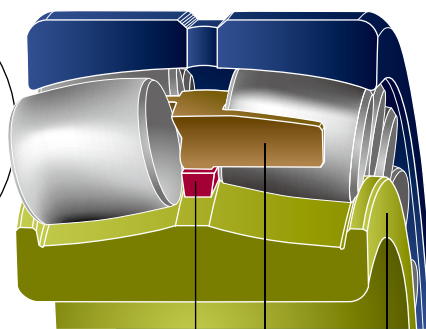
Type EM



One-piece machined cage Inner ring rib

Type EM (Large size)

41 sizes of Type EM (large size) are added.



Guide ring One-piece machined cage Inner ring rib

[Allowable Misalignment]

- Normal or heavy load 0.009rad (0.5°)
- Light load 0.035rad (2°)

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

1 Bearing Tolerances

4.1. 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_{ra} 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_{ca} 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			
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			

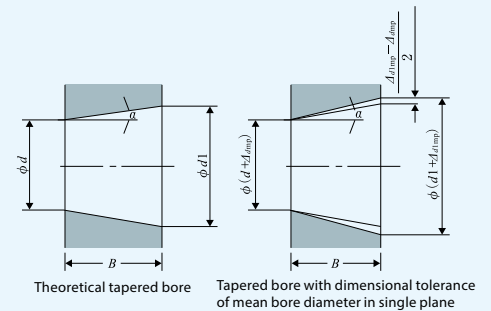
Same as Δ_{Bs} and V_{Bs} of bearings of same nominal bore diameter d .

4.2. 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_{dp}
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



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

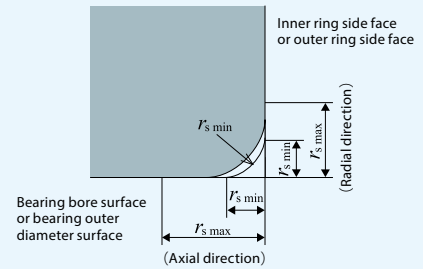
unit : μm

Nominal bore diameter d mm		Dimensional tolerance of mean bore diameter in single plane Δ_{dmp}		$\Delta_{d1mp} - \Delta_{dmp}$		Bore diameter variation V_{dp}
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

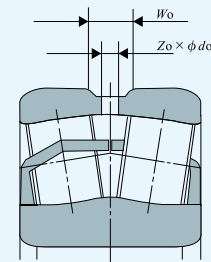
$r_s \text{ min}$	Nominal bore diameter d		$r_s \text{ max}$	
	Over	Including	Radial direction	Axial direction
1	-	50	1.5	3
	50	-	1.9	3
1.1	-	120	2	3.5
	120	-	2.5	4
1.5	-	120	2.3	4
	120	-	3	5
2	-	80	3	4.5
	80	220	3.5	5
	220	-	3.8	6
2.1	-	280	4	6.5
	280	-	4.5	7
2.5	-	100	3.8	6
	100	280	4.5	6
	280	-	5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



3 Dimensions of Oil Inlets and Outer Diameter Groove

Number of oil inlets

Nominal outside diameter D mm		Number of oil inlets	
		D1	W33 (European market specification)
Min	Less than	Z_0	Z_0
-	320	4	3
320	600	8	3



Note: See the dimension table for information on the oil groove width W_0 and oil inlet diameter ϕd_0 .

4 Internal Clearance

(1) Data for cylindrical bore bearings

unit : μm

Nominal bore diameter <i>d</i> 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 <i>d</i> 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 <i>d</i> mm		Reduction in radial internal clearance		Axial displacement drive-up				Minimum residual internal clearance		
Over	Including	Min	Max	Taper ratio 1/12		Taper ratio 1/30		CN	C3	C4
				Min	Max	Min	Max			
24	30	0.010	0.015	0.15	0.20	-	-	0.015	0.025	0.040
30	40	0.015	0.020	0.25	0.30	-	-	0.015	0.030	0.045
40	50	0.020	0.025	0.35	0.40	-	-	0.020	0.035	0.055
50	65	0.025	0.030	0.40	0.45	-	-	0.025	0.045	0.065
65	80	0.035	0.040	0.50	0.60	-	-	0.030	0.055	0.080
80	100	0.040	0.050	0.60	0.70	-	-	0.030	0.060	0.090
100	120	0.055	0.065	0.80	0.90	1.80	2.30	0.035	0.070	0.105
120	140	0.065	0.075	0.90	1.00	1.95	2.70	0.045	0.085	0.125
140	160	0.075	0.090	1.00	1.20	2.35	3.10	0.040	0.090	0.140
160	180	0.080	0.100	1.10	1.40	2.80	3.55	0.040	0.100	0.160
180	200	0.090	0.110	1.20	1.50	3.20	3.95	0.050	0.110	0.180
200	225	0.110	0.130	1.50	1.80	3.85	4.60	0.050	0.120	0.190
225	250	0.120	0.140	1.60	1.90	4.20	4.95	0.060	0.130	0.210
250	280	0.130	0.160	1.60	2.10	4.25	5.40	0.060	0.140	0.230
280	315	0.150	0.180	1.90	2.40	4.45	5.70	0.060	0.150	0.250
315	355	0.160	0.190	2.10	2.50	5.10	6.10	0.080	0.170	0.280
355	400	0.180	0.220	2.30	3.00	5.75	7.50	0.080	0.180	0.300
400	450	0.210	0.250	3.00	3.60	-	-	0.080	0.190	0.320

6 Bearing Fits

(1) Tolerance class of normally used shaft

Conditions	Shaft diameter (mm)		Tolerance zone of shaft	Remarks	
	Over	Including			
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 : $0.05C_r < \text{Dynamic equivalent radial loads} \leq 0.10C_r$
- Heavy loads : $0.10C_r < \text{Dynamic equivalent radial loads}$

2) When using shaft diameter over 200mm 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:

$$\begin{cases} \text{When } F_r \leq 0.3C_{0r} & \text{Necessary interference } \Delta_{dF} (\mu\text{m}) \text{ is } \Delta_{dF} = 0.08(d \cdot F_r/B)^{1/2} \\ \text{When } F_r > 0.3C_{0r} & \Delta_{dF} = 0.02(F_r/B) \end{cases}$$

(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 $\Delta_{dT} (\mu\text{m})$.

$$\Delta_{dT} = 0.0015 \cdot d \cdot \Delta T$$

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

(2) Tolerance class of normally used housing bore

Housing	Conditions		Axial movement of outer ring	Tolerance class of housing bore	Remarks	
	Load type, etc.					
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	—	
One-piece housing	Indefinite-direction load	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.	
		Precision rotation must be possible under light or normal load.	Generally immovable	K6	—	
		Quiet running required.	Movable	JS6	—	
			Movable	H6	—	
	Rotating outer ring load	Light or normal load	Light or normal load	Movable	JS7	—
			Normal or heavy load ¹⁾	Generally immovable	K7	—
			High-impact load	Immovable	M7	—
Rotating outer ring load	Normal or heavy 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 : $0.05C_r < \text{Dynamic equivalent radial loads} \leq 0.10C_r$
- Heavy loads : $0.10C_r < \text{Dynamic equivalent radial loads}$

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 a spherical roller bearing is used 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 Allowable Speeds

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

Grease-lubricated bearings

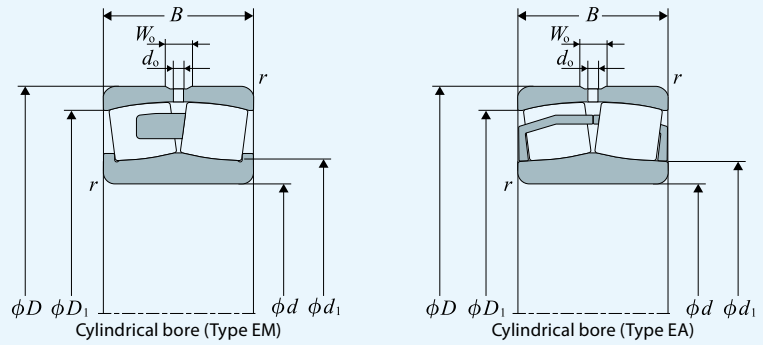
The bearing speed at which the outer ring temperature reaches 80° C when the bearing, which has undergone running-in operation, is allowed to run at 5% basic static load rating C_{0r} with the bearing's internal free volume 20 to 30% pre-filled with lithium grease (consistency: NLGI3)

With either lubrication system, the bearing temperature rise profile varies with the operating conditions (operating load, running speed pattern, 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 bearing 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.

