

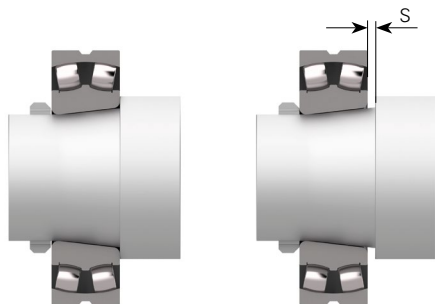
Spherical Roller Bearing

RADIAL CLEARANCE REDUCTION OF SPHERICAL ROLLER BEARINGS WITH TAPERED BORE

During mounting, the radial clearance should meet the below data.

Bore diameter		Radial clearance prior to mounting						Reduction in radial clearance	
d		CN		C3		C4			
over	up to	min.	max.	min.	max.	min.	max.	min.	max.
mm		mm						mm	
24	30	0,03	0,04	0,04	0,055	0,055	0,075	0,015	0,02
30	40	0,035	0,05	0,05	0,065	0,065	0,085	0,02	0,025
40	50	0,045	0,06	0,06	0,08	0,08	0,1	0,025	0,03
50	65	0,055	0,075	0,075	0,095	0,095	0,12	0,03	0,04
65	80	0,07	0,095	0,095	0,12	0,12	0,15	0,04	0,05
80	100	0,08	0,11	0,11	0,14	0,14	0,18	0,045	0,06
100	120	0,1	0,135	0,135	0,17	0,17	0,22	0,05	0,07
120	140	0,12	0,16	0,16	0,2	0,2	0,26	0,065	0,09
140	160	0,13	0,18	0,18	0,23	0,23	0,3	0,075	0,1
160	180	0,14	0,2	0,2	0,26	0,26	0,34	0,08	0,11
180	200	0,16	0,22	0,22	0,29	0,29	0,37	0,09	0,13
200	225	0,18	0,25	0,25	0,32	0,32	0,41	0,1	0,14
225	250	0,2	0,27	0,27	0,35	0,35	0,45	0,11	0,15
250	280	0,22	0,3	0,3	0,39	0,39	0,49	0,12	0,17
280	315	0,24	0,33	0,33	0,43	0,43	0,54	0,13	0,19
315	355	0,27	0,36	0,36	0,47	0,47	0,59	0,15	0,21
355	400	0,3	0,4	0,4	0,52	0,52	0,65	0,17	0,23
400	450	0,33	0,44	0,44	0,57	0,57	0,72	0,2	0,26
450	500	0,37	0,49	0,49	0,63	0,63	0,79	0,21	0,28
500	560	0,41	0,54	0,54	0,68	0,68	0,87	0,24	0,32
560	630	0,46	0,6	0,6	0,76	0,76	0,98	0,26	0,35
630	710	0,51	0,67	0,67	0,85	0,85	1,09	0,3	0,4
710	800	0,57	0,75	0,75	0,96	0,96	1,22	0,34	0,45
800	900	0,64	0,84	0,84	1,07	1,07	1,37	0,37	0,5
900	1000	0,71	0,93	0,93	1,19	1,19	1,52	0,41	0,55
1000	1120	0,78	1,02	1,02	1,3	1,3	1,65	0,45	0,6
1120	1250	0,86	1,12	1,12	1,42	1,42	1,8	0,49	0,65
1250	1400	0,94	1,22	1,22	1,55	1,55	1,96	0,55	0,72

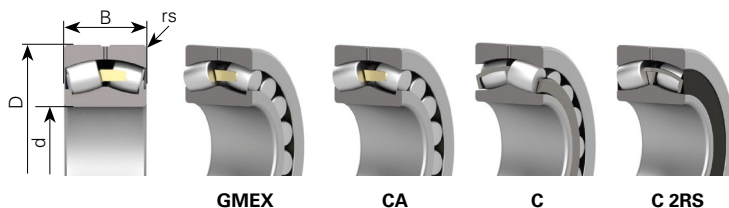
Spherical Roller Bearing



Axial displacement on 1:12 taper				Axial displacement on 1:30 taper				Smallest radial clearance after mounting		
Shaft		Sleeve		Shaft		Sleeve		CN	C3	C4
min.	max.	min.	max.	min.	max.	min.	max.	min.	min.	min.
0,3	0,35	0,3	0,4	-	-	-	-	0,015	0,02	0,035
0,35	0,4	0,35	0,45	-	-	-	-	0,015	0,025	0,04
0,4	0,45	0,45	0,5	-	-	-	-	0,02	0,03	0,05
0,45	0,6	0,5	0,7	-	-	-	-	0,025	0,035	0,055
0,6	0,75	0,7	0,85	-	-	-	-	0,025	0,04	0,07
0,7	0,9	0,75	1	1,7	2,2	1,8	2,4	0,035	0,05	0,08
0,7	1,1	0,8	1,2	1,9	2,7	2	2,8	0,05	0,065	0,1
1,1	1,4	1,2	1,5	2,7	3,5	2,8	3,6	0,055	0,08	0,11
1,2	1,6	1,3	1,7	3	4	3,1	4,2	0,055	0,09	0,13
1,3	1,7	1,4	1,9	3,2	4,2	3,3	4,6	0,06	0,1	0,15
1,4	2	1,5	2,2	3,5	4,5	3,6	5	0,07	0,1	0,16
1,6	2,2	1,7	2,4	4	5,5	4,2	5,7	0,08	0,12	0,18
1,7	2,4	1,8	2,6	4,2	6	4,6	6,2	0,09	0,13	0,2
1,9	2,6	2	2,9	4,7	6,7	4,8	6,9	0,1	0,14	0,22
2	3	2,2	3,2	5	7,5	5,2	7,7	0,11	0,15	0,24
2,4	3,4	2,6	3,6	6	8,2	6,2	8,4	0,12	0,17	0,26
2,6	3,6	2,9	3,9	6,5	9	5,8	9,2	0,13	0,19	0,29
3,1	4,1	3,4	4,4	7,7	10	8	10,4	0,13	0,2	0,31
3,3	4,4	3,6	4,8	8,2	11	8,4	11,2	0,16	0,23	0,35
3,7	5	4,1	5,4	9,2	12,5	9,6	12,8	0,17	0,25	0,36
4	5,4	4,4	5,9	10	13,5	10,4	14	0,2	0,29	0,41
4,6	6,2	5,1	6,8	11,5	15,5	12	16	0,21	0,31	0,45
5,3	7	5,8	7,6	13,3	17,5	13,6	18	0,23	0,35	0,51
5,7	7,8	6,3	8,5	14,3	19,5	14,8	20	0,27	0,39	0,57
6,3	8,5	7	9,4	15,8	21	16,4	22	0,3	0,43	0,64
6,8	9	7,6	10,2	17	23	18	24	0,32	0,48	0,7
7,4	9,8	8,3	11	18,5	25	19,6	26	0,34	0,54	0,77
8,3	10,8	9,3	12,1	21	27	22,2	28,3	0,36	0,59	0,84

Spherical Roller Bearing

DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
				Cr	Cor	Pu	rpm		mm	Kg				
	mm			kN			1 min ⁻¹				mm			
22205 GMEX	25	52	18	46,2	49,0	6,0	11050	14450	1	0,196	0,35	1,95	2,90	1,91
22206 GMEX	30	62	20	60,8	61,9	7,6	8500	11900	1	0,296	0,33	2,03	3,02	1,98
22207 GMEX	35	72	23	83,5	83,2	10,1	7650	10200	1,1	0,443	0,34	2,00	2,98	1,96
21307 GMEX	35	80	21	78,5	81,2	9,9	5695	8075	1,5	0,538	0,27	2,53	3,77	2,47
22208 GMEX	40	80	23	90,3	99,9	12,2	6800	9350	1,1	0,532	0,29	2,35	3,50	2,30
21308 GMEX	40	90	23	103,0	104,9	12,8	5950	8075	1,5	0,736	0,27	2,51	3,74	2,45
22308 GMEX	40	90	33	140,4	146,1	17,8	5100	6800	1,5	1,049	0,39	1,75	2,61	1,71
22308 C 2RS	40	90	38	115,0	127,0	15,5	5300		1,5	1,07	0,38	1,80	2,70	1,80
22209 GMEX	45	85	23	99,2	107,7	13,1	6375	8500	1,1	0,567	0,26	2,57	3,82	2,51
21309 GMEX	45	100	25	131,0	131,3	16,0	5355	7225	1,5	0,986	0,27	2,51	3,74	2,45
22309 GMEX	45	100	36	170,9	179,0	21,8	4505	5950	1,5	1,425	0,38	1,77	2,64	1,73
22309 C 2RS	45	100	42	146,0	168,0	20,5	4800		1,5	1,43	0,37	1,80	2,70	1,80
22210 GMEX	50	90	23	102,0	114,3	13,9	5950	8075	1,1	0,622	0,24	2,77	4,12	2,70
21310 GMEX	50	110	27	143,0	150,2	18,3	4760	6370	2	1,32	0,25	2,67	3,97	2,61
22310 GMEX	50	110	40	220,0	238,0	29,0	4080	5355	2	1,88	0,37	1,84	2,74	1,80
22310 C 2RS	50	110	45	181,0	208,0	25,4	4600		2	1,87	0,38	1,80	2,70	1,80
22211 GMEX	55	100	25	123,0	138,3	16,9	5355	7225	1,5	0,862	0,24	2,79	4,15	2,73
21311 GMEX	55	120	29	155,0	173,0	21,1	4760	6375	2	1,63	0,25	2,74	4,08	2,68
22311 GMEX	55	120	43	258,0	268,3	32,7	3655	4760	2	2,386	0,37	1,80	2,69	1,76
22311 C 2RS	55	120	49	213,0	248,0	30,2	4000		2	2,485	0,37	1,90	2,80	1,80
22212 GMEX	60	110	28	140,0	167,4	20,4	4760	6375	1,5	1,166	0,24	2,78	4,13	2,71
21312 GMEX	60	130	31	200,7	222,5	27,1	4080	5355	2,1	2,07	0,24	2,76	4,11	2,70
22312 GMEX	60	130	46	290,0	313,5	38,2	3400	4500	2,1	2,929	0,37	1,85	2,75	1,76
22312 C 2RS	60	130	53	243,0	284,0	34,6	3800		2,1	2,768	0,36	1,90	2,80	1,80
22213 GMEX	65	120	31	188,0	224,0	27,3	4250	5950	1,5	1,57	0,25	2,69	4,00	2,63
21313 GMEX	65	140	33	219,6	254,1	30,8	3655	5100	2,1	2,49	0,24	2,85	4,25	2,79
22313 GMEX	65	140	48	336,0	368,4	44,6	3230	4250	2,1	3,622	0,35	1,95	2,90	1,91
22313 C 2RS	65	140	53	251,0	291,0	35,2	3600		2,1	3,78	0,35	1,90	2,90	1,90
22214 GMEX	70	125	31	191,0	234,1	28,5	4250	5695	1,5	1,65	0,23	2,90	4,31	2,83
21314 GMEX	70	150	35	253,4	296,4	35,1	3400	4760	2,1	3,19	0,23	2,88	4,29	2,82
22314 GMEX	70	150	51	385,0	442,0	52,4	2890	3825	2,1	4,44	0,34	1,99	2,96	1,94
22314 C 2RS	70	150	60	300,0	362,0	42,9	3600		2,1	4,37	0,34	2,00	2,90	1,90
22215 GMEX	75	130	31	206,0	238,0	28,8	4080	5355	1,5	1,73	0,22	3,04	4,53	2,97
21315 GMEX	75	160	37	275,0	322,0	37,4	3400	4760	2,1	3,64	0,23	2,90	4,31	2,83
22315 GMEX	75	160	55	422,0	456,0	53,0	2200	3000	2,1	5,539	0,38	1,78	2,65	1,74

