MOTION & CONTROL
NSK

EA Series
Spherical Roller Bearings

Standard series of high-capacity bearings offers
improved performance for a wide range of applications

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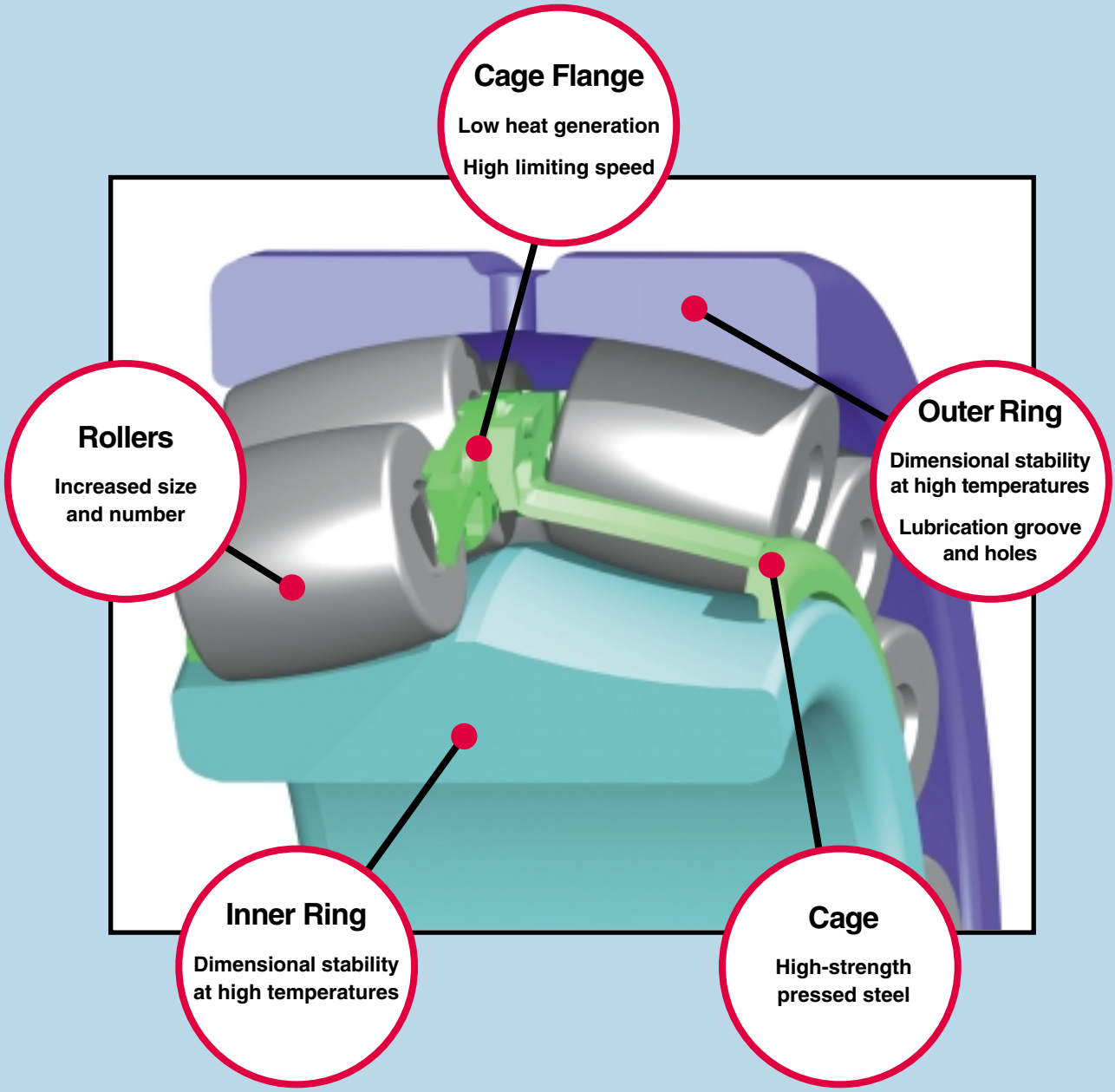
Based on an entirely new design concept, EA Series spherical roller bearings have outstanding features that position them uniquely to meet the needs of the 21st century.