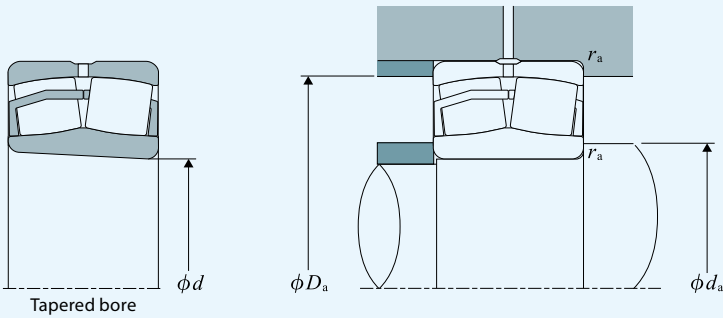
9 Dimensional Table

Type EA • Type EM



d	Boundary dimensions					Basic dynamic load rating	Basic static load rating	Basic dynamic load rating	Basic static load rating	Allowable speed					
	mm									kN		kgf		min ⁻¹	
	D	B	r _{s,min} ²⁾	W ₀	d ₀					C _r	C _{or}	C _r	C _{or}	Grease	Oil
25	52	18	1	3	1.5	57.3	46.1	5840	4700	10400	13000				
	52	18	1	3	1.5	57.3	46.1	5840	4700	10400	13000				
30	62	20	1	4	2	75.7	64.5	7720	6580	8800	11000				
	62	20	1	4	2	75.7	64.5	7720	6580	8800	11000				
35	72	23	1.1	5	2	100	92	10200	9380	7500	9400				
	72	23	1.1	5	2	100	92	10200	9380	7500	9400				
40	80	23	1.1	5	2.5	116	105	11800	10700	6800	8500				
	80	23	1.1	5	2.5	110	98	11200	10000	6800	8500				
	90	33	1.5	6	3	169	152	17200	15500	5400	6600				
	90	33	1.5	6	3	169	152	17200	15500	5400	6600				
45	85	23	1.1	6	2.5	121	113	12300	11500	6100	7700				
	85	23	1.1	6	2.5	116	106	11800	10800	6100	7700				
	100	36	1.5	6	3	206	187	21000	19100	4600	5700				
	100	36	1.5	6	3	206	187	21000	19100	4600	5700				
50	90	23	1.1	6	2.5	130	124	13300	12600	5700	7200				
	90	23	1.1	6	2.5	125	117	12700	11900	5700	7200				
	110	40	2	7	3.5	250	232	25400	23700	4300	5300				
	110	40	2	7	3.5	250	232	25400	23700	4300	5300				
55	100	25	1.5	6	3	155	148	15800	15100	5300	6700				
	100	25	1.5	6	3	148	140	15100	14300	5300	6700				
	120	43	2	8	3.5	296	274	30200	28000	3900	4800				
	120	43	2	8	3.5	296	274	30200	28000	3900	4800				
60	110	28	1.5	7	3	187	181	19100	18400	4800	6000				
	110	28	1.5	7	3	179	171	18300	17400	4800	6000				
	130	46	2.1	9	4	340	319	34700	32600	3600	4600				
	130	46	2.1	9	4	340	319	34700	32600	3600	4600				
65	120	31	1.5	8	3.5	226	224	23100	22900	4400	5500				
	120	31	1.5	8	3.5	217	212	22100	21600	4400	5500				
	140	48	2.1	9	4	369	343	37600	35000	3300	4100				
	140	48	2.1	9	4	369	343	37600	35000	3300	4100				
70	125	31	1.5	7	3.5	235	240	24000	24400	4100	5200				
	125	31	1.5	7	3.5	235	240	24000	24400	4100	5200				
	150	51	2.1	10	5	420	396	42800	40400	3000	3800				
	150	51	2.1	10	5	420	396	42800	40400	3000	3800				
75	130	31	1.5	7	3.5	244	249	24800	25400	4000	5000				
	130	31	1.5	7	3.5	244	249	24800	25400	4000	5000				
	160	55	2.1	10	5	491	467	50100	47600	2900	3600				
	160	55	2.1	10	5	491	467	50100	47600	2900	3600				
80	140	33	2	8	3.5	278	287	28400	29300	3700	4600				
	140	33	2	8	3.5	267	272	27300	27700	3700	4600				
	170	58	2.1	10	5	541	522	55200	53200	2700	3400				
	170	58	2.1	10	5	541	522	55200	53200	2700	3400				
85	150	36	2	8	3.5	324	330	33000	33600	3400	4300				
	150	36	2	8	3.5	324	330	33000	33600	3400	4300				
	180	60	3	11	5	599	604	61100	61600	2600	3200				
	180	60	3	11	5	599	604	61100	61600	2600	3200				

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



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y ₁	0.67	Y ₂

Static equivalent radial load

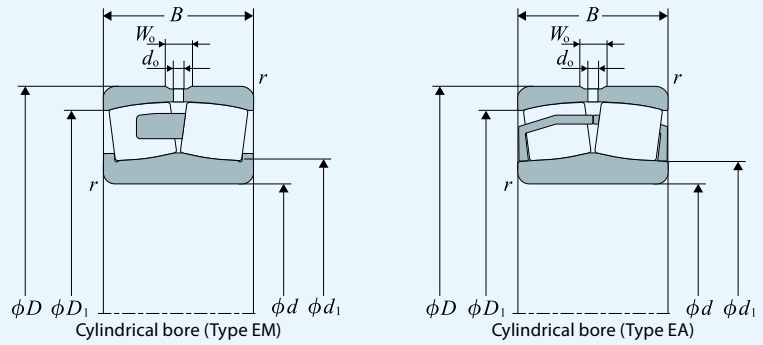
$$P_{or} = F_r + Y_0 F_a$$

For values e, Y₁, Y₂, and Y₀ see the following table.