Spherical Roller Bearing

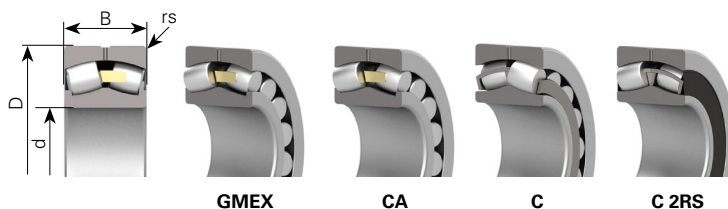
DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
	mm			Cr	Cor	Pu	rpm		mm	Kg	mm			
22315 C 2RS	75	160	64	351,0	437,0	50,8	3000		2,1	5,64	0,35	2,00	2,90	1,90
22216 GMEX	80	140	33	229,2	274,2	32,5	3655	5100	2	2,14	0,22	3,07	4,57	3,00
21316 GMEX	80	170	39	310,0	375,5	42,8	3230	4505	2,1	4,3	0,23	2,92	4,35	2,86
22316 GMEX	80	170	58	476,0	557	63,5	2550	3400	2,1	6,55	0,35	1,92	2,86	1,88
22316 C 2RS	80	170	67	395,0	496,0	56,6	2800		2,1	6,536	0,34	2,00	2,90	1,90
22217 GMEX	85	150	36	265,0	316,0	36,7	3400	4760	2	2,72	0,22	3,01	4,48	2,94
21317 GMEX	85	180	41	337,4	387,3	43,4	3230	4505	3	5,05	0,23	2,96	4,41	2,90
22317 GMEX	85	180	60	530,0	591,4	66,3	2500	3000	3	8,19	0,34	2,01	3,00	1,97
22317 C 2RS	85	180	60	431,0	539,0	60,4	2500		3	7,403	0,34	2,00	3,00	2,00
22218 GMEX	90	160	40	318,0	399,5	45,6	3230	4505	2	3,48	0,24	2,87	4,27	2,80
23218 CA	90	160	52,4	316,0	453,0	51,7	1600	2200	2	4,64	0,33	2,07	3,09	2,03
21318 GMEX	90	190	43	386,0	435,2	48,0	3060	4080	3	5,92	0,23	2,97	4,42	2,90
22318 GMEX	90	190	64	570	677	74,6	2300	2700	3	8,33	0,34	2,00	2,97	1,95
22318 C 2RS	90	190	64	497,0	659,0	72,6	2600		3	8,634	0,34	2,00	3,00	2,00
22219 GMEX	95	170	43	360,0	420,0	47,1	3060	4080	2,1	4,22	0,24	2,81	4,18	2,75
21319 GMEX	95	200	45	430,0	502	54,5	2890	3825	3	6,93	0,22	3,04	4,52	2,97
22319 GMEX	95	200	67	636	745	80,8	2100	2500	3	10,5	0,34	2,00	2,99	1,96
22319 C 2RS	95	200	67	531	705	76,5	2200		3	9,967	0,34	2,00	3,00	2,00
23020 GMEX	100	150	37	239,0	370,1	42,2	2000	2600	1,5	2,51	0,22	3,07	4,56	3,00
24020 CA	100	150	50	242,0	425,0	48,5	1500	2000	1,5	3,15	0,30	2,23	3,32	2,18
23120 GMEX	100	165	52	379,0	547	61,3	1500	2000	2	4,42	0,29	2,30	3,42	2,25
22220 GMEX	100	180	46	399,0	508	56,0	2890	3825	2,1	5,11	0,24	2,80	4,18	2,74
23220 CA	100	180	60,3	405,0	589	64,9	1500	1900	2,1	6,81	0,33	2,03	3,02	1,98
21320 GMEX	100	215	47	437,7	510	54,3	2890	3825	3	8,36	0,22	3,06	4,56	2,99
22320 GMEX	100	215	73	701	876	93,2	1900	2200	3	13,8	0,34	1,97	2,93	1,93
23022 GMEX	110	170	45	327,9	520	57,3	1900	2500	2	3,54	0,24	2,84	4,23	2,78
24022 CA	110	170	60	294,0	506	55,8	1300	1800	2	5,6	0,32	2,12	3,15	2,07
23122 GMEX	110	180	56	417,1	631	68,9	1300	1700	2	5,73	0,29	2,32	3,45	2,26
24122 CA	110	180	69	462,0	758	82,7	1200	1500	2	6,85	0,37	1,84	2,74	1,80
22222 GMEX	110	200	53	510	651	69,6	2200	3000	2,1	7,23	0,25	2,66	3,97	2,60
23222 CA	110	200	69,8	565	836	89,4	1300	1800	2,1	9,79	0,34	2,00	2,97	1,95
22322 GMEX	110	240	80	895	998	102,9	1800	2000	3	18,9	0,35	1,95	2,90	1,91
22322 C 2RS	110	240	80	545	832	85,8	1800		3	17,4	0,35	2,00	3,00	2,00
23024 GMEX	120	180	46	340,8	549	59,3	1700	2300	2	4,44	0,21	3,20	4,77	3,13
24024 CA	120	180	60	386,0	673	72,7	1200	1700	2	5,4	0,31	2,18	3,24	2,13

Spherical Roller Bearing

DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
	mm			Cr	Cor	Pu	rpm		mm	Kg	mm			
23124 GMEX	120	200	62	545	785	83,1	1250	1600	2	12,4	0,29	2,35	3,50	2,30
24124 CA	120	200	80	601	994	105,3	1100	1400	2	10,2	0,39	1,74	2,59	1,70
22224 GMEX	120	215	58	583	766	80,0	2100	2800	2,1	9,87	0,27	2,49	3,71	2,43
23224 CA	120	215	76	592	904	94,4	1200	1600	2,1	12,1	0,34	1,98	2,94	1,93
22324 GMEX	120	260	86	981	1217	122,4	1500	1900	3	23,3	0,34	2,01	3,00	1,97
23026 GMEX	130	200	52	438,0	709	74,40	1600	2100	2	7,04	0,23	2,87	4,28	2,81
24026 CA	130	200	69	484,0	841	88,3	1100	1500	2	8,16	0,33	2,07	3,09	2,03
23126 GMEX	130	210	64	586	842	87,5	1200	1500	2	10,7	0,28	2,37	3,53	2,32
24126 CA	130	210	80	597	1020	106,1	980	1300	2	11,1	0,36	1,87	2,79	1,83
22226 GMEX	130	230	64	660	919	94,0	2000	2600	3	11,25	0,26	2,55	3,80	2,50
23226 CA	130	230	80	734	1094	111,8	1100	1500	3	14,3	0,34	1,99	2,96	1,94
22326 GMEX	130	280	93	1170	1465	144,1	1300	1800	4	18,3	0,33	2,02	3,01	1,98
22326 C 2RS	130	280	93	965	1341	131,9	1600		4	28	0,34	2,00	3,00	2,00
23028 GMEX	140	210	53	465,2	761	78,5	1500	1900	2	6,70	0,23	2,95	4,39	2,89
24028 CA	140	210	69	495,0	865	89,2	1100	1400	2	8,42	0,31	2,21	3,29	2,16
23128 GMEX	140	225	68	665	976	99,3	1100	1400	2,1	10,9	0,28	2,43	3,61	2,37
24128 CA	140	225	85	634	1100	112,0	920	1200	2,1	13,1	0,35	1,94	2,88	1,89
22228 GMEX	140	250	68	725	997	99,5	1900	2200	3	14,23	0,27	2,49	3,71	2,43
23228 C	140	250	88	960	1500	149,7	1900	2200	3	18,5	0,38	1,78	2,64	1,80
23228 CA	140	250	88	818	1230	122,8	1000	1400	3	18,9	0,35	1,92	2,85	1,87
22328 GMEX	140	300	102	1360	1702	163,8	1200	1600	4	36,2	0,35	1,95	2,90	1,91
22328 C 2RS	140	300	102	1130	1600	154,0	1400		4	35,1	0,35	2,00	2,90	1,90
23030 GMEX	150	225	56	515	851	85,91	1400	1800	2,1	8,01	0,24	2,84	4,23	2,78
24030 CA	150	225	75	564	1010	102,0	990	1300	2,1	10,5	0,32	2,12	3,15	2,07
23130 GMEX	150	250	80	860	1312	130,0	1050	1300	2,1	16,5	0,30	2,28	3,39	2,23
24130 CA	150	250	100	891	1520	150,6	840	1100	2,1	19,5	0,39	1,74	2,59	1,70
22230 GMEX	150	270	73	876	1224	119,5	1800	2000	3	18,7	0,27	2,51	3,73	2,45
23230 CA	150	270	96	925	1450	141,5	980	1300	3	24,3	0,36	1,87	2,79	1,83
22330 GMEX	150	320	108	1530	1912	180,4	1100	1500	4	41,5	0,34	1,97	2,94	1,93
22330 C 2RS	150	320	108	1270	1740	164,2	1200		4	42,8	0,37	2,00	3,00	1,90
23032 GMEX	160	240	60	589	980	97,11	1300	1700	2,1	10,0	0,22	3,01	4,48	2,94
24032 CA	160	240	80	655	1180	116,9	930	1200	2,1	13	0,32	2,12	3,15	2,07
23132 GMEX	160	270	86	1040	1464	141,9	1000	1250	2,1	21,9	0,30	2,27	3,38	2,22
24132 CA	160	270	109	1050	1810	175,4	780	1000	2,1	26,1	0,39	1,71	2,54	1,67
22232 GMEX	160	290	80	976	1325	126,7	1700	1800	3	24,1	0,28	2,43	3,61	2,37

Spherical Roller Bearing

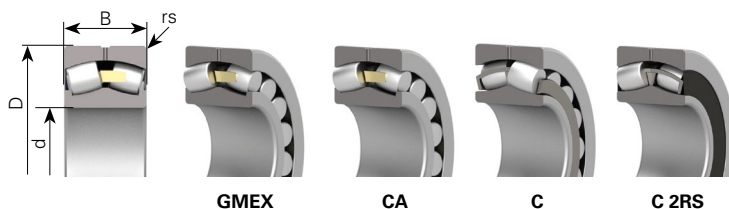
DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
	mm			Cr	Cor	Pu	rpm		mm	Kg	mm			
							1 min ⁻¹							
23232 CA	160	290	104	1050	1670	159,7	910	1200	3	31,7	0,36	1,87	2,79	1,83
22332 GMEX	160	340	114	1552	2101	194,7	1050	1400	4	52,8	0,34	1,97	2,94	1,93
23034 GMEX	170	260	67	705	1187	115,1	1200	1600	2,1	14,1	0,23	2,91	4,34	2,85
24034 CA	170	260	90	800	1470	142,5	860	1200	2,1	17,6	0,33	2,07	3,09	2,03
23134 GMEX	170	280	88	1072	1655	158,2	950	1200	2,1	26,1	0,30	2,26	3,37	2,21
24134 CA	170	280	109	1080	1870	178,8	740	990	2,1	26,4	0,37	1,83	2,72	1,79
22234 GMEX	170	310	86	1023	1495	140,2	1300	1600	4	26,8	0,27	2,54	3,78	2,48
23234 CA	170	310	110	1230	1970	184,8	840	1100	4	35,8	0,34	1,99	2,96	1,94
22334 GMEX	170	360	120	1750	2228	202,8	980	1300	4	62,6	0,34	1,99	2,97	1,95
22324 C 2RS	170	260	86	848	1129	109,4	1700		3	22,5	0,34	2,00	3,00	2,00
23936 CA	180	250	52	473,9	858	83,2	1700	2200	2	7,34	0,18	3,80	5,60	3,60
23036 GMEX	180	280	74	886	1364	129,6	1100	1500	2,1	17,7	0,24	2,84	4,23	2,78
24036 CA	180	280	100	936	1710	162,4	810	1100	2,1	23,5	0,34	1,99	2,96	1,94
23136 GMEX	180	300	96	1280	1967	184,5	880	1100	3	28	0,30	2,25	3,35	2,20
24136 CA	180	300	118	1240	2180	204,4	700	930	3	32,56	0,38	1,77	2,64	1,73
22236 GMEX	180	320	86	1180	1591	147,4	1300	1500	4	28,75	0,26	2,64	3,93	2,58
23236 CA	180	320	112	1270	2050	189,9	820	1100	4	39,5	0,35	1,94	2,88	1,89
22336 GMEX	180	380	126	2050	2646	236,9	930	1200	4	72,2	0,34	2,00	2,97	1,95
23038 GMEX	190	290	75	845	1420	133,2	1050	1400	2,1	17,3	0,24	2,84	4,23	2,78
24038 CA	190	290	100	931	1800	168,8	780	1000	2,1	23,8	0,33	2,07	3,09	2,03
23138 GMEX	190	320	104	1450	2121	195,3	800	1000	3	34,3	0,31	2,21	3,29	2,16
24138 CA	190	320	128	1330	2340	215,5	650	870	3	41,5	0,37	1,82	2,71	1,78
22238 GMEX	190	340	92	1292	1420	129,3	1200	1500	4	37,4	0,26	2,62	3,90	2,56
23238 CA	190	340	120	1420	2340	213,0	760	1000	4	48,0	0,33	2,03	3,03	1,99
23238 GMEX	190	340	120	1645	2560	233,1	780	1050	4	44,8	0,34	1,99	2,96	1,94
22338 GMEX	190	400	132	2160	2860	252,1	880	1100	5	82,2	0,35	1,95	2,90	1,91
23040 GMEX	200	310	82	1100	1750	161,2	1000	1300	2,1	23,5	0,24	2,83	4,22	2,77
24040 CA	200	310	109	1170	2170	199,8	730	970	2,1	31,4	0,33	2,03	3,02	1,98
23140 GMEX	200	340	112	1536	2547	230,6	750	950	3	40,8	0,31	2,19	3,26	2,14
24140 CA	200	340	140	1732	2920	264,3	620	830	3	53,3	0,40	1,68	2,50	1,64
23240 CA	200	360	128	1580	2620	234,6	730	970	4	57,8	0,36	1,90	2,83	1,86
22340 GMEX	200	420	138	2440	3137	272,5	800	1000	5	97	0,35	1,95	2,90	1,91
23044 GMEX	220	340	90	1192	2095	187,6	950	1200	3	31	0,24	2,84	4,23	2,78
24044 CA	220	340	118	1370	2550	228,3	660	880	3	40,5	0,33	2,07	3,09	2,03