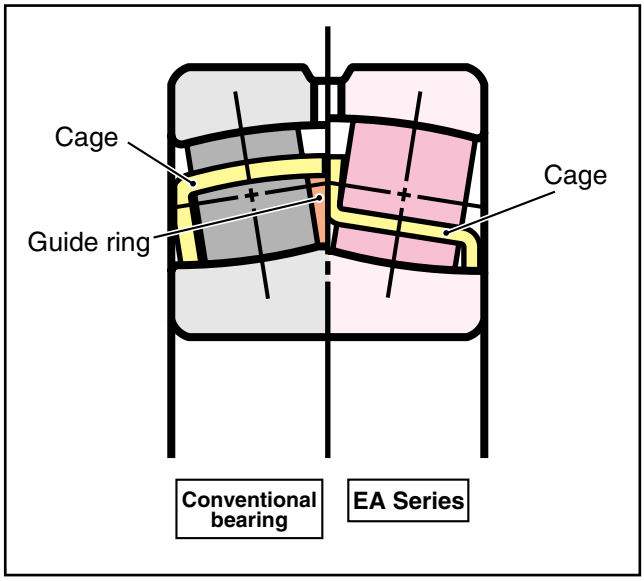


EA Series spherical roller bearings are high-capability, next-generation bearings with increased load capacity and limiting speed; a high-strength, low-wear cage; and improved dimensional stability at high temperatures. Machine performance and efficiency are enhanced by the high reliability, long life and outstanding cost performance of these bearings. Bearing size and weight can be reduced while maintaining life equivalent to that of previous larger bearings.

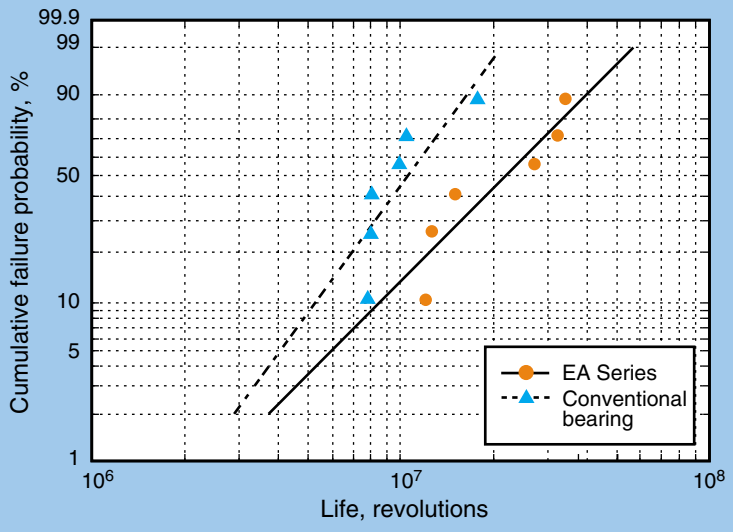
Increased Load Capacity, Longer Life

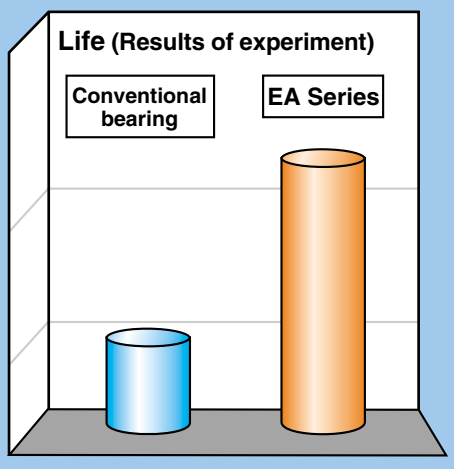
The guide ring is eliminated because roller guidance is designed into the cage. This, coupled with the optimum design of the inner and outer rings, enables increases in the diameter, length and number of rollers over conventional bearings. The results? A 10 to 20% increase in load capacity and significantly longer life.