Bearing number		Abutment and fillet dimensions					Constant	Axial load factors			Mass (approx.)	
Cylindrical bore	Tapered bore ¹⁾	d _i	d _{a min}	D _{a max}	D ₁	r _{as max}	e	Y ₁	Y ₂	Y ₀	kg	
											Cylindrical bore	Tapered bore
22205EAD1	22205EAKD1	30	30	46	46	1	0.34	2.00	2.98	1.96	0.173	0.169
22205EMD1	22205EMKD1	30	30	46	46	1	0.34	2.00	2.98	1.96	0.174	0.171
22206EAD1	22206EAKD1	37	36	56	55	1	0.31	2.15	3.20	2.10	0.278	0.272
22206EMD1	22206EMKD1	37	36	56	55	1	0.31	2.15	3.20	2.10	0.281	0.275
22207EAD1	22207EAKD1	45	42	65	63	1.1	0.31	2.21	3.29	2.16	0.438	0.430
22207EMD1	22207EMKD1	45	42	65	63	1.1	0.31	2.21	3.29	2.16	0.442	0.433
22208EAD1	22208EAKD1	50	47	73	71	1.1	0.27	2.47	3.67	2.41	0.528	0.518
22208EMD1	22208EMKD1	50	47	73	71	1.1	0.27	2.47	3.67	2.41	0.529	0.519
22308EAD1	22308EAKD1	52	49	81	78	1.5	0.36	1.87	2.79	1.83	1.02	1.00
22308EMD1	22308EMKD1	52	49	81	78	1.5	0.36	1.87	2.79	1.83	1.03	1.01
22209EAD1	22209EAKD1	54	52	78	76	1.1	0.26	2.64	3.93	2.58	0.572	0.561
22209EMD1	22209EMKD1	54	52	78	76	1.1	0.26	2.64	3.93	2.58	0.577	0.566
22309EAD1	22309EAKD1	58	54	91	87	1.5	0.36	1.90	2.83	1.86	1.37	1.34
22309EMD1	22309EMKD1	58	54	91	87	1.5	0.36	1.90	2.83	1.86	1.38	1.35
22210EAD1	22210EAKD1	59	57	83	81	1.1	0.24	2.84	4.23	2.78	0.614	0.602
22210EMD1	22210EMKD1	59	57	83	81	1.1	0.24	2.84	4.23	2.78	0.616	0.604
22310EAD1	22310EAKD1	63	61	99	95	2	0.36	1.87	2.79	1.83	1.82	1.79
22310EMD1	22310EMKD1	63	61	99	95	2	0.36	1.87	2.79	1.83	1.84	1.80
22211EAD1	22211EAKD1	66	64	91	90	1.5	0.23	2.95	4.40	2.89	0.830	0.814
22211EMD1	22211EMKD1	66	64	91	90	1.5	0.23	2.95	4.40	2.89	0.827	0.811
22311EAD1	22311EAKD1	68	66	109	104	2	0.36	1.87	2.79	1.83	2.31	2.26
22311EMD1	22311EMKD1	68	66	109	104	2	0.36	1.87	2.79	1.83	2.34	2.29
22212EAD1	22212EAKD1	71	69	101	99	1.5	0.24	2.84	4.23	2.78	1.14	1.12
22212EMD1	22212EMKD1	71	69	101	99	1.5	0.24	2.84	4.23	2.78	1.15	1.13
22312EAD1	22312EAKD1	75	72	118	113	2.1	0.35	1.95	2.90	1.91	2.86	2.80
22312EMD1	22312EMKD1	75	72	118	113	2.1	0.35	1.95	2.90	1.91	2.91	2.85
22213EAD1	22213EAKD1	78	74	111	107	1.5	0.24	2.79	4.15	2.73	1.52	1.49
22213EMD1	22213EMKD1	78	74	111	107	1.5	0.24	2.79	4.15	2.73	1.53	1.50
22313EAD1	22313EAKD1	81	77	128	122	2.1	0.33	2.06	3.06	2.01	3.48	3.41
22313EMD1	22313EMKD1	81	77	128	122	2.1	0.33	2.06	3.06	2.01	3.50	3.43
22214EAD1	22214EAKD1	84	79	116	113	1.5	0.22	3.01	4.48	2.94	1.61	1.58
22214EMD1	22214EMKD1	84	79	116	113	1.5	0.22	3.01	4.48	2.94	1.64	1.60
22314EAD1	22314EAKD1	85	82	138	131	2.1	0.34	2.00	2.98	1.96	4.25	4.16
22314EMD1	22314EMKD1	85	82	138	131	2.1	0.34	2.00	2.98	1.96	4.31	4.22
22215EAD1	22215EAKD1	88	84	121	118	1.5	0.22	3.14	4.67	3.07	1.67	1.64
22215EMD1	22215EMKD1	88	84	121	118	1.5	0.22	3.14	4.67	3.07	1.71	1.67
22315EAD1	22315EAKD1	91	87	148	139	2.1	0.34	2.00	2.98	1.96	5.18	5.07
22315EMD1	22315EMKD1	91	87	148	139	2.1	0.34	2.00	2.98	1.96	5.27	5.16
22216EAD1	22216EAKD1	94	91	129	127	2	0.22	3.14	4.67	3.07	2.09	2.05
22216EMD1	22216EMKD1	94	91	129	127	2	0.22	3.14	4.67	3.07	2.11	2.07
22316EAD1	22316EAKD1	98	92	158	148	2.1	0.34	2.00	2.98	1.96	6.12	5.99
22316EMD1	22316EMKD1	98	92	158	148	2.1	0.34	2.00	2.98	1.96	6.28	6.15
22217EAD1	22217EAKD1	100	96	139	137	2	0.22	3.07	4.57	3.00	2.59	2.54
22217EMD1	22217EMKD1	100	96	139	137	2	0.22	3.07	4.57	3.00	2.67	2.62
22317EAD1	22317EAKD1	107	99	166	157	3	0.32	2.09	3.11	2.04	7.18	7.04
22317EMD1	22317EMKD1	107	99	166	157	3	0.32	2.09	3.11	2.04	7.29	7.15

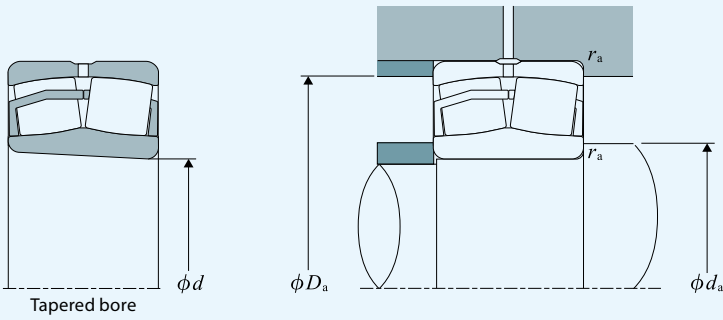
9 Dimensional Table

Type EA • Type EM



d	Boundary dimensions					Basic dynamic load rating	Basic static load rating	Basic dynamic load rating	Basic static load rating	Allowable speed	
	mm					kN		kgf		min ⁻¹	
	D	B	r _{s,min} ²⁾	W ₀	d ₀	C _r	C _{or}	C _r	C _{or}	Grease	Oil
90	160	40	2	10	4.5	384	398	39200	40600	3200	4000
	160	40	2	10	4.5	384	398	39200	40600	3200	4000
	160	52.4	2	9	4	467	513	47700	52300	2600	3200
	190	64	3	12	5	668	652	68100	66400	2500	3000
	190	64	3	12	5	668	652	68100	66400	2500	3000
95	170	43	2.1	10	4.5	416	417	42400	42600	3000	3800
	170	43	2.1	10	4.5	416	417	42400	42600	3000	3800
	200	67	3	12	6	732	751	74600	76500	2300	2800
	200	67	3	12	6	732	751	74600	76500	2300	2800
100	165	52	2	8	4	464	563	47300	57400	2400	3000
	165	52	2	8	4	480	590	49000	60100	2400	3000
	180	46	2.1	11	5	472	495	48100	50500	2800	3600
	180	46	2.1	11	5	472	495	48100	50500	2800	3600
	180	60.3	2.1	9	4.5	586	661	59800	67400	2300	2900
	215	73	3	13	6	827	844	84300	86100	2100	2600
110	170	45	2	8	3.5	417	517	42500	52700	2600	3300
	170	45	2	8	3.5	417	517	42500	52700	2600	3300
	180	56	2	9	4	547	669	55800	68200	2200	2800
	180	56	2	9	4	547	669	55800	68200	2200	2800
	180	69	2	8	4	622	769	63400	78400	2200	2700
	200	53	2.1	12	6	602	643	61400	65600	2600	3300
	200	53	2.1	12	6	602	643	61400	65600	2600	3300
	200	69.8	2.1	11	5	752	869	76700	88600	2100	2600
	240	80	3	16	7	975	972	99500	99100	2000	2400
120	180	46	2	8	3.5	446	577	45500	58900	2400	3100
	180	46	2	8	3.5	446	577	45500	58900	2400	3100
	180	60	2	8	3.5	526	726	53700	74100	2100	2600
	200	62	2	10	4.5	663	820	67600	83600	2000	2500
	200	62	2	10	4.5	663	820	67600	83600	2000	2500
	200	80	2	10	4.5	756	991	77100	101000	1900	2500
	215	58	2.1	12	6	688	753	70100	76800	2400	3000
	215	58	2.1	12	6	688	753	70100	76800	2400	3000
	215	76	2.1	11	5	857	998	87300	102000	1900	2400
	260	86	3	18	8	1170	1280	119000	131000	1800	2200
	260	86	3	18	8	1170	1280	119000	131000	1800	2200
130	200	52	2	9	4	565	721	57600	73500	2200	2900
	200	52	2	9	4	565	721	57600	73500	2200	2900
	200	69	2	9	4	682	936	69600	95400	1900	2400
	210	64	2	10	4.5	710	906	72400	92400	1900	2400
	210	64	2	10	4.5	710	906	72400	92400	1900	2400
	210	80	2	10	4.5	803	1080	81900	110000	1800	2400
	230	64	3	13	6	808	898	82400	91600	2200	2800
	230	64	3	13	6	808	898	82400	91600	2200	2800
	230	80	3	12	5	958	1130	97700	115000	1700	2300
	280	93	4	19	9	1330	1400	135000	143000	1600	2000
	280	93	4	19	9	1330	1400	135000	143000	1600	2000