Spherical Roller Bearing

DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
				Cr	Cor	Pu	rpm		mm	Kg				
	mm			kN			1 min ⁻¹				mm			
23144 GMEX	220	370	120	1768	2993	263,8	700	900	4	52	0,30	2,24	3,34	2,19
24144 CA	220	370	150	1870	3390	298,8	570	750	4	67,5	0,39	1,71	2,54	1,67
22244 GMEX	220	400	108	1800	2560	222,3	1000	1300	4	58,75	0,26	2,61	3,88	2,55
23244 CA	220	400	144	1960	3270	284,0	660	880	4	80,6	0,36	1,87	2,79	1,83
22344 GMEX	220	460	145	2810	3651	308,4	730	900	5	119	0,33	2,06	3,07	2,02
23048 GMEX	240	360	92	1350	2203	193,2	870	1150	3	34	0,23	2,94	4,38	2,88
24048 CA	240	360	118	1400	2680	235,1	620	830	3	43,6	0,31	2,21	3,29	2,16
23148 GMEX	240	400	128	2195	3470	298,5	670	800	4	66	0,30	2,27	3,38	2,22
24148 CA	240	400	160	2110	3880	333,8	520	700	4	83,8	0,39	1,74	2,59	1,70
22248 GMEX	240	440	120	2330	3310	279,6	900	1100	4	83	0,26	2,55	3,80	2,50
23248 CA	240	440	160	2520	3950	333,7	670	850	4	102	0,35	1,90	2,90	1,80
23952 CA	260	360	75	902	1750	152,0	1100	1500	2,1	21,6	0,18	3,80	5,60	3,60
23052 GMEX	260	400	104	1562	2678	228,3	850	1100	4	49,5	0,25	2,69	4,00	2,63
24052 CA	260	400	140	1800	3500	298,3	700	900	4	66,7	0,33	2,00	3,00	2,00
23152 CA	260	440	144	2250	3900	326,6	800	1000	4	87,5	0,31	2,20	3,30	2,20
24152 CA	260	440	180	2100	4350	364,3	430	530	4	115	0,39	1,73	2,58	1,69
22252 CA	260	480	130	2280	3600	296,5	850	1100	5	106	0,27	2,51	3,74	2,45
23252 CA	260	480	174	2800	4750	391,2	630	800	5	141	0,35	1,90	2,90	1,80
22352 CA	260	540	165	3080	4750	382,2	630	800	6	186	0,31	2,20	3,30	2,20
23856 CA	280	350	52	435,0	1230	106,3	800	1000	2	11,4	0,13	5,36	7,98	5,24
23956 CA	280	380	75	910	1980	168,8	1000	1400	2,1	25,7	0,18	3,80	5,66	3,72
23056 CA	280	420	106	1450	2850	238,7	850	1100	4	56,8	0,23	2,91	4,40	2,84
23056 GMEX	280	420	106	1800	3000	251,2	850	1100	4	52,34	0,23	2,91	4,40	2,84
24056 CA	280	420	140	1780	3700	309,9	670	850	4	69,2	0,31	2,20	3,30	2,20
23156 CA	280	460	146	2190	4150	341,8	750	950	5	104	0,30	2,30	3,40	2,20
24156 CA	280	460	180	2530	4750	391,2	400	500	5	119	0,40	1,70	2,50	1,60
22256 CA	280	500	130	2320	3590	291,0	810	1100	5	117,2	0,26	2,60	3,87	2,54
23256 CA	280	500	176	2840	5100	413,5	600	750	5	147	0,35	1,90	2,90	1,80
22356 CA	280	580	175	3520	5700	448,8	600	750	6	221	0,30	2,30	3,40	2,20
23860 CA	300	380	60	640	1650	139,4	950	1400	3	18,2	0,13	5,20	7,70	5,00
23960 CA	300	420	90	1050	2500	207,6	950	1300	3	40,1	0,19	3,60	5,30	3,60
23060 CA	300	460	118	2037	3806	310,9	800	1000	4	75,8	0,23	2,90	4,40	2,80
24060 CA	300	460	160	2320	4940	403,6	600	750	4	99	0,32	2,09	3,11	2,04
23160 CA	300	500	160	2800	5100	410,3	670	850	5	125	0,30	2,30	3,40	2,20
24160 CA	300	500	200	3100	6000	482,7	600	750	5	161	0,39	1,75	2,61	1,71

Spherical Roller Bearing

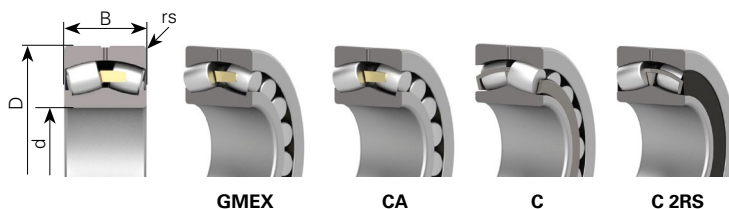
DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
	mm			Cr	Cor	Pu	rpm		mm	Kg	mm			
							1 min ⁻¹							
22260 CA	300	540	140	2620	4300	340,9	750	950	5	138	0,26	2,60	3,90	2,50
23260 CA	300	540	192	3632	5978	474,0	530	670	5	192	0,35	1,90	2,90	1,80
23864 CA	320	400	60	670	1620	134,5	920	1280	2,1	20,3	0,12	5,60	8,40	5,60
23964 CA	320	440	90	1200	2650	216,5	900	1200	3	42,7	0,18	3,80	5,60	3,60
23064 CA	320	480	121	2120	3913	314,8	800	1000	4	84,8	0,23	2,90	4,40	2,80
24064 CA	320	480	160	2480	5100	410,3	560	700	4	105	0,32	2,09	3,11	2,04
23164 CA	320	540	176	3250	6004	472,7	630	800	5	200	0,31	2,20	3,30	2,20
24164 CA	320	540	218	3560	6500	512	340	430	5	206	0,40	1,70	2,50	1,60
22264 CA	320	580	150	3000	4550	353,4	670	850	5	175	0,26	2,60	3,90	2,50
23264 CA	320	580	208	3900	6800	528	500	630	5	253	0,35	1,90	2,90	1,80
23968 CA	340	460	90	1200	2700	217,2	900	1200	3	46	0,17	4,00	5,90	4,00
23068 CA	340	520	133	1980	4400	346,4	700	900	5	115	0,24	2,84	4,23	2,78
24068 CA	340	520	180	3000	6100	480,3	530	670	5	137	0,32	2,12	3,15	2,07
23168 CA	340	580	190	3650	6700	517	600	750	5	182	0,31	2,20	3,30	2,20
24168 CA	340	580	243	4400	7950	613,4	320	400	5	256	0,40	1,70	2,50	1,60
23268 CA	340	620	224	4400	7700	586,5	430	530	6	297	0,35	1,90	2,90	1,80
23972 CA	360	480	90	1290	2820	223,6	850	1100	3	46,6	0,16	4,20	6,30	4,00
23072 CA	360	540	134	2280	4800	372,8	670	850	5	126	0,23	2,90	4,40	2,80
24072 CA	360	540	180	2820	6100	473,8	600	750	5	150	0,31	2,20	3,30	2,20
23172 CA	360	600	192	3750	7000	533	560	700	5	255	0,30	2,30	3,40	2,20
24172 CA	360	600	243	5600	8400	640	300	380	5	270	0,37	1,80	2,70	1,80
22272 CA	360	650	170	3630	6200	465,1	380	480	6	253	0,26	2,60	3,87	2,54
23272 CA	360	650	232	4650	8300	623	400	500	6	335	0,35	1,90	2,90	1,80
22372 CA	360	750	224	4900	8600	627	400	500	7,5	460	0,31	2,21	3,29	2,16
23976 CA	380	520	106	1847	4039	313,7	800	1000	4	69,5	0,17	4,00	5,90	4,00
23076 CA	380	560	135	2480	5000	383,3	630	800	5	130	0,22	3,00	4,60	2,80
24076 CA	380	560	180	3150	6900	529	480	600	5	150	0,30	2,30	3,40	2,20
23176 CA	380	620	194	3740	7350	553	400	500	5	250	0,30	2,30	3,40	2,20
24176 CA	380	620	243	4400	9200	692	300	380	5	296	0,30	2,30	3,40	2,20
23276 CA	380	680	240	4800	9200	680	380	480	6	386	0,35	1,90	2,90	1,80
23980 CA	400	540	106	1750	3950	302,8	750	950	4	72,4	0,17	4,00	5,90	4,00
23080 CA	400	590	142	2650	5600	422,7	630	800	5	133	0,21	3,14	4,68	3,07
24080 CA	400	600	200	3600	7800	587	450	560	5	202	0,30	2,30	3,40	2,20
23180 CA	400	650	200	4100	7650	567	380	480	6	275	0,28	2,40	3,60	2,50
24180 CA	400	650	250	4800	9600	712	320	400	6	326	0,36	1,87	2,79	1,83

Spherical Roller Bearing

DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
				Cr	Cor	Pu	rpm		mm	Kg				
	mm			kN			1 min ⁻¹				mm			
23280 CA	400	720	256	6150	11300	822	340	430	6	350	0,35	1,90	2,90	1,80
22380 CA	400	820	243	6400	9900	702	340	430	7,5	623	0,31	2,21	3,29	2,16
23984 CA	420	560	106	1530	4050	306,6	700	900	4	72,4	0,16	4,20	6,30	4,00
23084 CA	420	620	150	2970	6400	476,0	450	560	5	150	0,22	3,00	4,60	2,80
24084 CA	420	620	200	3690	8450	628	380	480	5	202	0,30	2,30	3,40	2,20
23184 CA	420	700	224	4680	9200	669	360	450	6	353	0,30	2,30	3,40	2,20
24184 CA	420	700	280	5750	11100	807	300	380	6	436	0,38	1,80	2,60	1,70
23284 CA	420	760	272	6170	11900	852	320	400	7,5	550	0,35	1,90	2,90	1,80
23988 CA	440	600	118	2030	4850	360,7	450	560	4	101	0,17	4,00	5,90	4,00
23088 CA	440	650	157	3150	6500	476,6	430	530	6	179	0,22	3,00	4,60	2,80
24088 CA	440	650	212	4150	9100	667	360	450	6	251	0,30	2,30	3,40	2,20
23188 CA	440	720	226	4950	10000	720	340	430	6	378	0,30	2,30	3,40	2,20
24188 CA	440	720	280	7300	13400	964	300	380	6	469	0,37	1,80	2,70	1,80
23288 CA	440	790	280	7600	12300	870	320	400	7,5	612	0,35	1,90	2,90	1,80
24892 CA	460	580	118	1730	4850	360,7	450	560	3	82	0,17	4,00	5,90	4,00
23992 CA	460	620	118	2263	5260	386,8	430	530	4	105	0,16	4,20	6,30	4,00
23092 CA	460	680	163	3280	6950	503	400	500	6	226	0,22	3,00	4,60	2,80
24092 CA	460	680	218	4200	9100	658	340	430	6	304	0,29	2,35	3,50	2,30
23192 CA	460	760	240	5500	10000	709	320	400	7,5	443	0,30	2,30	3,40	2,20
24192 CA	460	760	300	6890	14400	1021	160	200	7,5	461	0,37	1,80	2,70	1,80
23292 CA	460	830	296	7350	13500	941	300	380	7,5	698	0,35	1,90	2,90	1,80
23896 CA	480	600	90	1450	4000	294,1	450	600	3	60,4	0,13	5,36	7,98	5,24
23996 CA	480	650	128	2370	5750	417,1	400	500	5	126	0,18	3,80	5,60	3,60
23096 CA	480	700	165	3300	6900	494,1	380	480	6	217	0,21	3,20	4,80	3,20
24096 CA	480	700	218	5250	10200	730	340	430	6	296	0,28	2,40	3,60	2,50
23196 CA	480	790	248	6100	12000	840	300	380	7,5	516	0,30	2,30	3,40	2,20
24196 CA	480	790	308	8000	14900	1044	240	320	7,5	584	0,37	1,80	2,70	1,80
23296 CA	480	870	310	7750	15200	1045	260	340	7,5	853	0,35	1,90	2,90	1,80
238/500 CA	500	620	90	1450	3800	276,4	420	520	3	66	0,12	5,60	8,40	5,60
239/500 CA	500	670	128	2530	6000	430,7	400	500	5	120	0,17	4,00	5,90	4,00
230/500 CA	500	720	167	3470	7650	542	380	480	6	228	0,21	3,20	4,80	3,20
240/500 CA	500	720	218	5400	10600	751	420	520	6	306	0,26	2,60	3,90	2,50
231/500 CA	500	830	264	6100	13800	953	320	400	7,5	588	0,30	2,30	3,40	2,20
241/500 CA	500	830	325	9600	16000	1105	300	380	7,5	736	0,37	1,80	2,70	1,80
232/500 CA	500	920	336	9460	18600	1260	280	360	7,5	985	0,35	1,90	2,90	1,80