Bearing interior design comparison



Results of life test (Test bearing: 22211)

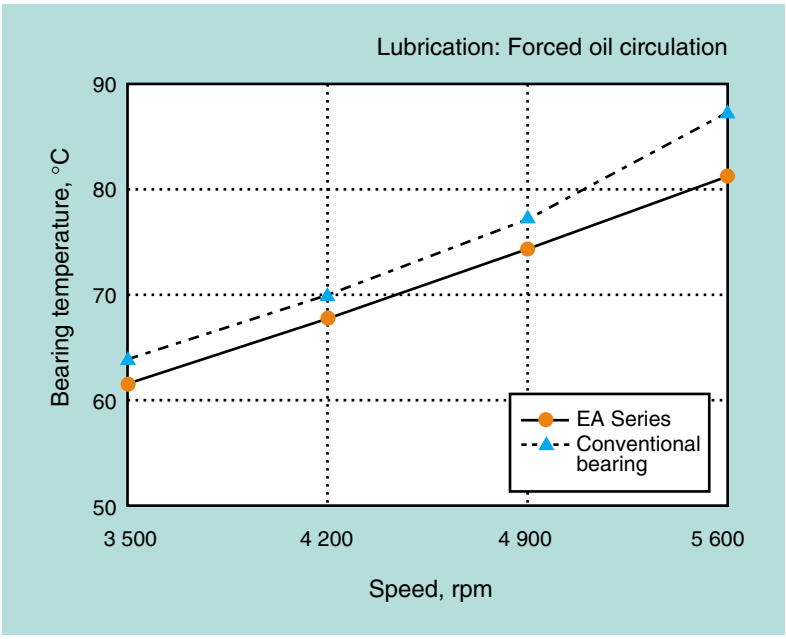




Higher Limiting Speed

Incorporating a center guide flange on the cage and reducing the clearance between the pockets and rollers improved roller guidance and reduced heat generation. The geometry of the inner ring, outer ring and rollers was optimized, further lowering heat generation. Together, these changes substantially increase the limiting speed of EA bearings.

Results of high-speed test (Test bearing: 22220)



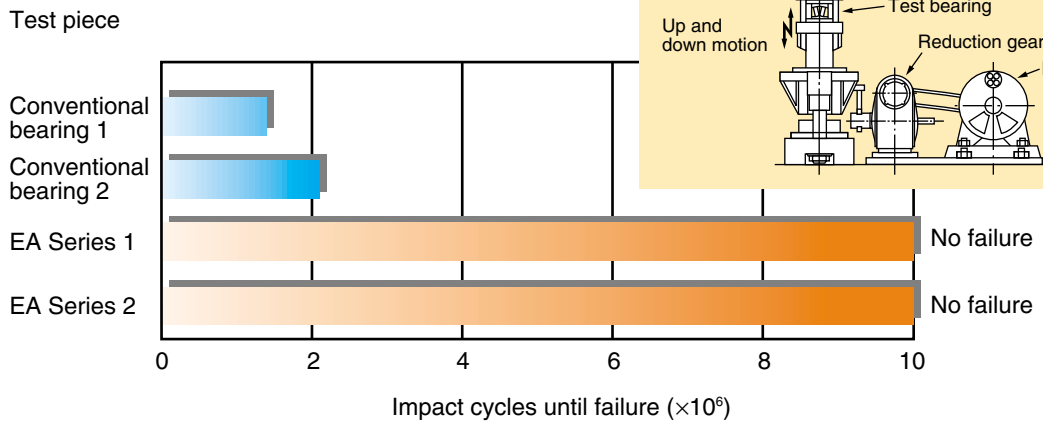
Cross-section of cage flange

Note: To save test time, this test was carried out at speeds higher than the limiting speed. Please do not exceed bearing limiting speeds in actual applications. (Limiting speeds of 22220EAE4: grease lubrication, 2,400 rpm; oil lubrication, 3,200 rpm)

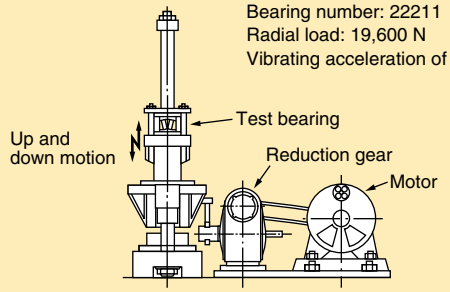
High-Strength Cage

Higher cage strength was achieved by utilizing the space gained from eliminating the guide ring and by optimizing the design through detailed structural analysis. Severe tests demonstrate the durability of the design.