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



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

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

Static equivalent radial load

$$P_{or} = F_r + Y_0 F_a$$

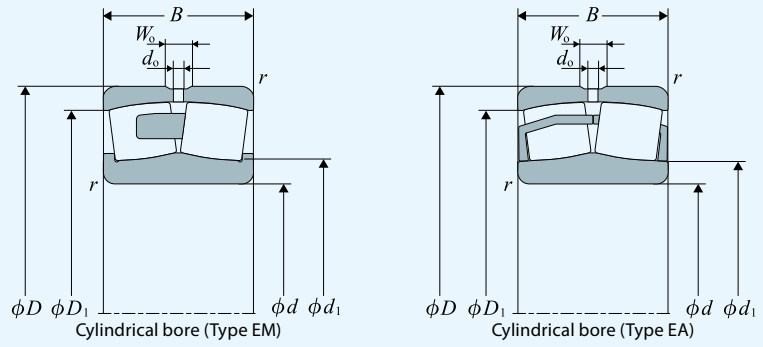
For values e, Y_1, Y_2 , and Y_0 see the following table.

Bearing number		Abutment and fillet dimensions					Constant	Axial load factors				Mass (approx.)	
Cylindrical bore	Tapered bore ¹⁾	d_i	$d_{a \min}$	$D_{a \max}$	D_i	$r_{as \max}$		e	Y_1	Y_2	Y_0	kg	
											Cylindrical bore	Tapered bore	
22218EAD1	22218EAKD1	105	101	149	144	2	0.23	2.90	4.31	2.83	3.34	3.27	
22218EMD1	22218EMKD1	105	101	149	144	2	0.23	2.90	4.31	2.83	3.43	3.37	
23218EMD1	23218EMKD1	104	101	149	141	2	0.30	2.25	3.34	2.20	4.43	4.31	
22318EAD1	22318EAKD1	110	104	176	166	3	0.33	2.06	3.06	2.01	8.42	8.25	
22318EMD1	22318EMKD1	110	104	176	166	3	0.33	2.06	3.06	2.01	8.53	8.35	
22219EAD1	22219EAKD1	110	107	158	153	2.1	0.23	2.95	4.40	2.89	3.98	3.90	
22219EMD1	22219EMKD1	110	107	158	153	2.1	0.23	2.95	4.40	2.89	4.06	3.98	
22319EAD1	22319EAKD1	120	109	186	174	3	0.32	2.09	3.11	2.04	9.91	9.71	
22319EMD1	22319EMKD1	120	109	186	174	3	0.32	2.09	3.11	2.04	10.0	9.82	
23120EAD1	23120EAKD1	114	111	154	147	2	0.28	2.39	3.56	2.34	4.37	4.24	
23120EMD1	23120EMKD1	114	111	154	147	2	0.28	2.39	3.56	2.34	4.45	4.32	
22220EAD1	22220EAKD1	118	112	168	161	2.1	0.24	2.84	4.23	2.78	4.90	4.80	
22220EMD1	22220EMKD1	118	112	168	161	2.1	0.24	2.84	4.23	2.78	5.02	4.93	
23220EMD1	23220EMKD1	118	112	168	159	2.1	0.31	2.18	3.24	2.13	6.51	6.33	
22320EAD1	22320EAKD1	127	114	201	187	3	0.34	1.98	2.94	1.93	12.6	12.3	
22320EMD1	22320EMKD1	127	114	201	187	3	0.34	1.98	2.94	1.93	12.9	12.7	
23022EAD1	23022EAKD1	123	119	161	155	2	0.23	2.95	4.40	2.89	3.66	3.55	
23022EMD1	23022EMKD1	123	119	161	155	2	0.23	2.95	4.40	2.89	3.66	3.55	
23122EAD1	23122EAKD1	125	121	169	161	2	0.28	2.43	3.61	2.37	5.66	5.49	
23122EMD1	23122EMKD1	125	121	169	161	2	0.28	2.43	3.61	2.37	5.53	5.36	
24122EMD1	24122EMK30D1	121	121	169	158	2	0.36	1.90	2.83	1.86	6.75	6.65	
22222EAD1	22222EAKD1	130	122	188	179	2.1	0.25	2.69	4.00	2.63	7.10	6.95	
22222EMD1	22222EMKD1	130	122	188	179	2.1	0.25	2.69	4.00	2.63	7.30	7.15	
23222EMD1	23222EMKD1	130	122	188	176	2.1	0.32	2.12	3.15	2.07	9.41	9.14	
22322EAD1	22322EAKD1	139	124	226	209	3	0.32	2.09	3.11	2.04	17.0	16.6	
22322EMD1	22322EMKD1	139	124	226	209	3	0.32	2.09	3.11	2.04	17.4	17.1	
23024EAD1	23024EAKD1	134	129	171	165	2	0.22	3.14	4.67	3.07	4.02	3.90	
23024EMD1	23024EMKD1	134	129	171	165	2	0.22	3.14	4.67	3.07	4.02	3.90	
24024EMD1	24024EMK30D1	132	129	171	161	2	0.29	2.32	3.45	2.26	5.28	5.21	
23124EAD1	23124EAKD1	138	131	189	179	2	0.28	2.43	3.61	2.37	7.72	7.49	
23124EMD1	23124EMKD1	138	131	189	179	2	0.28	2.43	3.61	2.37	7.77	7.54	
24124EMD1	24124EMK30D1	136	131	189	173	2	0.37	1.84	2.74	1.80	10.0	9.87	
22224EAD1	22224EAKD1	141	132	203	193	2.1	0.25	2.74	4.08	2.68	8.88	8.68	
22224EMD1	22224EMKD1	141	132	203	193	2.1	0.25	2.74	4.08	2.68	9.01	8.82	
23224EMD1	23224EMKD1	139	132	203	190	2.1	0.32	2.09	3.11	2.04	11.7	11.3	
22324EAD1	22324EAKD1	156	134	246	225	3	0.32	2.09	3.11	2.04	22.3	21.9	
22324EMD1	22324EMKD1	156	134	246	225	3	0.32	2.09	3.11	2.04	22.7	22.2	
23026EAD1	23026EAKD1	145	139	191	183	2	0.22	3.01	4.48	2.94	5.88	5.71	
23026EMD1	23026EMKD1	145	139	191	183	2	0.22	3.01	4.48	2.94	5.90	5.73	
24026EMD1	24026EMK30D1	143	139	191	178	2	0.31	2.20	3.27	2.15	7.82	7.71	
23126EAD1	23126EAKD1	148	141	199	189	2	0.27	2.51	3.74	2.45	8.45	8.19	
23126EMD1	23126EMKD1	148	141	199	189	2	0.27	2.51	3.74	2.45	8.51	8.25	
24126EMD1	24126EMK30D1	146	141	199	183	2	0.34	1.96	2.92	1.92	10.7	10.5	
22226EAD1	22226EAKD1	151	144	216	206	3	0.25	2.69	4.00	2.63	11.0	10.7	
22226EMD1	22226EMKD1	151	144	216	206	3	0.25	2.69	4.00	2.63	11.1	10.9	
23226EMD1	23226EMKD1	150	144	216	203	3	0.32	2.12	3.15	2.07	13.8	13.4	
22326EAD1	22326EAKD1	164	147	263	243	4	0.33	2.06	3.06	2.01	27.2	26.6	
22326EMD1	22326EMKD1	164	147	263	243	4	0.33	2.06	3.06	2.01	28.0	27.5	

¹⁾ dimension for chamfer dimension r .