Spherical Roller Bearing

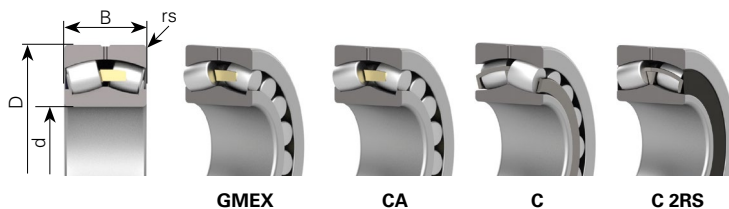
DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
				Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
	Cr	Cor	Pu	rpm	mm	Kg								
	mm			kN			1 min ⁻¹		mm					
238/530 CA	530	650	90	1500	4200	300,7	400	500	3	64,2	0,12	5,60	8,40	5,60
248/530 CA	530	650	118	1820	5280	378,1	380	480	3	91	0,15	4,50	6,70	4,50
239/530 CA	530	710	316	2900	6700	472,7	360	450	5	154	0,17	4,00	5,90	4,00
230/530 CA	530	780	185	4370	9650	670	340	430	6	339	0,22	3,00	4,60	2,80
240/530 CA	530	780	250	5400	12700	881	280	360	6	416	0,29	2,30	3,50	2,40
231/530 CA	530	870	272	8100	13200	898	260	340	7,5	665	0,30	2,30	3,40	2,20
241/530 CA	530	870	335	10300	18700	1272	190	280	7,5	846	0,37	1,80	2,80	1,80
232/530 CA	530	980	335	10300	20300	1350	210	290	9,5	1220	0,36	1,87	2,79	1,83
239/560 CA	560	750	140	3050	7200	500	340	430	5	177	0,16	4,20	6,30	4,00
230/560 CA	560	820	195	4300	10500	717	320	410	6	363	0,22	3,14	4,67	3,07
240/560 CA	560	820	258	5700	13200	902	220	300	6	471	0,28	2,40	3,60	2,50
231/560 CA	560	920	280	7590	15700	1050	240	320	7,5	756	0,30	2,30	3,40	2,20
241/560 CA	560	920	355	10000	20100	1345	120	160	7,5	953	0,37	1,80	2,80	1,80
232/560 CA	560	1030	365	11200	21000	1375	190	260	9,5	1380	0,35	1,90	2,90	1,80
239/600 CA	600	800	150	3640	8420	573	400	530	5	220	0,17	3,97	5,91	4,00
249/600 CA	600	800	200	4070	11200	762	320	400	5	287	0,22	3,00	4,60	2,80
230/600 CA	600	870	200	5170	11600	778	300	380	6	442	0,22	3,00	4,60	2,80
240/600 CA	600	870	272	6800	16000	1073	220	300	6	560	0,30	2,30	3,40	2,80
231/600 CA	600	980	300	8900	18800	1233	180	250	7,5	894	0,29	2,30	3,50	2,40
241/600 CA	600	980	375	10850	22750	1492	220	280	7,5	1200	0,38	1,78	2,64	1,80
232/600 CA	600	1090	388	12500	25000	1607	190	260	9,5	1568	0,35	1,93	2,88	1,80
238/630 CA	630	780	112	2200	6300	428	300	380	4	124	0,12	5,60	8,40	5,60
239/630 CA	630	850	165	3550	9750	652	280	360	6	280	0,17	4,00	5,90	4,00
230/630 CA	630	920	212	5670	12800	845	260	340	7,5	471	0,21	3,20	4,80	3,20
231/630 CA	630	1030	315	10000	21000	1357	180	250	7,5	1080	0,30	2,30	3,40	2,20
241/630 CA	630	1030	400	12500	27200	1758	160	210	7,5	1440	0,37	1,80	2,70	1,80
238/670 CA	670	820	112	2210	6300	420,6	270	350	4	136	0,11	6,10	9,10	6,30
230/670 CA	670	980	230	6580	14400	932	340	450	7,5	600	0,21	3,21	4,79	3,20
231/670 CA	670	1090	336	11000	22500	1429	175	240	7,5	1280	0,30	2,30	3,40	2,20
241/670 CA	670	1090	412	14000	31500	2001	150	190	7,5	1560	0,36	1,87	2,79	1,83
232/670 CA	670	1220	438	15000	32000	1989	160	210	12	2300	0,35	1,90	2,90	1,80
238/710 CA	710	870	118	2680	7550	495,3	260	340	4	156	0,11	6,10	9,10	6,30
239/710 CA	710	950	180	5000	12000	776	240	310	6	364	0,17	4,00	5,90	4,00
249/710 CA	710	950	243	6200	17000	1099	200	280	6	500	0,22	3,00	4,60	2,80
240/710 CA	710	1030	315	8970	21700	1383	240	320	7,5	895	0,27	2,50	3,72	2,50

Spherical Roller Bearing

DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Y0
				Cr	Cor	Pu	rpm		mm	Kg				
	mm			kN			1 min ⁻¹				mm			
231/710 CA	710	1150	345	12000	25800	1612	170	220	9,8	1480	0,28	2,40	3,60	2,50
241/710 CA	710	1150	438	11900	29700	1855	90	120	9,5	1791	0,35	1,90	2,90	1,80
232/710 CA	710	1280	450	17500	34400	2106	160	210	12	2640	0,35	1,90	2,90	1,80
238/750 CA	750	920	128	2950	8600	555	240	310	5	188	0,11	6,10	9,10	6,30
239/750 CA	750	1000	185	5800	13500	859	210	290	6	426	0,16	4,20	6,30	4,00
249/750 CA	750	1000	250	7600	18200	1158	180	250	6	566	0,22	3,00	4,60	2,80
230/750 CA	750	1090	250	7000	17900	1122	200	280	7,5	789	0,21	3,20	4,80	3,20
240/750 CA	750	1090	335	10000	24800	1554	170	220	7,5	1100	0,28	2,40	3,60	2,50
231/750 CA	750	1220	365	13500	28800	1768	160	210	9,5	1760	0,28	2,40	3,60	2,50
241/750 CA	750	1220	475	16000	37000	2272	130	170	9,5	2195	0,35	1,90	2,90	1,80
232/750 CA	750	1360	475	16390	36000	2165	90	120	15	3100	0,36	1,87	2,79	1,83
248/800 CA	800	980	180	4150	13000	823	170	220	5	330	0,15	4,50	6,70	4,50
239/800 CA	800	1060	195	6350	14200	887	190	270	6	480	0,16	4,20	6,30	4,00
249/800 CA	800	1060	258	7800	19500	1218	175	240	6	648	0,21	3,20	4,80	3,20
230/800 CA	800	1150	258	8090	19100	1176	170	220	7,5	894	0,20	3,40	5,00	3,20
240/800 CA	800	1150	345	11305	27145	1672	220	280	7,5	1200	0,27	2,50	3,72	2,50
231/800 CA	800	1280	375	14500	31000	1873	150	190	9,5	1960	0,28	2,40	3,60	2,50
241/800 CA	800	1280	475	16300	37100	2241	130	170	9,5	2350	0,35	1,90	2,90	1,80
238/850 CA	850	1030	136	3300	9800	610	180	250	5	244	0,11	6,10	9,10	6,30
239/850 CA	850	1120	200	6450	15880	975	280	380	6	560	0,17	3,97	5,91	4,00
249/850 CA	850	1120	272	8200	22500	1381	170	220	6	750	0,22	3,00	4,60	2,80
230/850 CA	850	1220	272	8450	22500	1361	180	240	7,5	1074	0,20	3,40	5,00	3,20
240/850 CA	850	1220	365	12000	29500	1785	220	280	7,5	1410	0,27	2,50	3,72	2,50
231/850 CA	850	1360	400	16000	34200	2029	130	170	12	2260	0,28	2,40	3,60	2,50
241/850 CA	850	1360	500	20000	45100	2675	105	140	12	2750	0,35	1,90	2,90	1,80
248/900 CA	900	1090	190	4890	15500	949	210	375	5	370	0,14	4,80	7,20	4,50
239/900 CA	900	1180	206	6930	17120	1034	280	360	6	605	0,15	4,50	6,70	4,50
230/900 CA	900	1280	280	10200	23500	1400	160	210	7,5	1220	0,20	3,40	5,00	3,20
240/900 CA	900	1280	375	13000	34200	2037	140	190	7,5	1600	0,26	2,60	3,90	2,50
240/900 CA	900	1280	375	14400	35500	2114	200	260	7,5	1570	0,27	2,50	3,72	2,50
241/900 CA	900	1420	515	21000	48500	2835	95	140	12	3400	0,35	1,90	2,90	1,80
239/950 CA	950	1250	224	7350	19000	1129	160	225	7,5	759	0,15	4,50	6,70	4,50
249/950 CA	950	1250	300	9300	25500	1515	135	180	7,5	1030	0,21	3,20	4,80	3,20
230/950 CA	950	1360	300	11000	26800	1569	150	210	7,5	1440	0,20	3,40	5,00	3,20
240/950 CA	950	1360	412	15000	38500	2254	125	160	7,5	2100	0,27	2,50	3,70	2,50

Spherical Roller Bearing

DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
				Cr	Cor	Pu	rpm		mm	Kg				
	mm			kN			1 min ⁻¹				mm			
241/950 CA	950	1500	545	24000	54500	3134	90	125	7,5	3600	0,35	1,90	2,90	1,80
238/1000 CA	1000	1220	165	4400	13600	806	125	160	6	402	0,11	5,92	8,81	5,78
249/1000 CA	1000	1320	315	10200	29200	1707	125	160	7,5	1220	0,21	3,20	4,80	3,20
230/1000 CA	1000	1420	308	12700	30500	1761	130	175	7,5	1590	0,19	3,60	5,30	3,60
240/1000 CA	1000	1420	412	15200	40500	2338	110	150	7,5	2130	0,26	2,60	3,90	2,50
231/1000 CA	1000	1580	462	21500	48200	2729	95	130	12	3520	0,28	2,40	3,50	2,50
241/1000 CA	1000	1580	580	26500	62200	3522	85	110	12	4350	0,35	1,90	2,90	1,80
238/1060 CA	1060	1280	165	4700	14800	863	150	195	6	440	0,11	6,10	9,10	6,30
248/1060 CA	1060	1280	218	6000	19500	1137	125	160	6	576	0,14	4,80	7,20	4,50
239/1060 CA	1060	1400	250	9350	25000	1436	145	170	7,5	1041	0,16	4,20	6,30	4,00
249/1060 CA	1060	1400	335	11000	32600	1873	115	150	7,5	1420	0,21	3,20	4,80	3,20
230/1060 CA	1060	1500	325	13500	33000	1873	125	160	9,5	2300	0,19	3,60	5,30	3,60
240/1060 CA	1060	1500	438	17000	46000	2611	100	145	9,5	2530	0,26	2,60	3,90	2,50
248/1120 CA	1120	1360	243	7150	23500	1347	105	165	6	740	0,15	4,50	6,70	4,50
249/1120 CA	1120	1460	335	12000	35200	1993	90	135	7,5	1500	0,20	3,40	5,00	3,20
230/1120 CA	1120	1580	345	15000	38100	2128	90	125	9,5	2210	0,19	3,40	5,00	3,20
240/1120 CA	1120	1580	462	18100	49500	2765	90	125	9,5	2940	0,26	2,60	3,90	2,50
238/1180 CA	1180	1420	180	5600	18000	1017	150	190	6	577	0,11	6,28	9,35	6,14
248/1180 CA	1180	1420	243	7700	27200	1537	135	160	6	790	0,14	4,80	7,20	4,50
239/1180 CA	1180	1540	272	10290	29600	1650	110	150	7,5	1350	0,16	4,20	6,30	4,00
249/1180 CA	1180	1540	355	13310	40000	2229	110	150	7,5	1772	0,20	3,42	5,09	3,34
230/1180 CA	1180	1660	355	10290	29600	1629	110	150	9,5	2460	0,20	3,42	5,09	3,34
230/1250 CA	1250	1750	375	17500	44800	2425	95	125	9,5	2850	0,19	3,60	5,30	3,60
248/1320 CA	1320	1600	280	9750	33400	1822	85	115	6	1180	0,15	4,50	6,70	4,50
249/1320 CA	1320	1720	400	16000	49200	2652	80	105	7,5	2510	0,21	3,20	4,80	3,20
240/1320 CA	1320	1850	530	23200	63300	3370	70	85	12	4540	0,25	2,70	4,00	2,60
249/1400 CA	1400	1820	425	20000	58500	3100	70	85	9,5	2920	0,20	3,42	5,09	3,34
248/1500 CA	1500	1820	315	12000	40000	2100	65	83	7,5	1730	0,15	4,50	6,70	4,50
248/1800 CA	1800	2180	375	17400	62800	3122	62	70	9,5	2920	0,15	4,50	6,70	4,50
239/950 CAF	950	1250	224	7310	19500	1158	260	340	7,5	755	0,15	4,50	6,70	4,50
240/950 CAF	950	1360	412	15210	39375	2305	180	240	7,5	1990	0,27	2,50	3,72	2,50



PRODUCT CATALOG

SPHERICAL ROLLER BEARING VIBRATING SCREEN

In this section:	Page
Design Characteristics Applications	
Angular Misalignment ISO Specification Series Nomenclature	140
Equivalent Load Equations Radial Clearance Tables	141
Data Tables	142

Spherical Roller Bearing

VIBRATING SCREEN

DESIGN | CHARACTERISTICS | APPLICATIONS

The vibrating screen spherical roller bearing is designed to accommodate vibrating.

The small size bearings have a single piece brass cage, guided on the outer ring raceway (VS).