Results of drop impact test



Testing equipment



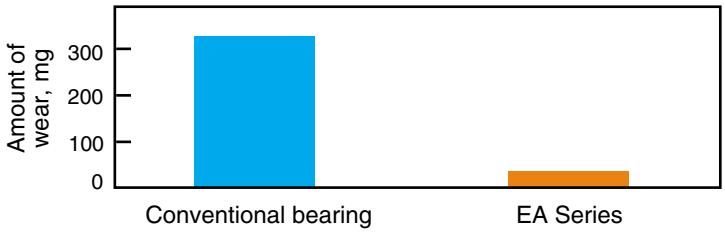
Test conditions

Bearing number: 22211
Radial load: 19,600 N
Vibrating acceleration of housing: 1,760 m/s^2

Low-Wear Cage

Cage wear was greatly reduced through the application of highly accurate press technology to create an extremely precise roller-guided cage.

Comparison of cage wear after life test
(Test bearing: 22218)

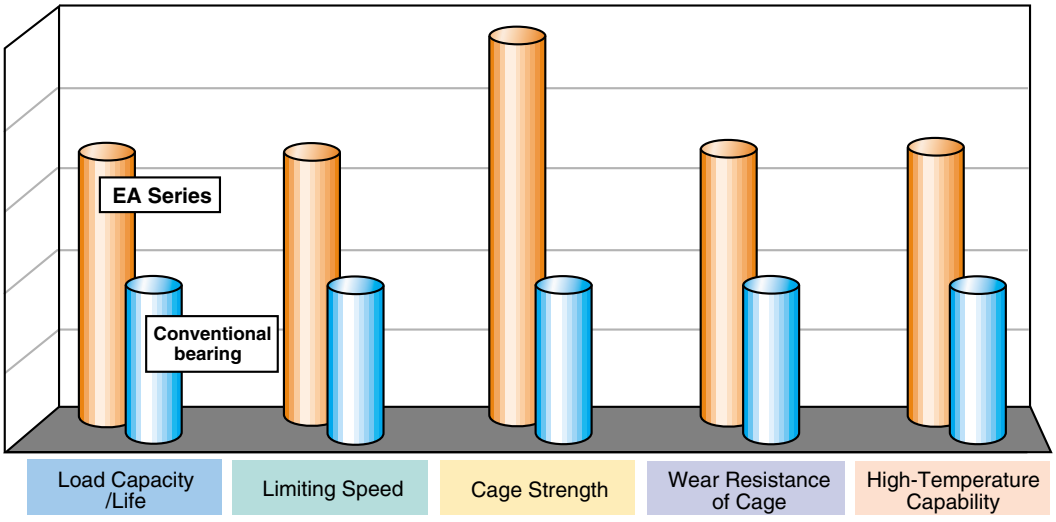


High-Temperature Capability

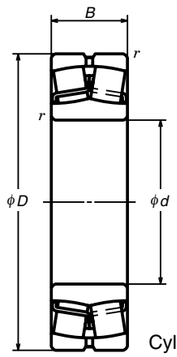
Operation at temperatures up to 200°C (392°F) is made possible by using a pressed steel cage and by making special heat treatment of the outer and inner rings standard.

Summary

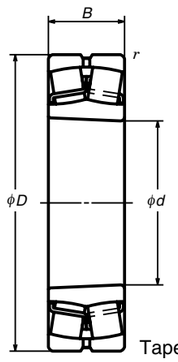
Raising the bar for bearing life and reliability, EA Series bearings excel in five critical aspects of bearing performance.