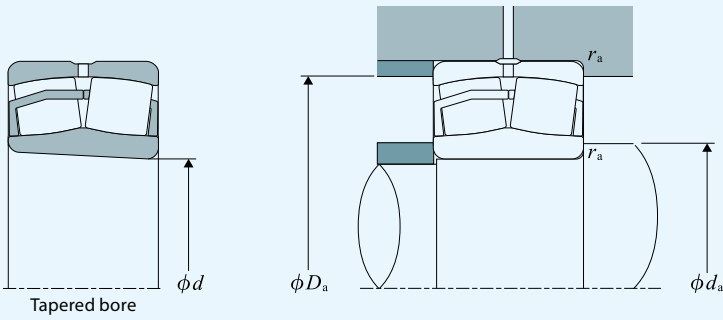
9 Dimensional Table

Type EA • Type EM



d	Boundary dimensions					Basic dynamic load rating	Basic static load rating	Basic dynamic load rating	Basic static load rating	Allowable speed	
	mm					kN		kgf		min ⁻¹	
	D	B	r _{s,min} ²⁾	W ₀	d ₀	C _r	C _{or}	C _r	C _{or}	Grease	Oil
140	210	53	2	9	4	597	783	60900	79800	2100	2700
	210	53	2	9	4	597	783	60900	79800	2100	2700
	210	69	2	9	4	709	990	72300	101000	1800	2200
	225	68	2.1	11	5	802	1030	81800	105000	1800	2200
	225	68	2.1	11	5	802	1030	81800	105000	1800	2200
	225	85	2.1	10	4.5	951	1280	97000	130000	1700	2200
	250	68	3	14	7	912	1010	93000	103000	2000	2500
	250	68	3	14	7	912	1010	93000	103000	2000	2500
	250	88	3	13	6	1140	1370	116000	139000	1600	2100
	300	102	4	19	9	1540	1720	157000	175000	1500	1900
300	102	4	19	9	1540	1720	157000	175000	1500	1900	
150	225	56	2.1	10	4.5	660	893	67300	91100	2000	2500
	225	56	2.1	10	4.5	660	893	67300	91100	2000	2500
	225	75	2.1	10	4.5	789	1140	80400	116000	1700	2100
	250	80	2.1	13	6	1060	1350	108000	138000	1600	2000
	250	80	2.1	13	6	1060	1350	108000	138000	1600	2000
	250	100	2.1	12	6	1180	1590	121000	162000	1600	2000
	270	73	3	15	7	1080	1220	110000	124000	1800	2300
	270	73	3	15	7	1080	1220	110000	124000	1800	2300
	270	96	3	14	6	1340	1620	137000	165000	1500	1900
	320	108	4	20	9	1740	1890	178000	193000	1400	1700
160	220	45	2	9	4	455	683	46400	69600	1900	2400
	240	60	2.1	11	5	748	1000	76300	102000	1800	2300
	240	60	2.1	11	5	748	1000	76300	102000	1800	2300
	240	80	2.1	10	5	901	1290	91900	132000	1600	2000
	270	86	2.1	14	6	1220	1580	124000	162000	1500	1900
	270	86	2.1	14	6	1220	1580	124000	162000	1500	1900
	270	109	2.1	14	6	1360	1860	139000	190000	1500	1800
	290	80	3	17	8	1220	1390	124000	142000	1700	2100
	290	80	3	17	8	1220	1390	124000	142000	1700	2100
	290	104	3	15	7	1550	1890	158000	193000	1400	1800
	340	114	4	20	10	1950	2210	199000	226000	1300	1600
170	230	45	2	9	4.5	468	723	47700	73700	1800	2300
	260	67	2.1	12	5	914	1240	93200	127000	1700	2200
	260	67	2.1	12	5	914	1240	93200	127000	1700	2200
	260	90	2.1	11	5	1100	1600	112000	163000	1500	1900
	280	88	2.1	14	6	1270	1700	129000	173000	1400	1800
	280	88	2.1	14	6	1270	1700	129000	173000	1400	1800
	280	109	2.1	14	6	1410	1990	144000	203000	1400	1700
	310	86	4	18	8	1400	1610	143000	164000	1600	2000
	310	110	4	16	8	1700	2070	173000	211000	1300	1700
	360	120	4	20	10	2200	2630	225000	268000	1200	1500

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



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

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

Static equivalent radial load

$$P_{or} = F_r + Y_0 F_a$$

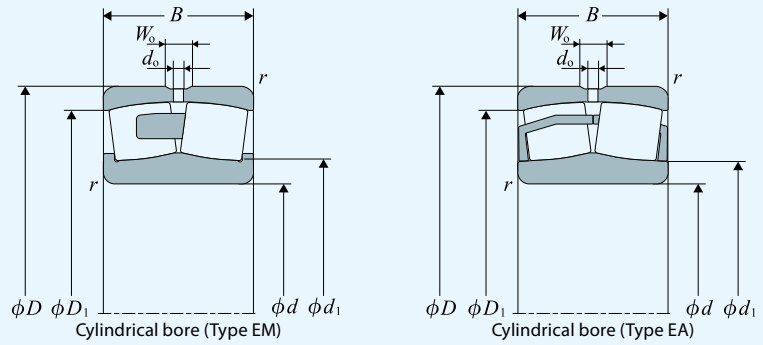
For values e, Y_1, Y_2 , and Y_0 see the following table.