The large size bearings have a 2 piece brass cage, guided on the outer ring raceway (MA).

These designs improve the cage wear against vibrations.



VS



MA

ANGULAR MISALIGNMENT

The following is an approximate guide to the misalignment that can be accommodated in a vibrating screen spherical roller bearing:

Bearing Series	Permissible angular misalignment degrees
223	2.0

ISO SPECIFICATIONS

- Dimensions in accordance with ISO 15 (latest version)
- Precision class and radial clearance in accordance with the C4F80 table.

SERIES

The vibration screen is only available in 223 series.

NOMENCLATURE

Suffixes:

VS C4 F80 : Vibration screen (d = 40mm - 150mm)

MA C4 F80 : Vibration screen (d = 160mm - 240mm)

W33 : Lubrication groove and 3 lubrication holes on the outside ring



EQUIVALENT LOAD EQUATIONS

Equivalent dynamic load P_e

$$P = F_r + Y_1 F_a \quad \text{when } F_a/F_r \leq e$$

$$P = 0.67 \cdot F_r + Y_2 \cdot F_a \quad \text{when } F_a/F_r > e$$

Values for Y_1 , Y_2 and e are given in the bearing tables.

Equivalent static load P_o

$$P_o = F_r + Y_o F_a$$

Values for Y_o are given in the bearing tables.

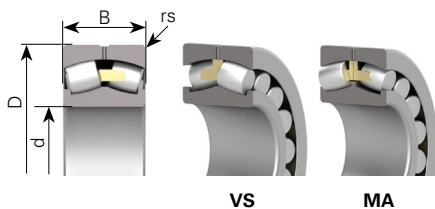
C4 F80 CLEARANCE AND PRECISION TABLES

The below table shows the clearance (C4) and tolerances (F80).

Tolerance						Radial Clearance			
Bore			OD						
d	Min.	Max.	D	Min.	Max.	D	Min.	Max.	
40	0	-0.007	90	-0.005	-0.013	40	0.085	0.100	
45			100			45			
50			110			50			
55		-0.009	120			55	0,100	0,120	
60			130			60			
65			140			65			
70			150			70	0,120	0,145	
75			160			75			
80			170		-0.018	80	0,150	0,180	
85		-0.012	180	-0.010		85			
90			190	-0.023	90	0,180	0,210		
95			200		95				
100			215		100				
110			240		110	0,205	0,240		
120			260		120				
130		-0.015	280	-0.028	130	0,240	0,280		
140			300		140				
150			320		150				
160			340		-0.013		160	0,260	0,310
170			360				170		
180			380				180		
190		-0.018	400				190	0,285	0,340

Spherical Roller Bearing

DATA TABLE - VIBRATING SCREEN



Part number	Principal dimensions			Basic load ratings			Speed limits		Radius rs min.	Weight	Calculation factors			
	d	D	B	Dynamic	Static	Fatigue	Grease	Oil			e	Y1	Y2	Yo
				Cr	Cor	Pu	rpm		mm	Kg				
	mm			kN			1 min ⁻¹				mm			
22308 VS C4 F80	40	90	33	125,0	135,0	16,5	5300	6300	1,5	1,054	0,39	1,80	2,60	1,70
22309 VS C4 F80	45	100	36	153,0	179,0	21,8	4800	5800	1,5	1,406	0,37	1,80	2,70	1,80
22310 VS C4 F80	50	110	40	193,0	226,0	27,6	4600	5600	2	1,911	0,37	1,80	2,70	1,80
22311 VS C4 F80	55	120	43	226,0	268,0	32,7	4000	4800	2	2,374	0,36	1,90	2,80	1,80
22312 VS C4 F80	60	130	46	262,0	313,0	38,2	3800	4400	2,1	2,942	0,36	1,90	2,80	1,80
22313 VS C4 F80	65	140	48	285,0	330,0	39,9	3600	4200	2,1	3,672	0,35	1,90	2,90	1,90
22314 VS C4 F80	70	150	51	340,0	420,0	49,8	3600	4000	2,1	4,392	0,34	2,00	2,90	1,90
22315 VS C4 F80	75	160	55	380,0	475,0	55,2	3000	3600	2,1	5,352	0,35	2,00	2,90	1,90
22316 VS C4 F80	80	170	58	420,0	535	61,0	2800	3400	2,1	6,411	0,34	2,00	2,90	1,90
22317 VS C4 F80	85	180	60	462,0	591	66,2	2500	3200	3	7,467	0,34	2,00	3,00	2,00
22318 VS C4 F80	90	190	64	588	677	74,6	2600	3000	3	8,563	0,34	2,00	3,00	2,00
22319 VS C4 F80	95	200	67	568	744	80,7	2200	2800	3	10,305	0,34	2,00	3,00	2,00
22320 VS C4 F80	100	215	73	670	880	93,6	2200	2600	3	13,208	0,34	2,00	2,90	1,90
22322 VS C4 F80	110	240	80	800	1060	109,3	1800	2200	3	18,013	0,35	2,00	2,90	1,90
22324 VS C4 F80	120	260	86	930	1230	123,7	1700	2000	3	22,489	0,34	2,00	3,00	2,00
22326 VS C4 F80	130	280	93	1170	1458	143,4	1600	1900	4	27,633	0,33	2,00	3,00	2,00
22328 VS C4 F80	140	300	102	1240	1720	165,6	1400	1500	4	35,918	0,35	2,00	2,90	1,90
22330 VS C4 F80	150	320	108	1400	1940	183,1	1000	1300	4	44,3	0,38	2,00	2,90	1,90
22332 MA C4 F80	160	340	114	1520	2160	200,1	900	1200	4	50,5	0,38	1,78	2,64	1,80
22334 MA C4 F80	170	360	120	1690	2380	216,7	850	1100	4	60,2	0,38	1,78	2,64	1,80
22336 MA C4 F80	180	380	126	1900	2700	241,8	850	1100	4	68,2	0,38	1,78	2,64	1,80
22338 MA C4 F80	190	400	132	1610	2640	232,7	750	1000	4	48,8	0,36	1,90	2,80	1,80



PRODUCT CATALOG

TAPERED ROLLER BEARING

In this section:	Page
Design Characteristics Applications Angular Misalignment	
ISO Specification	144
Seriee Nomenclature	145
Equivalent Load Equations.....	145-147
Data Tables	148-154

Tapered Roller Bearing

DESIGN | CHARACTERISTICS | APPLICATIONS

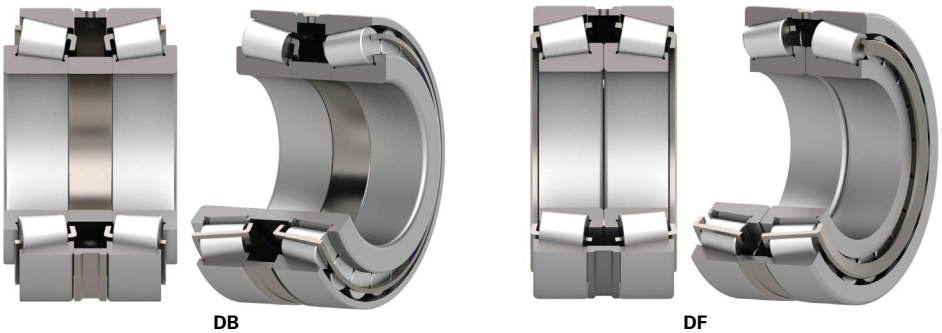
Tapered roller bearings are designed to take radial and thrust loads from one direction. They consist of the inner race (cone) with cage guided rollers and the outer race (cup). The track has the same profile as the tapered rollers. The rollers are guided by contact between the large end of the roller and a large rib on the cone. The extension of the contact lines meet at a common point on the bearing axis of rotation. The cone and cup are separable. By using two bearings as opposed mountings they can carry thrust loadings in both directions.

The bearings are usually mounted in pairs with axial adjustment to provide proper running clearance within the bearings. Being separable, the inner and outer rings may be mounted individually.

For heavy thrust loads, the 30300 with large contact angle is desirable.

Single row tapered roller bearings can be supplied matched in "DB" or "DF" arrangement.

Tapered roller bearings with two and four rows of rollers are used for special steel mill applications.



ANGULAR MISALIGNMENT

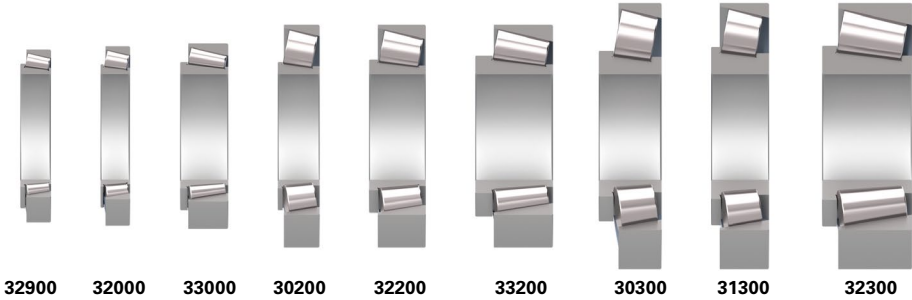
The following is an approximate guide to the misalignment that can be prevalent when fitting tapered roller bearings: 2 mins of arc.

ISO SPECIFICATIONS

- Dimensions in accordance with ISO 355 (latest version)
- Precision class in accordance with ISO 492 (latest version)

SERIES

The series below are the most popular:



NOMENCLATURE

Suffixes:

- A : Higher load rating
- X : Dimensional changes
- M : Brass cage. Typically for bore size over 100 mm
- PO-P5 : Precision class

EQUIVALENT LOAD EQUATIONS

Equivalent dynamic load P_e

$$P = F_r \quad \text{where} \quad F_a/F_r \leq e$$

$$P = 0.4 F_r + Y F_a \quad \text{where} \quad F_a/F_r > e$$

For paired single row tapered roller bearings.

$$P = F_r + Y_1 F_a \quad \text{where} \quad F_a/F_r \leq e$$

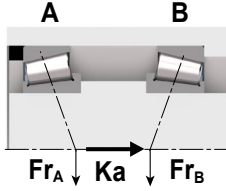
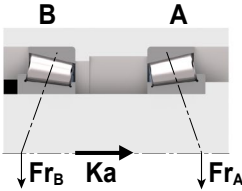
$$P = 0.67 F_r + Y_2 F_a \quad \text{where} \quad F_a/F_r > e$$

For paired bearings F_r and F_a are the loads acting on the pair.

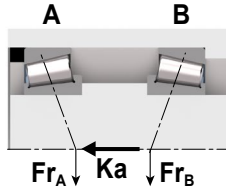
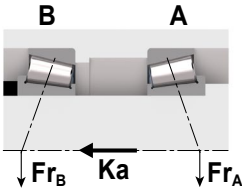
Since the loads are transmitted from one raceway to the other in an inclined position, radial loads include axial reaction forces, which must be considered when calculating the equivalent dynamic load. For calculation purposes the equations show where bearing A and bearing B are subjected to a radial load F_{rA} and F_{rB} respectively and are always considered positive even when they act in the opposite direction to that shown in the figures. The radial loads act at what is termed the pressure centre of the bearings which is given in the bearing tables as "a" dimension. There is an external force K_a which acts on the shaft or on the housing. Figures 1c and 2c are also valid for $K_a = 0$. The equations are valid only if the bearings have been adjusted against each other to zero clearance and no preload.

Tapered Roller Bearing

Bearing arrangements and load equations



1a)	$\frac{F_{rA}}{Y_A} \geq \frac{F_{rB}}{Y_B}$	$F_{aA} = \frac{0.5F_{rA}}{Y_A}$	$F_{aB} = F_{aA} + K_a$	$K_a \geq 0$
1b)	$\frac{F_{rA}}{Y_A} < \frac{F_{rB}}{Y_B}$	$F_{aA} = \frac{0.5F_{rA}}{Y_A}$	$F_{aB} = F_{aA} + K_a$	$K_a \geq 0.5 \left(\frac{F_{rB}}{Y_B} - \frac{F_{rA}}{Y_A} \right)$
1c)	$\frac{F_{rA}}{Y_A} < \frac{F_{rB}}{Y_B}$	$F_{aA} = F_{aB} - K_a$	$F_{aB} = \frac{0.5F_{rB}}{Y_B}$	$K_a \geq 0.5 \left(\frac{F_{rB}}{Y_B} - \frac{F_{rA}}{Y_A} \right)$



2a)	$\frac{F_{rA}}{Y_A} \leq \frac{F_{rB}}{Y_B}$	$F_{aA} = F_{aB} + K_a$	$F_{aB} = \frac{0.5F_{rB}}{Y_B}$	$K_a \geq 0$
2b)	$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$	$F_{aA} = F_{aB} + K_a$	$F_{aB} = \frac{0.5F_{rB}}{Y_B}$	$K_a \geq 0.5 \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B} \right)$
2c)	$\frac{F_{rA}}{Y_A} > \frac{F_{rB}}{Y_B}$	$F_{aA} = \frac{0.5F_{rA}}{Y_A}$	$F_{aB} = F_{aA} - K_a$	$K_a < 0.5 \left(\frac{F_{rA}}{Y_A} - \frac{F_{rB}}{Y_B} \right)$

Equivalent static load P_o

For Single row taper roller bearing

$$P_o = 0.5Fr + Y_oFa \quad \text{where} \quad P_o \leq Fr$$

Single row taper roller bearing of paired mounting

$$P_o = Fr + Y_oFa \quad \text{where} \quad P_o \leq Fr$$

Coefficients Y_o is listed in the bearing dimension table.