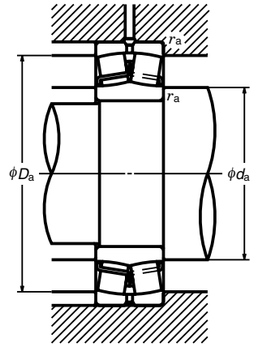
EA Series Bearing Table



Cylindrical bore



Tapered bore



Dynamic Equivalent Load

$P = XF_r + YF_a$

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

Static Equivalent Load

$P_0 = F_r + Y_0 F_a$

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

Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (rpm)		Bearing Numbers		Abutment and Fillet Dimensions (mm)					Constant	Axial Load Factors			Mass (kg)
d	D	B	r min	C_r	C_{0r}	Grease	Oil	Cylindrical Bore	Tapered Bore	d_a min	d_a max	D_a max	D_a min	r_a max	e	Y_2	Y_3	Y_0	approx
40	80	23	1.1	90 500	99 500	6 000	7 500	**22208EAE4**	**22208EAKE4**	47	49	73	70	1	0.28	3.6	2.4	2.4	0.50
	90	23	1.5	94 500	111 000	5 300	7 000	**21308EAE4**	**21308EAKE4**	49	54	81	75	1.5	0.25	3.9	2.7	2.6	0.73
	90	33	1.5	136 000	153 000	4 500	6 000	**22308EAE4**	**22308EAKE4**	49	52	81	77	1.5	0.35	2.8	1.9	1.9	0.98
45	85	23	1.1	94 500	111 000	5 300	7 000	**22209EAE4**	**22209EAKE4**	52	54	78	75	1	0.25	3.9	2.7	2.6	0.55
	100	25	1.5	119 000	144 000	4 500	5 600	**21309EAE4**	**21309EAKE4**	54	65	91	89	1.5	0.23	4.3	2.9	2.8	0.96
	100	36	1.5	166 000	195 000	4 000	5 300	**22309EAE4**	**22309EAKE4**	54	59	91	86	1.5	0.34	2.9	2.0	1.9	1.34
50	90	23	1.1	99 000	119 000	5 000	6 300	**22210EAE4**	**22210EAKE4**	57	60	83	81	1	0.24	4.3	2.9	2.8	0.61
	110	27	2	142 000	174 000	4 300	5 300	**21310EAE4**	**21310EAKE4**	60	72	100	98	2	0.23	4.4	3.0	2.9	1.21
	110	40	2	197 000	234 000	3 800	4 800	**22310EAE4**	**22310EAKE4**	60	64	100	93	2	0.35	2.8	1.9	1.9	1.78
55	100	25	1.5	119 000	144 000	4 500	5 600	**22211EAE4**	**22211EAKE4**	64	65	91	89	1.5	0.23	4.3	2.9	2.8	0.81
	120	29	2	142 000	174 000	4 300	5 300	**21311EAE4**	**21311EAKE4**	65	72	110	98	2	0.23	4.4	3.0	2.9	1.58
	120	43	2	234 000	292 000	3 400	4 300	**22311EAE4**	**22311EAKE4**	65	73	110	103	2	0.34	2.9	2.0	1.9	2.30
60	110	28	1.5	142 000	174 000	4 300	5 300	**22212EAE4**	**22212EAKE4**	69	72	101	98	1.5	0.23	4.4	3.0	2.9	1.10
	130	31	2.1	190 000	244 000	3 400	4 300	**21312EAE4**	**21312EAKE4**	72	87	118	117	2	0.22	4.5	3.0	3.0	1.98
	130	46	2.1	271 000	340 000	3 200	4 000	**22312EAE4**	**22312EAKE4**	72	79	118	111	2	0.34	3.0	2.0	1.9	2.89
65	120	31	1.5	177 000	230 000	3 800	4 800	**22213EAE4**	**22213EAKE4**	74	80	111	107	1.5	0.24	4.2	2.8	2.7	1.51
	140	33	2.1	212 000	275 000	3 200	4 000	**21313EAE4**	**21313EAKE4**	77	94	128	126	2	0.22	4.6	3.1	3.0	2.45
	140	48	2.1	300 000	380 000	3 000	3 800	**22313EAE4**	**22313EAKE4**	77	84	128	119	2	0.33	3.0	2.0	2.0	3.52
70	125	31	1.5	180 000	232 000	3 600	4 500	**22214EAE4**	**22214EAKE4**	79	84	116	111	1.5	0.23	4.3	2.9	2.8	1.58
	150	35	2.1	250 000	325 000	3 000	3 800	**21314EAE4**	**21314EAKE4**	82	101	138	135	2	0.22	4.6	3.1	3.0	3.00