Bearing number		Abutment and fillet dimensions						Constant	Axial load factors			Mass (approx.)	
Cylindrical bore	Tapered bore ¹⁾	d_i	$d_{a \text{ min}}$	$D_{a \text{ max}}$	D_i	$r_{as \text{ max}}$	e	Y_1	Y_2	Y_0	kg		
											Cylindrical bore	Tapered bore	
23028EAD1	23028EAKD1	155	149	201	193	2	0.22	3.14	4.67	3.07	6.32	6.13	
23028EMD1	23028EMKD1	155	149	201	193	2	0.22	3.14	4.67	3.07	6.37	6.18	
24028EMD1	24028EMK30D1	153	149	201	188	2	0.28	2.37	3.53	2.32	8.27	8.15	
23128EAD1	23128EAKD1	159	152	213	203	2.1	0.26	2.55	3.80	2.50	10.3	9.94	
23128EMD1	23128EMKD1	159	152	213	203	2.1	0.26	2.55	3.80	2.50	10.3	10.0	
24128EMD1	24128EMK30D1	156	152	213	198	2.1	0.34	1.98	2.94	1.93	12.9	12.8	
22228EAD1	22228EAKD1	163	154	236	224	3	0.25	2.74	4.08	2.68	13.9	13.6	
22228EMD1	22228EMKD1	163	154	236	224	3	0.25	2.74	4.08	2.68	14.2	13.9	
23228EMD1	23228EMKD1	162	154	236	220	3	0.33	2.06	3.06	2.01	18.2	17.7	
22328EAD1	22328EAKD1	181	157	283	261	4	0.33	2.03	3.02	1.98	34.4	33.7	
22328EMD1	22328EMKD1	181	157	283	261	4	0.33	2.03	3.02	1.98	35.4	34.7	
23030EAD1	23030EAKD1	167	161	214	207	2.1	0.21	3.20	4.77	3.13	7.68	7.45	
23030EMD1	23030EMKD1	167	161	214	207	2.1	0.21	3.20	4.77	3.13	7.73	7.50	
24030EMD1	24030EMK30D1	165	161	214	202	2.1	0.29	2.32	3.45	2.26	10.4	10.3	
23130EAD1	23130EAKD1	171	162	238	223	2.1	0.29	2.35	3.50	2.30	15.7	15.2	
23130EMD1	23130EMKD1	171	162	238	223	2.1	0.29	2.35	3.50	2.30	15.8	15.3	
24130EMD1	24130EMK30D1	168	162	238	216	2.1	0.36	1.85	2.76	1.81	19.7	19.4	
22230EAD1	22230EAKD1	177	164	256	242	3	0.25	2.74	4.08	2.68	17.6	17.3	
22230EMD1	22230EMKD1	177	164	256	242	3	0.25	2.74	4.08	2.68	18.0	17.7	
23230EMD1	23230EMKD1	174	164	256	237	3	0.33	2.03	3.02	1.98	23.6	22.9	
22330EMD1	22330EMKD1	188	167	303	279	4	0.34	2.00	2.98	1.96	42.2	41.3	
23932EMD1	23932EMKD1	175	169	211	205	2	0.17	3.90	5.81	3.81	5.09	4.94	
23032EAD1	23032EAKD1	177	171	229	221	2.1	0.21	3.20	4.77	3.13	9.32	9.03	
23032EMD1	23032EMKD1	177	171	229	221	2.1	0.21	3.20	4.77	3.13	9.37	9.09	
24032EMD1	24032EMK30D1	175	171	229	215	2.1	0.29	2.32	3.45	2.26	12.6	12.4	
23132EAD1	23132EAKD1	185	172	258	240	2.1	0.29	2.35	3.50	2.30	20.1	19.5	
23132EMD1	23132EMKD1	185	172	258	240	2.1	0.29	2.35	3.50	2.30	20.2	19.6	
24132EMD1	24132EMK30D1	181	172	258	232	2.1	0.37	1.83	2.72	1.79	25.4	25.1	
22232EAD1	22232EAKD1	190	174	276	260	3	0.25	2.69	4.00	2.63	22.3	21.8	
22232EMD1	22232EMKD1	190	174	276	260	3	0.25	2.69	4.00	2.63	22.9	22.4	
23232EMD1	23232EMKD1	187	174	276	254	3	0.33	2.03	3.02	1.98	29.6	28.8	
22332EMD1	22332EMKD1	205	177	323	296	4	0.33	2.03	3.02	1.98	50.5	49.5	
23934EMD1	23934EMKD1	185	179	221	215	2	0.16	4.11	6.12	4.02	5.39	5.23	
23034EAD1	23034EAKD1	190	181	249	238	2.1	0.22	3.07	4.57	3.00	12.7	12.3	
23034EMD1	23034EMKD1	190	181	249	238	2.1	0.22	3.07	4.57	3.00	12.8	12.4	
24034EMD1	24034EMK30D1	186	181	249	231	2.1	0.30	2.23	3.32	2.18	17.2	16.9	
23134EAD1	23134EAKD1	195	182	268	250	2.1	0.28	2.39	3.56	2.34	21.5	20.9	
23134EMD1	23134EMKD1	195	182	268	250	2.1	0.28	2.39	3.56	2.34	21.6	20.9	
24134EMD1	24134EMK30D1	193	182	268	243	2.1	0.35	1.91	2.85	1.87	26.7	26.3	
22234EMD1	22234EMKD1	201	187	293	277	4	0.26	2.60	3.87	2.54	28.3	27.7	
23234EMD1	23234EMKD1	199	187	293	272	4	0.33	2.03	3.02	1.98	35.8	34.8	
22334EMD1	22334EMKD1	223	187	343	313	4	0.32	2.09	3.11	2.04	60.3	59.1	

¹⁾ dimension for chamfer dimension r .

9 Dimensional Table

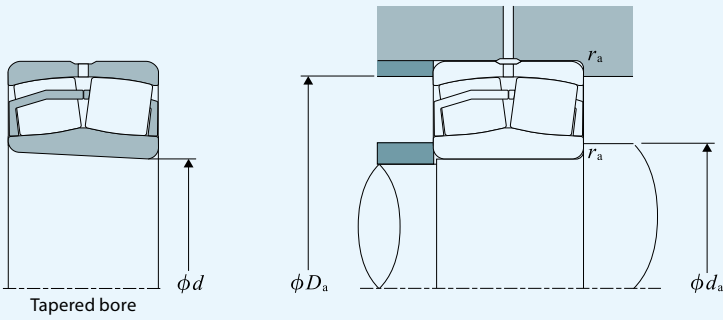
Type EA • Type EM



d	Boundary dimensions					Basic dynamic load rating	Basic static load rating	Basic dynamic load rating	Basic static load rating	Allowable speed	
	mm					kN		kgf		min ⁻¹	
	D	B	r _{s,min} ²⁾	W ₀	d ₀	C _r	C _{or}	C _r	C _{or}	Grease	Oil
180	250	52	2	10	5	573	869	58400	88600	1700	2100
	280	74	2.1	13	6	1080	1450	110000	148000	1600	2000
	280	74	2.1	13	6	1080	1450	110000	148000	1600	2000
	280	100	2.1	13	6	1310	1880	133000	192000	1400	1800
	300	96	3	15	7	1490	1960	152000	200000	1300	1700
	300	96	3	15	7	1490	1960	152000	200000	1300	1700
	300	118	3	15	7	1660	2290	169000	233000	1300	1600
	320	86	4	18	8	1450	1660	148000	169000	1500	1900
	320	112	4	16	8	1800	2270	183000	231000	1200	1600
	380	126	4	21	10	2420	2810	247000	286000	1100	1400
190	260	52	2	10	5	603	935	61500	95400	1600	2000
	290	75	2.1	13	6	1140	1570	116000	160000	1500	1900
	290	75	2.1	13	6	1140	1570	116000	160000	1500	1900
	290	100	2.1	13	6	1360	2000	138000	204000	1300	1700
	320	104	3	17	8	1670	2250	170000	230000	1200	1600
	320	128	3	16	8	1900	2700	194000	275000	1200	1500
	340	92	4	20	9	1620	1870	165000	191000	1400	1800
	340	120	4	18	8	1990	2480	203000	253000	1200	1500
	400	132	5	21	10	2600	3120	265000	318000	1000	1300
200	280	60	2.1	12	6	766	1190	78100	121000	1500	1900
	310	82	2.1	15	7	1310	1790	134000	182000	1400	1800
	310	109	2.1	14	7	1570	2280	160000	233000	1200	1600
	340	112	3	18	8	1890	2510	192000	256000	1100	1400
	340	140	3	17	8	2130	2930	218000	299000	1100	1400
	360	98	4	20	10	1810	2100	184000	214000	1400	1700
	360	128	4	19	9	2250	2840	230000	290000	1100	1300
	420	138	5	21	10	2830	3530	289000	360000	950	1200
220	300	60	2.1	12	6	789	1260	80500	128000	1400	1700
	340	90	3	15	7	1530	2110	156000	215000	1300	1600
	340	118	3	15	7	1850	2720	189000	278000	1100	1400
	370	120	4	19	9	2190	2940	223000	300000	1000	1300
	370	150	4	19	9	2540	3620	259000	369000	1000	1300
	400	108	4	21	11	2210	2690	225000	274000	1200	1500
	400	144	4	20	10	2890	3830	295000	391000	1000	1200
240	320	60	2.1	12	6	815	1350	83100	138000	1300	1600
	360	92	3	16	8	1630	2350	166000	240000	1100	1400
	360	118	3	16	8	1940	2980	198000	304000	1000	1300
	400	128	4	20	9	2510	3500	256000	357000	960	1200
	400	160	4	19	9	2910	4290	297000	438000	960	1200
260	360	75	2.1	14	7	1130	1940	115000	198000	1100	1400
	400	104	4	18	8	2060	2910	210000	297000	1000	1300
	400	140	4	18	8	2520	3820	257000	390000	960	1200
280	380	75	2.1	14	7	1180	2050	120000	209000	1000	1300
	420	106	4	18	8	2170	3150	221000	321000	960	1200
	420	140	4	18	8	2620	4060	267000	414000	880	1100

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



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

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

Static equivalent radial load

$$P_{or} = F_r + Y_0 F_a$$

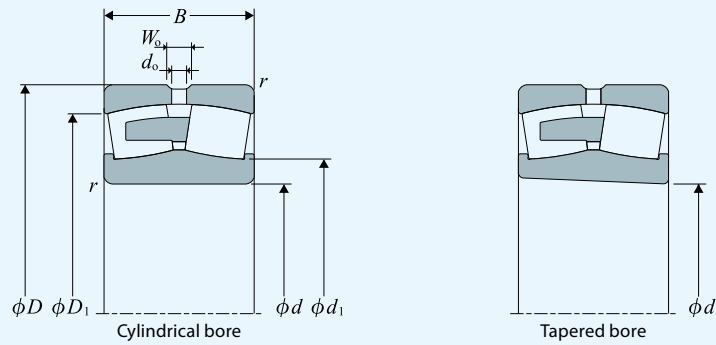
For values e, Y_1, Y_2 , and Y_0 see the following table.