LUBRICATION

Refer to the lubrication chapter (Pages 246-250) to have more info about the lubrication of tapered roller bearings.

AXIAL CLEARANCE

The axial clearance of single tapered roller bearings is adjusted on assembly.

With matched bearings, as with double and 4 row bearings, axial clearance is achieved by the addition of spacer rings ground to give the required clearance.

Radial clearances recommended for double and four row tapered roller bearings are shown in the technical section. The radial clearance is transformed into axial clearance by the following relation:

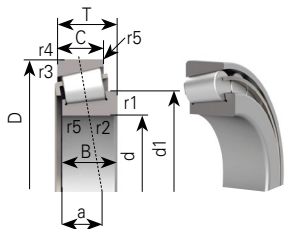
$$\text{Axial clearance} = \frac{\text{Radial clearance}}{2 \tan \alpha}$$

Where: α = contact angle between rollers and the outer ring raceway

d mm		C1		C2		CN		C3		C4		C5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
50	65	0	15	15	30	30	50	50	70	70	90	90	120
65	80	0	20	20	40	40	60	60	80	80	110	110	150
80	100	0	20	20	45	45	70	70	100	100	130	130	170
100	120	0	25	25	50	50	80	80	110	110	150	150	200
120	140	0	30	30	60	60	90	90	120	120	170	170	230
140	160	0	30	30	65	65	100	100	140	140	190	190	260
160	180	0	35	35	70	70	110	110	150	150	210	210	280
180	200	0	40	40	80	80	120	120	170	170	230	230	310
200	225	0	40	40	90	90	140	140	190	190	260	260	340
225	250	0	50	50	100	100	150	150	210	210	290	290	380
250	280	0	50	50	110	110	170	170	230	230	320	320	420
280	315	0	60	60	120	120	180	180	250	250	350	350	460
315	355	0	70	70	140	140	210	210	280	280	390	390	510
355	400	0	70	70	150	150	230	230	310	310	440	440	580
400	450	0	80	80	170	170	260	260	350	350	490	490	650
450	500	0	90	90	190	190	290	290	390	390	540	540	720
500	560	0	100	100	210	210	320	320	430	430	590	590	790
560	630	0	110	110	230	230	350	350	480	480	660	660	880
630	710	0	130	130	260	260	400	400	540	540	740	740	910
710	800	0	140	140	290	290	450	450	610	610	830	830	1100
800	900	0	160	160	330	330	500	500	670	670	920	920	1240

Tapered Roller Bearing

DATA TABLE



Part number	Principal dimensions			Load ratings			Speed limits		Weight	B	C	Dimen- sions		Calculation factors					
	d	D	T	Dynamic	Static	Fatigue	Grease	Oil						r1/r2	r3/r4	r5	a	e	Y
				Cr	Cor	Pu													
	mm						rpm		Kg			mm	mm	mm					
							1 min ⁻¹												
30202	15	35	11,75	15,8	14,4	1,76	9000	13000	0,05	11	10	0,6	0,6	0,3	9	0,35	1,7	0,9	
30302	15	42	14,25	23,9	21,6	2,63	9000	13000	0,09	13	11	1	1	0,3	9	0,28	2,1	1,1	
30203	17	40	13,25	21,2	21,3	2,60	9000	13000	0,08	12	11	1	1	0,3	10	0,35	1,7	0,9	
30303	17	47	15,25	32,3	27,6	3,37	8500	12000	0,13	14	12	1	1	0,3	10	0,28	2,1	1,1	
32004	20	42	15	26,3	30	3,66	8500	12000	0,01	15	12	0,6	0,6	0,3	10	0,37	1,6	0,9	
30204	20	47	15,25	28,2	30,6	3,73	8000	11000	0,12	14	12	1	1	0,3	11	0,35	1,7	0,9	
32204	20	47	19,25	37	40,6	4,95	8000	11000	0,16	18	15	1	1	0,3	12,65	0,33	1,81	1,1	
30304	20	52	16,25	38,01	33,21	4,05	8000	11000	0,17	15	13	1,5	1,5	0,6	11	0,3	2	1,1	
32304	20	52	22,25	44,6	46,3	5,65	7500	10000	0,22	21	18	1,5	1,5	0,6	14	0,3	2	1,1	
32005	25	47	15	29,9	33,1	4,04	7900	11000	0,11	15	11,5	0,6	0,6	0,3	11,6	0,43	1,39	0,77	
33005	25	47	17	32,5	42,5	5,18	6000	8000	0,13	17	14	0,6	0,6	0,3	13,25	0,3	2	0,9	
30205	25	52	16,25	29,4	22,54	2,75	7500	10000	0,15	15	13	1	1	0,3	12	0,37	1,6	0,9	
32205	25	52	19,25	43	48	5,85	7500	10000	0,18	18	16	1	1	0,3	16	0,33	1,8	1	
33205	25	52	22	51,1	55,8	6,80	6500	9500	0,21	22	18	1	1	0,3	13,87	0,35	1,7	0,9	
30305	25	62	18,25	52,5	49,7	6,06	6700	9000	0,25	17	15	1,5	1,5	0,6	13	0,3	2	1,1	
31305 A	25	62	18,25	44,8	46,1	5,62	5600	7500	0,25	17	13	1,5	1,5	0,6	20	0,83	0,7	0,4	
32305	25	62	25,25	64,6	68,8	8,39	6000	8000	0,36	24	20	1,5	1,5	0,6	15	0,3	2	1,1	
32006	30	55	17	38	48,9	5,96	6700	9000	0,17	17	13	1	1	0,3	13	0,43	1,4	0,8	
30206	30	62	17,25	50,1	55	6,71	6300	8500	0,22	16	14	1	1	0,3	14	0,37	1,6	0,9	
32206	30	62	21,25	54,3	63,7	7,77	6300	8500	0,28	20	17	1	1	0,3	15	0,37	1,6	0,9	
30306	30	72	20,75	61,7	63,1	7,70	5600	7500	0,38	19	16	1,5	1,5	0,6	15	0,31	1,9	1,1	
31306	30	72	20,75	52,5	60,3	7,35	5000	6700	0,39	19	14	1,5	1,5	0,6	22	0,83	0,7	0,4	
32306	30	72	28,75	90,7	96,4	11,76	5300	7000	0,55	27	23	1,5	1,5	0,6	18	0,31	1,9	1,1	
32007	35	62	18	42	56	6,83	6000	8000	0,22	18	14	1	1	0,3	15	0,46	1,3	0,7	
30207	35	72	18,25	56,8	63,5	7,74	5300	7000	0,32	17	15	1,5	1,5	0,6	15	0,37	1,6	0,9	
32207	35	72	24,25	74	89,5	10,91	5300	7000	0,42	23	19	1,5	1,5	0,6	17	0,37	1,6	0,9	
33207	35	72	28	91,6	107	13,05	5700	7500	0,52	28	22	1,5	1,5	0,3	18,08	0,35	1,7	0,9	
30307	35	80	22,75	85,5	82,6	10,07	5000	6700	0,52	21	18	2	1,5	0,6	16	0,31	1,9	1,1	
31307	35	80	22,75	67,9	76,3	9,30	4500	6000	0,52	21	15	2	1,5	0,6	25	0,83	0,7	0,4	
32307	35	80	32,75	108,6	118,4	14,44	4800	6300	0,73	31	25	2	1,5	0,6	20	0,31	1,9	1,1	
32008	40	68	19	47	67,3	8,21	5300	7000	0,27	19	14,5	1	1	0,3	15	0,37	1,6	0,9	
30208	40	80	19,75	63	74	9,02	4800	6300	0,42	18	16	1,5	1,5	0,6	16	0,37	1,6	0,9	
32208	40	80	24,75	77,9	97,2	11,85	4800	6300	0,51	23	19	1,5	1,5	0,6	19	0,37	1,6	0,9	
30308	40	90	25,25	104,3	107,5	13,11	4500	6000	0,7	23	20	2	1,5	0,6	19	0,35	1,7	0,9	
31308	40	90	25,25	81,4	96,4	11,76	4000	5300	0,69	23	17	2	1,5	0,6	28	0,83	0,7	0,4	

Tapered Roller Bearing

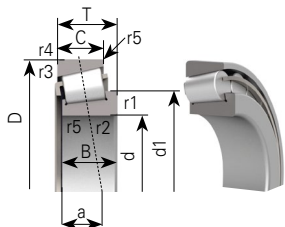
DATA TABLE



Part number	Principal dimensions			Load ratings			Speed limits		Weight	B	C	Dimen- sions		Calculation factors					
	d	D	T	Dynamic	Static	Fatigue	Grease	Oil				r1/r2	r3/r4	r5	a	e	Y	Yo	
				Cr	Cor	Pu	rpm												
	mm			kN			1 min ⁻¹					mm							
32308	40	90	35,25	120,8	147,1	17,94	4000	5300	0,99	33	27	2	1,5	0,6	23	0,35	1,7	0,9	
32009	45	75	20	57	82,2	10,02	4800	6300	0,33	20	15,5	1	1	0,3	16	0,4	1,5	0,8	
33009	45	75	24	71	103	12,56	4000	5300	0,44	24	19	1	1	0,3	16	0,29	2,04	1,1	
33109	45	80	26	87,1	117,2	14,29	4000	5300	0,54	26	20,5	1,5	1,5	0,6	18,99	0,37	1,6	0,9	
30209	45	85	20,75	71,3	83,8	10,22	4500	6000	0,47	19	16	1,5	1,5	0,6	18	0,4	1,5	0,8	
32209	45	85	24,75	84,1	103	12,56	4500	6000	0,56	23	19	1,5	1,5	0,6	20	0,4	1,5	0,8	
33209	45	85	32	109,5	145,1	17,70	4000	5300	0,77	32	25	2	2	0,6	21,71	0,4	1,5	0,8	
30309	45	100	27,25	127	131,2	16,00	4000	5300	0,92	25	22	2	1,5	0,6	21	0,35	1,7	0,9	
31309	45	100	27,25	95,6	113,8	13,88	3400	4500	0,91	25	18	2	1,5	0,6	31	0,83	0,7	0,4	
32309	45	100	38,25	152,2	189,4	23,10	3600	4800	1,25	36	30	2	1,5	0,6	25	0,35	1,7	0,9	
32010	50	80	20	60	88	10,73	4500	6000	0,36	20	15,5	1	1	0,3	18	0,43	1,4	0,8	
33010	50	80	24	79,7	111,8	13,63	4600	6100	0,46	24	19	1	1	0,3	17,39	0,31	1,9	1,1	
33110	50	85	26	89,5	126,2	15,39	4400	5900	0,59	26	20	1,5	1,5	0,6	20	0,4	1,5	0,8	
30210	50	90	21,75	73,3	92,1	11,23	4300	5600	0,53	20	17	1,5	1,5	0,6	19	0,43	1,4	0,8	
32210	50	90	24,75	86,7	107,6	13,12	4300	5600	0,60	23	19	1,5	1,5	0,6	21	0,43	1,4	0,8	
33210	50	90	32	127,8	158,3	19,30	4200	5700	0,86	32	24,5	1,5	1,5	0,6	22,97	0,4	1,5	0,8	
30310	50	110	29,25	130,1	157,1	19,16	3600	4800	1,19	27	23	2,5	2	0,6	23	0,35	1,7	0,9	
31310	50	110	29,25	108	128,25	15,64	3200	4300	1,16	27	19	2,5	2	0,6	34	0,83	0,7	0,4	
32310	50	110	42,25	177,5	236,1	28,79	3200	4300	1,83	40	33	2,5	2	0,6	27	0,35	1,7	0,9	
32011 X	55	90	23	79,7	115,6	14,10	4000	5300	0,54	23	17,5	1,5	1,5	0,6	20	0,4	1,5	0,8	
33111	55	95	30	127,6	166,3	20,28	4000	5300	0,86	30	23	1,5	1,5	0,6	22	0,37	1,6	0,9	
30211	55	100	22,75	94,6	112,8	13,76	3800	5000	0,69	21	18	2	1,5	0,6	20	0,4	1,5	0,8	
32211	55	100	26,75	112,7	141,5	17,26	3600	4900	0,83	25	21	2	1,5	0,5	22,83	0,4	1,48	0,81	
30311	55	120	31,5	153,3	187,6	22,88	3200	4300	1,53	29	25	2,5	2	0,6	24	0,35	1,7	0,9	
31311	55	120	31,5	129,9	158	19,27	2800	3800	1,49	29	21	2,5	2	0,6	37	0,83	0,7	0,4	
32311	55	120	45,5	222,9	271,3	33,09	3000	4000	2,21	43	35	2,5	2	0,6	29	0,35	1,7	0,9	
32012	60	95	23	83,8	121,5	14,82	3800	5000	0,58	23	17,5	1,5	1,5	0,6	21	0,43	1,4	0,8	
33112	60	100	30	128,6	179	21,83	3700	5000	0,93	30	23	1,5	1,5	0,6	23,2	0,4	1,5	0,8	
30212	60	110	23,75	103,3	130	15,85	3400	4500	0,86	22	19	2	1,5	0,6	22	0,4	1,5	0,8	
32212	60	110	29,75	132,8	179,6	21,90	3400	4500	1,10	28	24	2	1,5	0,6	24	0,4	1,5	0,8	
33212	60	110	38	165,8	231,4	28,22	3000	4000	1,50	38	29	2	1,5	0,6	28	0,4	1,48	0,82	
30312	60	130	33,5	171,4	210	25,61	3000	4000	1,90	31	26	3	2,5	1	26	0,35	1,7	0,9	
31312	60	130	33,5	145,4	176,8	21,56	2600	3600	1,83	31	22	3	2,5	1	39	0,83	0,7	0,4	
32312	60	130	48,5	226,7	303	36,95	2600	3600	2,80	46	37	3	2,5	1	31	0,35	1,7	0,9	
32013	65	100	23	80,6	123	15,00	3400	4500	0,62	23	17,5	1,5	1,5	0,6	22	0,46	1,3	0,7	