	150	51	2.1	340 000	435 000	2 800	3 400	**22314EAE4**	**22314EAKE4**	82	91	138	129	2	0.33	3.0	2.0	2.0	4.28
75	130	31	1.5	190 000	244 000	3 400	4 300	**22215EAE4**	**22215EAKE4**	84	87	121	117	1.5	0.22	4.5	3.0	3.0	1.64
	160	37	2.1	250 000	325 000	3 000	3 800	**21315EAE4**	**21315EAKE4**	87	101	148	134	2	0.22	4.6	3.1	3.0	3.64
	160	55	2.1	390 000	505 000	2 600	3 200	**22315EAE4**	**22315EAKE4**	87	97	148	137	2	0.33	3.0	2.0	2.0	5.26
80	140	33	2	212 000	275 000	3 200	4 000	**22216EAE4**	**22216EAKE4**	90	94	130	126	2	0.22	4.6	3.1	3.0	2.01
	170	39	2.1	284 000	375 000	2 800	3 600	**21316EAE4**	**21316EAKE4**	92	109	158	146	2	0.23	4.4	3.0	2.9	4.32
	170	58	2.1	435 000	565 000	2 400	3 000	**22316EAE4**	**22316EAKE4**	92	103	158	145	2	0.33	3.0	2.0	2.0	6.23
85	150	36	2	250 000	325 000	3 000	3 800	**22217EAE4**	**22217EAKE4**	95	101	140	135	2	0.22	4.6	3.1	3.0	2.54
	180	41	3	289 000	395 000	2 800	3 600	**21317EAE4**	**21317EAKE4**	99	108	166	142	2.5	0.24	4.3	2.9	2.8	5.20
	180	60	3	480 000	630 000	2 200	2 800	**22317EAE4**	**22317EAKE4**	99	110	166	155	2.5	0.33	3.1	2.1	2.0	7.23
90	160	40	2	289 000	395 000	2 800	3 600	**22218EAE4**	**22218EAKE4**	100	108	150	142	2	0.24	4.3	2.9	2.8	3.30
	190	43	3	330 000	450 000	2 600	3 400	**21318EAE4**	**21318EAKE4**	104	115	176	152	2.5	0.24	4.3	2.9	2.8	6.10
	190	64	3	535 000	705 000	2 200	2 600	**22318EAE4**	**22318EAKE4**	104	115	176	163	2.5	0.33	3.1	2.1	2.0	8.56
95	170	43	2.1	330 000	450 000	2 600	3 400	**22219EAE4**	**22219EAKE4**	107	115	158	152	2	0.24	4.3	2.9	2.8	4.04
	200	67	3	590 000	780 000	2 000	2 600	**22319EAE4**	**22319EAKE4**	109	121	186	172	2.5	0.33	3.1	2.1	2.0	9.91
100	180	46	2.1	365 000	490 000	2 400	3 200	**22220EAE4**	**22220EAKE4**	112	119	168	160	2	0.24	4.3	2.9	2.8	4.84
	215	73	3	690 000	930 000	1 900	2 400	**22320EAE4**	**22320EAKE4**	114	130	201	184	2.5	0.33	3.0	2.0	2.0	12.7
110	200	53	2.1	485 000	645 000	2 200	2 800	**22222EAE4**	**22222EAKE4**	122	129	188	178	2	0.25	4.0	2.7	2.6	6.99
	240	80	3	825 000	1120 000	1 700	2 200	**22322EAE4**	**22322EAKE4**	124	145	226	206	2.5	0.33	3.1	2.1	2.0	17.6
120	215	58	2.1	550 000	765 000	2 000	2 600	**22224EAE4**	**22224EAKE4**	132	142	203	190	2	0.25	3.9	2.7	2.6	8.80
	260	86	3	955 000	1320 000	1 600	2 000	**22324EAE4**	**22324EAKE4**	134	157	246	222	2.5	0.32	3.1	2.1	2.0	22.2
130	230	64	3	655 000	940 000	1 900	2 400	**22226EAE4**	**22226EAKE4**	144	152	216	204	2.5	0.26	3.8	2.6	2.5	11.0

Remarks 1. The maximum operating temperature of standard EA Series bearings is 200°C (392°F).

2. The suffix E4 indicates that the bearing has an oil groove and holes.

3. The suffix K indicates that the bearing has a tapered bore (taper 1:12).