Bearing number		Abutment and fillet dimensions					Constant	Axial load factors				Mass (approx.)	
Cylindrical bore	Tapered bore ¹⁾	d_i	$d_{a \min}$	$D_{a \max}$	D_i	$r_{as \max}$		e	Y_1	Y_2	Y_0	kg	
											Cylindrical bore	Tapered bore	
23936EMD1	23936EMKD1	199	189	241	232	2	0.17	3.90	5.81	3.81	7.79	7.56	
23036EAD1	23036EAKD1	201	191	269	255	2.1	0.23	2.95	4.40	2.89	16.8	16.3	
23036EMD1	23036EMKD1	201	191	269	255	2.1	0.23	2.95	4.40	2.89	16.9	16.4	
24036EMD1	24036EMK30D1	199	191	269	248	2.1	0.31	2.15	3.20	2.10	22.8	22.4	
23136EAD1	23136EAKD1	205	194	286	267	3	0.29	2.32	3.45	2.26	27.2	26.4	
23136EMD1	23136EMKD1	205	194	286	267	3	0.29	2.32	3.45	2.26	27.4	26.5	
24136EMD1	24136EMK30D1	202	194	286	259	3	0.36	1.87	2.79	1.83	33.5	33.0	
22236EMD1	22236EMKD1	209	197	303	287	4	0.25	2.74	4.08	2.68	29.3	28.7	
23236EMD1	23236EMKD1	210	197	303	282	4	0.33	2.06	3.06	2.01	38.2	37.1	
22336EMD1	22336EMKD1	229	197	363	329	4	0.32	2.09	3.11	2.04	70.2	68.7	
23938EMD1	23938EMKD1	209	199	251	243	2	0.17	4.05	6.04	3.96	8.20	7.96	
23038EAD1	23038EAKD1	213	201	279	266	2.1	0.22	3.01	4.48	2.94	17.8	17.3	
23038EMD1	23038EMKD1	213	201	279	266	2.1	0.22	3.01	4.48	2.94	17.9	17.4	
24038EMD1	24038EMK30D1	209	201	279	258	2.1	0.30	2.23	3.32	2.18	23.8	23.4	
23138EMD1	23138EMKD1	221	204	306	284	3	0.29	2.32	3.45	2.26	34.3	33.2	
24138EMD1	24138EMK30D1	216	204	306	275	3	0.37	1.84	2.74	1.80	42.1	41.5	
22238EMD1	22238EMKD1	222	207	323	305	4	0.25	2.74	4.08	2.68	35.6	34.9	
23238EMD1	23238EMKD1	220	207	323	299	4	0.33	2.03	3.02	1.98	46.1	44.7	
22338EMD1	22338EMKD1	247	210	380	346	5	0.32	2.12	3.15	2.07	81.5	79.9	
23940EMD1	23940EMKD1	221	211	269	260	2.1	0.18	3.76	5.59	3.67	12.0	11.6	
23040EMD1	23040EMKD1	223	211	299	283	2.1	0.23	2.95	4.40	2.89	22.8	22.1	
24040EMD1	24040EMK30D1	221	211	299	275	2.1	0.31	2.18	3.24	2.13	30.2	29.7	
23140EMD1	23140EMKD1	231	214	326	301	3	0.30	2.25	3.34	2.20	41.9	40.6	
24140EMD1	24140EMK30D1	224	214	326	291	3	0.39	1.74	2.59	1.70	51.5	50.7	
22240EMD1	22240EMKD1	234	217	343	323	4	0.25	2.74	4.08	2.68	42.7	41.8	
23240EMD1	23240EMKD1	232	217	343	315	4	0.34	1.98	2.94	1.93	55.2	53.6	
22340EMD1	22340EMKD1	265	220	400	364	5	0.31	2.15	3.20	2.10	94.6	92.7	
23944EMD1	23944EMKD1	241	231	289	280	2.1	0.17	4.05	6.04	3.96	12.5	12.1	
23044EMD1	23044EMKD1	246	233	327	310	3	0.23	2.95	4.40	2.89	29.9	29.1	
24044EMD1	24044EMK30D1	243	233	327	302	3	0.31	2.20	3.27	2.15	39.2	38.6	
23144EMD1	23144EMKD1	252	237	353	328	4	0.30	2.28	3.39	2.23	52.3	50.7	
24144EMD1	24144EMK30D1	247	237	353	317	4	0.38	1.78	2.65	1.74	65.2	64.3	
22244EMD1	22244EMKD1	264	237	383	358	4	0.25	2.74	4.08	2.68	59.6	58.4	
23244EMD1	23244EMKD1	261	237	383	349	4	0.34	2.00	2.98	1.96	79.4	77.1	
23948EMD1	23948EMKD1	262	251	309	301	2.1	0.15	4.40	6.56	4.31	13.5	13.1	
23048EMD1	23048EMKD1	267	253	347	329	3	0.22	3.07	4.57	3.00	32.0	31.7	
24048EMD1	24048EMK30D1	264	253	347	322	3	0.28	2.37	3.53	2.32	42.2	41.6	
23148EMD1	23148EMKD1	276	257	383	356	4	0.29	2.32	3.45	2.26	65.1	63.1	
24148EMD1	24148EMK30D1	270	257	383	344	4	0.37	1.82	2.70	1.78	81.0	79.8	
23952EMD1	23952EMKD1	292	271	349	335	2.1	0.17	3.90	5.81	3.81	23.9	23.1	
23052EMD1	23052EMKD1	291	275	385	366	4	0.23	2.95	4.40	2.89	47.8	46.3	
24052EMD1	24052EMK30D1	286	275	385	354	4	0.31	2.16	3.22	2.12	63.6	62.6	
23956EMD1	23956EMKD1	310	291	369	356	2.1	0.16	4.16	6.20	4.07	25.2	24.4	
23056EMD1	23056EMKD1	310	295	405	386	4	0.22	3.07	4.57	3.00	51.3	49.7	
24056EMD1	24056EMK30D1	306	295	405	376	4	0.29	2.30	3.42	2.25	67.3	66.3	

dimension for chamfer dimension r .