Tapered Roller Bearing

DATA TABLE



Part number	Principal dimensions			Load ratings			Speed limits		Weight	B	C	Dimen- sions		Calculation factors				
	d	D	T	Dynamic	Static	Fatigue	Grease	Oil				r1/r2	r3/r4	r5	a	e	Y	Yo
	mm			kN			rpm		Kg	mm								
							1 min ⁻¹											
33013	65	100	27	100,5	162,7	19,84	3600	4800	0,75	27	21	1,5	1,5	0,6	21	0,35	1,7	0,9
33113	65	110	34	153,6	224,6	27,39	3400	4600	1,30	34	26,5	1,5	1,5	0,6	25,6	0,4	1,5	0,8
30213	65	120	24,75	120,6	152,6	18,61	3000	4000	1,10	23	20	2	1,5	0,6	23	0,4	1,5	0,8
32213	65	120	32,75	181,9	234,9	28,65	3000	4000	1,48	31	27	2	1,5	0,6	27	0,4	1,5	0,8
33213	65	120	41	224,3	283,1	34,52	3100	4200	1,99	41	32	2	1,5	0,5	29,5	0,39	1,53	0,84
30313	65	140	36	230,9	248,6	30,09	2800	3700	2,30	33	28	3	2,5	1	28	0,35	1,7	0,9
31313	65	140	36	195,7	215,5	26,09	2200	3200	2,25	33	23	3	2,5	1	42	0,83	0,7	0,4
32313	65	140	51	307,2	358,8	43,43	2400	3400	3,49	48	39	3	2,5	1	33	0,35	1,7	0,9
32014	70	110	25	95,6	143	17,44	3200	4300	0,83	25	19	1,5	1,5	0,6	23	0,43	1,4	0,8
33014	70	110	31	127	204	24,88	3200	4200	1,07	31	25,5	1,5	1,5	0,6	22,5	0,28	2,1	1,1
33114	70	120	37	172	250	30,49	4000	5300	1,70	37	29	2	1,5	0,6	27,6	0,37	1,6	0,9
30214	70	125	26,25	138,3	173,7	21,18	3000	4000	1,22	24	21	2	1,5	0,6	25	0,43	1,4	0,8
32214	70	125	33,25	168,5	237,1	28,91	2800	3800	1,56	31	27	2	1,5	0,6	28	0,43	1,4	0,8
33214	70	125	41	204	290	35,37	2900	3900	2,10	41	32	2	1,5	0,8	30,7	0,41	1,47	0,81
30314	70	150	38	248,8	271,7	32,20	2400	3400	3	35	30	3	2,5	1	29	0,35	1,7	0,9
32314	70	150	54	297	381	45,15	2200	3200	4,10	51	42	3	2,5	1	36	0,35	1,7	0,9
32015	75	115	25	103,1	160,2	19,54	3000	4000	0,88	25	19	1,5	1,5	0,6	25	0,46	1,3	0,7
33015	75	115	31	129	212	25,85	3000	4000	1,13	31	25,5	1,5	1,5	0,6	23,2	0,3	2	1,1
33115	75	125	37	176	265	32,32	3800	5000	1,80	37	29	2	1,5	0,6	28,8	0,4	1,5	0,8
30215	75	130	27,25	138,4	185,4	22,44	2800	3800	1,33	25	22	2	1,5	0,6	27	0,43	1,4	0,8
32215	75	130	33,25	170,3	242,1	29,31	2600	3600	1,73	31	27	2	1,5	0,6	29	0,43	1,4	0,8
33215	75	130	41	208	298	36,07	2700	3600	2,20	41	31	2	1,5	0,6	31,6	0,43	1,4	0,8
30315	75	160	40	252,8	318,8	37,04	2600	3600	3,40	37	31	3	2,5	1	31	0,35	1,7	0,9
31315	75	160	40	240	245	28,47	3200	4300	3,50	37	26	3	2,5	1	48	0,83	0,7	0,4
32315	75	160	58	345	480	55,77	2200	3000	5,30	55	45	3	2,5	1	38	0,35	1,7	0,9
32016	80	125	29	141	220	26,63	2600	3600	1,25	29	22	1,5	1,5	0,6	27	0,43	1,4	0,8
33016	80	125	36	173	284	34,38	2800	3700	1,60	36	29,5	1,5	1,5	0,6	25,5	0,28	2,1	1,1
33116	80	130	37	211,6	322,2	38,72	3600	4800	1,90	37	29	2	1,5	0,6	30	0,43	1,4	0,8
30216	80	140	28,25	167,7	212,9	25,23	2400	3400	1,59	26	22	2,5	2	0,6	28	0,43	1,4	0,8
32216	80	140	35,25	198,1	279	33,07	2400	3400	2	33	28	2,5	2	0,6	30	0,43	1,4	0,8
33216	80	140	46	250	365	43,26	2500	3400	2,92	46	35	2,5	2	0,6	34,6	0,43	1,4	0,8
30316	80	170	42,5	319,7	352,5	40,20	2000	3000	4	39	33	3	2,5	1	33	0,35	1,7	0,9
31316	80	170	42,5	260	265	30,22	3000	4000	4,05	39	27	3	2,5	1	52	0,83	0,7	0,4
32316	80	170	61,5	387,9	543,1	61,94	2100	2800	6,10	58	48	3	2,5	1	41	0,35	1,7	0,9
32017	85	130	29	142	224	26,73	2600	3500	1,35	29	22	1,5	1,5	0,6	28	0,44	1,4	0,8

Tapered Roller Bearing

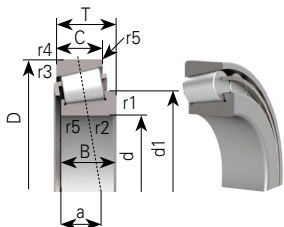
DATA TABLE



Part number	Principal dimensions			Load ratings			Speed limits		Weight	B	C	Dimen- sions			Calculation factors					
	d	D	T	Dynamic	Static	Fatigue	Grease	Oil				r1/r2	r3/r4	r5	a	e	Y	Yo		
				Cr	Cor	Pu	rpm		Kg											
	mm			kN			1 min ⁻¹					mm								
33017	85	130	36	176	296	35,32	2600	3500	1,7	36	29,5	1,5	1,5	0,6	26,6	0,3	2	1,1		
33117	85	140	41	220	340	40,02	3400	4500	2,4	41	32	2,5	2	0,6	34,4	0,4	1,5	0,8		
30217	85	150	30,5	177,6	236,8	27,51	2200	3200	2	28	24	2,5	2	0,6	30	0,43	1,4	0,8		
32217	85	150	38,5	227	324	37,65	2200	3200	2,7	36	30	2,5	2	0,6	33	0,43	1,4	0,8		
30317	85	180	44,5	305	388	43,49	2100	2900	5	41	34	4	3	1	35	0,35	1,7	0,9		
31317	85	180	44,5	242	285	31,94	2600	3800	4,6	41	28	4	3	5	53,9	0,83	0,72	0,4		
32317	85	180	63,5	439,4	592	66,35	1900	2700	7,1	60	49	4	3	1	42	0,35	1,7	0,9		
32018	90	140	32	198,7	289,4	33,84	2500	3300	1,8	32	24	2	1,5	0,6	30	0,43	1,4	0,8		
33018	90	140	39	215	360	42,10	2500	3300	2,2	39	32,5	2	1,5	0,6	27,3	0,27	2,2	0,4		
33118	90	150	45	251	390	45,03	3000	4300	3,1	45	35	2,5	2	0,6	35	0,4	1,5	0,8		
32218	90	160	42,5	270	396	45,17	2000	3000	3,4	40	34	2,5	2	0,6	36	0,43	1,4	0,8		
30318	90	190	46,5	342	441	48,62	2000	2700	5,8	43	36	4	3	1	36	0,35	1,7	0,9		
31318	90	190	46,5	308	380	41,89	2400	3400	5,9	43	30	4	3	1	57	0,83	0,7	0,4		
32318 A	90	190	67,5	468	625	68,90	2000	2700	8,8	64	53	4	3	1,5	46,2	0,35	1,74	0,96		
32019	95	145	32	171	280	32,33	2300	3100	1,8	32	24	2	1,5	0,6	31	0,44	1,4	0,8		
33019	95	145	39	219	375	43,30	2300	3100	2,3	39	32,5	2	1,5	0,6	27,6	0,28	2,16	0,4		
30219	95	170	34,5	227	309	34,63	2100	2800	3	32	34,2	3	2,5	1,2	27	0,43	1,4	0,8		
32219	95	170	45,5	303	448	50,21	1900	2800	4,3	43	37	3	2,5	1	39	0,43	1,4	0,8		
30319	95	200	49,5	369	478	51,88	1900	2500	6,8	45	38	4	3	1	39	0,35	1,7	0,9		
31319	95	200	49,5	292	355	38,53	2400	3400	9,1	45	32	4	3	1	59,6	0,83	0,72	0,4		
32319	95	200	71,5	516	737	79,99	1700	2300	10,1	67	55	4	3	1	47	0,35	1,7	0,9		
32020	100	150	32	170	280	31,94	2200	3000	1,9	32	24	2	1,5	0,6	32	0,46	1,3	0,7		
33020	100	150	39	224	390	44,48	2200	3000	2,4	39	32,5	0,5	1,5	0,6	28,8	0,28	2,1	1,1		
33120	100	165	52	325	607	68,03	2800	4100	4,8	52	40	2,5	2	1	41	0,41	1,48	0,81		
30220	100	180	37	254	350	38,58	2000	2700	3,7	34	29	3	2,5	1	35	0,43	1,4	0,8		
32220	100	180	49	341	512	56,44	1800	2600	5,1	46	39	3	2,5	1	41	0,43	1,4	0,8		
30320	100	215	51,5	406	526	55,97	1800	2400	8,2	47	39	4	3	1	40	0,35	1,7	0,9		
31320	100	215	56,5	430	465	49,48	2400	3000	8,7	51	35	4	3	1	45,1	0,83	0,73	0,9		
32320	100	215	77,5	600	872	92,79	1600	2100	13	73	60	4	3	1	53	0,35	1,7	0,9		
32021	105	160	35	201	335	37,55	2100	2800	2,4	35	26	2,5	2	0,6	34	0,44	1,4	0,8		
33021	105	160	43	245	420	47,07	2100	2800	3	43	34	2,5	2	0,6	30,7	0,28	2,1	1,1		
33121	105	175	56	360	607	66,92	2600	3800	5,3	56	44	2,5	2	0,6	43	0,4	1,48	0,8		
30221	105	190	39	285	399	43,30	1900	2500	4,4	36	30	3	2,5	1	37	0,43	1,4	0,8		
32221	105	190	53	381	579	62,84	1700	2500	6,2	50	43	3	2,5	1	44	0,43	1,4	0,8		
30321	105	225	53,5	433	562	58,98	1700	2300	9,4	49	41	4	3	3	41,3	0,35	1,7	0,9		