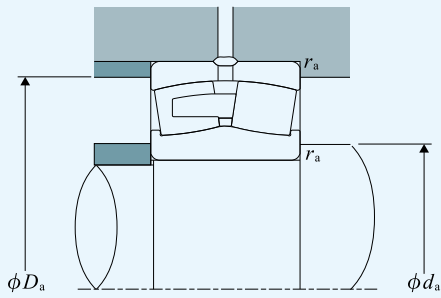
9 Dimensional Table

Type EM (Large size)



Boundary dimensions						Basic dynamic load rating	Basic static load rating	Basic dynamic load rating	Basic static load rating	Allowable speed	
mm						kN		kgf		min ⁻¹	
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s, min}</i> ²⁾	<i>W₀</i>	<i>d₀</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	Grease	Oil
220	460	145	5	20	12	3010	3560	307000	363000	850	1090
240	440	120	4	16	10	2470	3110	252000	317000	1060	1350
	440	160	4	20	12	3140	4260	320000	435000	850	1090
	500	155	5	20	12	3500	4170	357000	425000	780	1000
260	440	144	4	20	12	2780	4020	283000	410000	860	1090
	440	180	4	27	16	3290	4880	335000	497000	850	1090
	480	130	5	20	12	2890	3680	295000	375000	970	1240
	480	174	5	27	16	3650	5050	372000	515000	780	1000
	540	165	6	27	16	4020	4830	410000	493000	720	920
280	460	146	5	20	12	2980	4400	304000	448000	810	1030
	460	180	5	27	16	3550	5450	362000	556000	810	1030
	500	130	5	20	12	3010	3920	306000	400000	920	1180
	500	176	5	27	16	3810	5420	389000	552000	740	950
	580	175	6	27	16	4490	5450	458000	556000	670	860
300	420	90	3	14	8	1600	2620	163000	267000	890	1140
	460	118	4	16	10	2400	3610	245000	368000	890	1130
	460	160	4	20	12	3150	5190	322000	529000	760	970
	500	160	5	20	12	3540	5170	361000	527000	750	950
	500	200	5	27	16	4270	6610	435000	674000	750	950
	540	140	5	20	12	3470	4590	354000	468000	860	1080
	540	192	5	27	16	4520	6280	461000	640000	690	880
320	440	90	3	14	8	1670	2820	170000	288000	840	1080
	480	121	4	20	12	2540	4020	259000	409000	850	1070
	480	160	4	20	12	3250	5400	331000	551000	720	920
	540	176	5	27	16	4020	6020	410000	614000	700	880
	540	218	5	33	20	5010	7720	511000	787000	690	880
	580	150	5	20	12	3950	5100	403000	520000	800	1020
	580	208	5	33	20	5230	7370	534000	751000	640	820
	580	243	5	33	20	5980	9340	610000	953000	650	830
340	460	90	3	14	8	1710	2980	174000	304000	800	1020
	520	133	5	20	12	2990	4690	305000	479000	790	1000
	520	180	5	27	16	3910	6510	398000	664000	670	860
	580	190	5	27	16	4670	6870	476000	701000	650	830
	580	243	5	33	20	5980	9340	610000	953000	650	830
360	480	90	3	14	8	1750	3090	178000	316000	760	970
	540	134	5	20	12	3070	4910	313000	500000	750	950
	540	180	5	27	16	4040	6840	412000	698000	640	820
380	520	106	4	16	10	2300	3920	235000	400000	710	910
	560	135	5	20	12	3230	5270	330000	538000	720	910
	560	180	5	27	16	4140	7280	422000	742000	610	780
400	540	106	4	16	10	2370	4170	241000	425000	680	870
420	560	106	4	16	10	2390	4320	244000	441000	650	830

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



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

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

Static equivalent radial load

$$P_{or} = F_r + Y_0 F_a$$

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

Bearing number		Abutment and fillet dimensions					Constant	Axial load factors				Mass (approx.)	
Cylindrical bore	Tapered bore ¹⁾	d_i	$d_{a \min}$	$D_{a \max}$	D_i	$r_{as \max}$		e	Y_1	Y_2	Y_0	kg	
											Cylindrical bore	Tapered bore	
22344EMD1	22344EMKD1	277	240	440	388	5	0.32	2.10	3.13	2.06	119	116	
22248EMD1	22248EMKD1	288	257	423	383	4	0.27	2.53	3.77	2.47	82.6	80.9	
23248EMD1	23248EMKD1	284	257	423	372	4	0.36	1.86	2.77	1.82	108	105	
22348EMD1	22348EMKD1	299	260	480	421	5	0.32	2.12	3.15	2.07	149	146	
23152EMD1	23152EMKD1	302	277	423	380	4	0.31	2.15	3.20	2.10	92.2	89.5	
24152EMD1	24152EMK30D1	295	277	423	371	4	0.40	1.69	2.52	1.65	111	109	
22252EMD1	22252EMKD1	312	280	460	415	5	0.27	2.53	3.77	2.47	108	105	
23252EMD1	23252EMKD1	310	280	460	405	5	0.36	1.87	2.79	1.83	143	139	
22352EMD1	22352EMKD1	324	286	514	456	6	0.31	2.16	3.22	2.12	186	183	
23156EMD1	23156EMKD1	322	300	440	403	5	0.30	2.23	3.32	2.18	98.4	95.3	
24156EMD1	24156EMK30D1	316	300	440	394	5	0.38	1.78	2.65	1.74	118	117	
22256EMD1	22256EMKD1	333	300	480	437	5	0.25	2.69	4.00	2.63	113	111	
23256EMD1	23256EMKD1	331	300	480	426	5	0.35	1.95	2.90	1.91	152	148	
22356EMD1	22356EMKD1	349	306	554	489	6	0.31	2.18	3.24	2.13	228	223	
23960EMD1	23960EMKD1	329	313	407	387	3	0.20	3.42	5.09	3.34	40.1	39.2	
23060EMD1	23060EMKD1	338	315	445	413	4	0.24	2.81	4.19	2.75	72.9	70.9	
24060EMD1	24060EMK30D1	332	315	445	401	4	0.33	2.04	3.04	2.00	98.0	96.9	
23160EMD1	23160EMKD1	345	320	480	436	5	0.31	2.20	3.27	2.15	129	125	
24160EMD1	24160EMK30D1	340	320	480	425	5	0.39	1.74	2.59	1.70	159	157	
22260EMD1	22260EMKD1	358	320	520	469	5	0.25	2.69	4.00	2.63	134	131	
23260EMD1	23260EMKD1	352	320	520	461	5	0.35	1.92	2.86	1.88	194	188	
23964EMD1	23964EMKD1	350	333	427	407	3	0.19	3.62	5.39	3.54	42.1	40.8	
23064EMD1	23064EMKD1	360	335	465	433	4	0.23	2.92	4.35	2.86	78.9	76.6	
24064EMD1	24064EMK30D1	352	335	465	423	4	0.31	2.15	3.20	2.10	104	102	
23164EMD1	23164EMKD1	373	340	520	468	5	0.31	2.15	3.20	2.10	169	164	
24164EMD1	24164EMK30D1	363	340	520	457	5	0.39	1.71	2.54	1.67	204	201	
22264EMD1	22264EMKD1	383	340	560	510	5	0.25	2.69	4.00	2.63	177	174	
23264EMD1	23264EMKD1	376	340	560	493	5	0.35	1.91	2.85	1.87	245	238	
23968EMD1	23968EMKD1	370	353	447	427	3	0.18	3.80	5.66	3.72	44.5	43.1	
23068EMD1	23068EMKD1	384	358	502	466	5	0.24	2.87	4.27	2.80	98.5	95.5	
24068EMD1	24068EMK30D1	377	358	502	456	5	0.33	2.06	3.06	2.01	140	137	
23168EMD1	23168EMKD1	393	360	560	500	5	0.32	2.12	3.15	2.07	213	206	
24168EMD1	24168EMK30D1	385	360	560	486	5	0.41	1.65	2.46	1.61	266	262	
23972EMD1	23972EMKD1	390	373	467	447	3	0.17	4.00	5.96	3.91	46.2	44.8	
23072EMD1	23072EMKD1	405	378	522	488	5	0.23	2.98	4.44	2.92	111	108	
24072EMD1	24072EMK30D1	398	378	522	478	5	0.31	2.16	3.22	2.12	147	145	
23976EMD1	23976EMKD1	412	395	505	481	4	0.18	3.66	5.46	3.58	68.0	65.9	
23076EMD1	23076EMKD1	425	398	542	509	5	0.22	3.07	4.57	3.00	117	113	
24076EMD1	24076EMK30D1	420	398	542	499	5	0.30	2.25	3.34	2.20	154	151	
23980EMD1	23980EMKD1	433	415	525	501	4	0.18	3.80	5.66	3.72	71.4	69.2	
23984EMD1	23984EMKD1	454	435	545	522	4	0.17	3.95	5.88	3.86	74.9	72.6	

dimension for chamfer dimension r .