Tapered Roller Bearing

DATA TABLE



Part number	Principal dimensions			Load ratings			Speed limits		Weight	B	C	Dimen- sions		Calculation factors				
	d	D	T	Dynamic	Static	Fatigue	Grease	Oil										
				Cr	Cor	Pu	rpm		Kg			r1/r2	r3/r4	r5	a	e	Y	Yo
	mm			kN			1 min ⁻¹					mm		mm				
32321	105	225	81,5	660	915	96,02	1500	2000	15	77	63	4	4	3	54	0,35	1,7	0,96
32022	110	170	38	234	356,5	39,30	2100	2800	3	38	36,6	2,5	2	1	36,6	0,43	1,4	0,8
33022	110	170	47	288	500	55,12	2000	2700	3,8	56	43	2,5	2	1	33,5	0,28	2,1	1,1
33122	110	180	56	369	630	68,73	2600	3400	5,5	56	43	2,5	2	1	44,1	0,42	1,43	0,8
30222	110	200	41	315	444	47,48	1800	2400	5,2	38	32	3	2,5	1	39	0,43	1,4	0,8
32222	110	200	56	432	666	71,21	1700	2400	7,1	53	46	3	2,5	1	46	0,43	1,4	0,8
30322	110	240	54,5	473	612	63,10	1600	2200	11	50	42	4	3	1	43	0,35	1,7	0,9
31322	110	240	63	457	585	60,32	1900	2800	12	57	38	4	3	1	72,2	0,83	0,73	0,9
32322	110	240	84,5	717	990,7	102,14	1400	1900	17	80	65	4	3	1	55	0,35	1,7	0,9
32024	120	180	38	320	545	58,85	1800	2500	3,3	38	29	2,5	2	0,6	39	0,46	1,3	0,7
33024	120	180	48	292	540	58,31	2600	3400	4,2	48	38	2,5	2	0,6	36,3	0,3	2	1,1
33124	120	200	62	462	785	83,14	2400	3200	7,7	62	48	2,5	2	1	48	0,4	1,51	0,8
30224	120	215	43,5	337	483	50,46	1700	2200	6,2	40	34	3	2,5	1	43	0,43	1,4	0,8
32224	120	215	61,5	549,5	758,6	79,25	1600	2200	9,1	58	50	3	2,5	1	51	0,43	1,4	0,8
30324	120	260	59,5	588,9	745,5	74,99	1500	2000	14	55	46	4	3	1	47	0,35	1,7	0,9
31324	120	260	68	539	695	69,91	1700	2400	15,5	62	42	4	3	1	54,8	0,83	0,73	0,8
32324	120	260	90,5	845	1190	119,70	1300	1800	22,4	86	69	4	3	1	60	0,35	1,7	0,96
32026 X	130	200	45	326	550	57,72	1700	2200	4,9	45	34	2,5	2	1	43,3	0,43	1,38	0,76
30226	130	230	43,75	366	521	53,27	1500	2000	6,9	40	34	4	3	1	45	0,43	1,4	0,8
32226	130	230	67,75	550	830	84,86	1500	2000	11,5	64	54	4	3	1	56	0,43	1,4	0,8
30326	130	280	63,75	710,2	911,1	89,58	1300	1800	17	58	49	5	4	1,5	51	0,35	1,7	0,9
31326	130	280	72	605	780	76,69	1600	2400	18,5	66	44	5	4	1,5	87	0,83	0,7	0,4
32326	130	280	98,75	858	1180	116,02	1100	1600	30,5	93	78	5	4	1,5	66	0,35	1,7	0,9
32028	140	210	45	358,6	580	59,80	1600	2100	5,3	45	34	2,5	2	0,6	46	0,46	1,3	0,7
30228 A	140	250	45,75	434,5	593,6	59,25	1400	1900	8,8	42	36	4	3	1	47	0,44	1,4	0,76
32228	140	250	71,75	644	1000	99,81	1400	1900	14,5	68	58	4	3	1	60	0,43	1,4	0,8
30328 A	140	300	67,75	670	945	90,97	1200	1700	21,2	62	53	5	5	1	54	0,35	1,7	0,96
32328 A	140	300	107,75	1090	1630	156,91	1200	1700	35,8	102	85	5	5	4	74	0,37	1,6	0,9
32030	150	225	48	370	655	66,15	1400	1900	6,4	48	36	3	2,5	1	49	0,46	1,3	0,7
33030	150	225	59	457	865	87,36	2000	2600	8,1	59	46	3	2,5	1	48,2	0,37	1,6	0,9
30230	150	270	49	451	646	63,06	1300	1700	10,8	45	38	4	3	1	50	0,43	1,4	0,8
32230	150	270	77	737	1140	111,28	1200	1700	17,5	73	60	4	3	1	64	0,43	1,4	0,8
30330	150	320	72	825	1060	100,04	1100	1600	28,5	65	55	5	4	1	58	0,35	1,7	0,9
32330	150	320	114	1170	1660	156,67	950	1400	46	108	90	5	4	1	79	0,35	1,74	0,96
32032	160	240	51	435	790	78,25	1400	1800	7,8	51	38	3	2,5	1	52	0,46	1,3	0,7

Tapered Roller Bearing

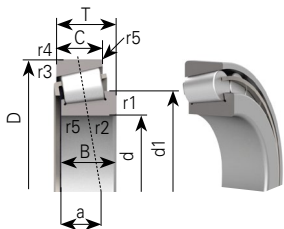
DATA TABLE



Part number	Principal dimensions			Load ratings			Speed limits		Weight	B	C	Dimensions		Calculation factors				
	d	D	T	Dynamic	Static	Fatigue	Grease	Oil						r1/r2	a	e	Y	Yo
				Cr	Cor	Pu						r3/r4	r5					
	mm				kN		rpm	1 min ⁻¹	Kg			mm						
30232	160	290	52	512	739	70,66	1200	1600	13,3	48	40	4	3	1	54	0,43	1,4	0,8
32232	160	290	84	880	1400	133,86	1100	1600	25,5	80	67	4	3	1	70	0,43	1,4	0,8
30332	160	340	75	913	1180	109,32	1000	1500	29	68	58	5	4	1	61,4	0,35	1,7	0,9
32332 A	160	340	121	1400	2230	206,59	1000	1500	51,7	114	95	5	4	1	81	0,35	1,7	0,96
32034	170	260	57	500	895	86,75	1300	1700	10,5	57	43	3	2,5	1	56	0,44	1,4	0,8
30234	170	310	57	591	866	81,22	1100	1500	16,6	52	43	5	4	1,5	58	0,43	1,4	0,8
32234	170	310	91	1010	1630	152,87	1000	1500	28,5	86	71	5	4	1,5	75	0,43	1,4	0,8
30334	170	360	80	1020	1340	121,99	950	1400	35	72	62	5	4	1,5	65,8	0,35	1,7	0,9
32036	180	280	64	655	1210	114,94	1100	1500	14,5	64	48	3	2,5	1	59	0,43	1,4	0,8
30236	180	320	57	610	912	84,49	1100	1400	17,3	52	43	5	4	1,5	61	0,46	1,3	0,7
32236 A	180	320	91	1063,8	1651,8	153,02	950	1400	32,3	86	71	5	5	4	78	0,45	1,3	0,73
32938	190	260	45	386,4	717,9	68,64	1100	1600	6,5	42	36	2,5	2	2	49	0,38	1,6	0,86
32038	190	290	64	726,8	1210	113,48	1100	1500	15,1	64	48	3	2,5	1	62	0,44	1,4	0,8
30238	190	340	60	715	1000	91,04	1000	1300	20,8	55	46	5	4	1	63,1	0,43	1,4	0,8
32238	190	340	97	1000	1670	152,03	1000	1300	33,3	92	75	5	4	1,5	81	0,43	1,4	0,8
32940	200	280	51	455	935	87,69	1000	1500	9,5	51	39	3	3	2,5	54	0,39	1,5	0,84
32040	200	310	70	817,6	1487,5	136,99	1100	1470	19,3	70	53	3	2,5	1	66	0,43	1,4	0,8
30240	200	360	64	780	1100	98,50	900	1300	25,4	58	48	5	5	4	70	0,44	1,4	0,76
32240	200	360	104	1266,2	1947,7	174,41	900	1300	42,6	98	82	5	5	4	84	0,41	1,5	0,81
32944	220	300	51	471	978	89,54	1000	1400	10	48	41	3	2,5	1	56,1	0,37	1,6	0,88
32044	220	340	76	937,6	1690	151,33	960	1690	25	76	57	4	3	1	72	0,43	1,4	0,8
30244	220	400	72	975	1370	118,99	900	1300	36,8	65	54	5	5	4	77	0,42	1,4	0,79
32244	220	400	114	1671,1	2619,8	227,53	900	1300	62,7	108	50	5	5	4	96	0,44	1,4	0,76
32948	240	320	51	608	1137,3	101,84	850	1200	11,5	51	39	3	3	2,5	64	0,46	1,3	0,7
32048	240	360	76	930	1760	154,37	870	1200	27,5	76	57	4	3	1	78	0,46	1,3	0,7
32248	240	440	127	2043,3	3206,4	270,87	700	950	82,5	120	100	5	5	4	105	0,43	1,4	0,8
32952	260	360	63,5	759,7	1503,1	130,55	800	1100	19,2	60	52	3	3	2,5	60	0,3	2	1,09
32052	260	400	87	1243	2200	187,52	800	1100	40	87	65	5	4	1,5	84	0,43	1,4	0,8
32252	260	480	137	2160	3650	300,62	670	900	105	130	105	6	6	5	113	0,43	1,4	0,77
30352	260	540	114	2015	2730	219,65	670	900	113	102	85	6	6	6	92	0,32	1,9	1,04
32956	280	380	63,5	873,8	1682,5	143,41	800	1100	19,7	60	52	3	3	2,5	64	0,32	1,9	1,03
32056	280	420	87	1194	1840	154,09	750	1000	39,6	87	65	5	5	4	83	0,37	1,6	0,89
32960	300	420	76	1019	2200	182,69	700	950	30,2	72	62	4	4	3	67	0,28	2,1	1,17
32060	300	460	100	1516	2740	223,87	670	900	56,6	100	74	5	5	4	97	0,43	1,4	0,8
30660	300	540	149	2680	4700	372,66	600	800	142	140	115	6	6	5	126	0,43	1,4	0,8

Tapered Roller Bearing

DATA TABLE



Part number	Principal dimensions			Load ratings			Speed limits		Weight	B	C	Dimen- sions		Calculation factors					
	d	D	T	Dynamic	Static	Fatigue	Grease	Oil						r1/r2	r3/r4	r5	a	e	Y
	mm			kN			rpm		Kg	mm									
							1 min ⁻¹												
32964	320	440	76	1046	2317	189,31	650	900	34,5	76	57	4	4	3	84	0,43	1,4	0,8	
32064	320	480	100	1658	3046	245,07	630	850	62,7	100	74	5	5	4	104	0,46	1,3	0,72	
30664	320	620	141	2780	4600	352,63	520	680	183	125	107	7,5	7,5	7,5	154	0,6	1	0,6	
32968	340	460	76	1000	2350	189,08	500	830	36,5	76	57	4	4	3	90	0,44	1,35	0,8	
32972	360	480	76	970	2220	176,02	500	630	38,5	76	57	4	4	4	97	0,46	1,3	0,72	
30672	360	680	165	3620	6250	464,80	480	600	262	150	125	7,5	7,5	7,5	172	0,6	1	0,6	
30680	400	750	130	2660	4180	301,62	320	430	222	115	77	6	6	6	189	0,7	0,86	0,47	
30692	460	860	210	5590	10100	699,27	350	470	512	190	160	7,5	7,5	7,5	218	0,57	1,05	0,6	
30696	480	950	240	6980	12500	844,90	310	420	761	225	174	9,5	9,5	9,5	230	0,54	1,1	0,6	
306/560	560	1080	265	8910	15700	1018,45	180	270	1063	235	208	9,5	9,5	9,5	241	0,43	1,4	0,8	
329/630	630	850	132	3080	7150	478,32	360	450	200	132	95	6	6	6	168	0,46	1,3	0,72	
306/630	630	920	134	3410	7100	468,44	320	430	286	128	94	7,5	7,5	7,5	166	0,43	1,4	0,78	
306/680	680	1000	190	5580	12500	805,03	250	350	486	188	140	6	6	6	200	0,43	1,4	0,8	
319/710	710	950	114	2860	6900	445,98	260	360	210	106	80	6	6	6	175	0,46	1,3	0,72	
306/1000	1000	1420	210	8100	18000	1039,02	160	230	966	195	150	7,5	7,5	7,5	278	0,46	1,3	0,72	



PRODUCT CATALOG

THRUST BALL BEARING SINGLE ACTING

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Design Characteristics Applications Angular Misalignment ISO Specification	156
Series Nomenclature Equivalent Load Equations	157
Data Tables	158-160

Thrust Ball Bearing

SINGLE ACTING

DESIGN | CHARACTERISTICS | APPLICATIONS

THRUST BALL BEARINGS

Thrust ball bearings can be applied for high axial loads and low to medium speeds.

However, they cannot take radial loads. They are sensitive to angular deflection and characterized by extremely rigid guidance in axial direction. The thrust loading is in one direction only.

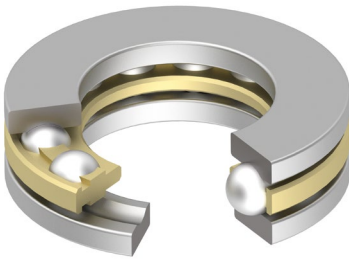
Thrust ball bearings are separable bearings. The single acting thrust ball bearing consists of one shaft washer, one housing washer and one ball set with cage.

The standard cage is made of a steel sheet.

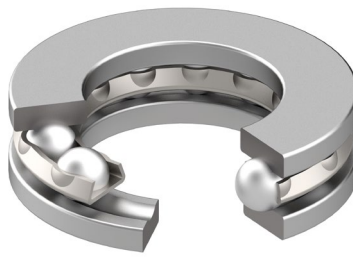
Depending on speed, a minimum load is necessary to avoid sliding movements of the ball set, which are caused by centrifugal forces. To compensate for misalignments of the shaft, bearings with spherical housing washers and support washers should be used.

The thrust loading should not drop below a minimum axial load, thus maintaining contact between the balls and the track when centrifugal forces are present.

Single – acting thrust ball bearings



Brass Cage M



Steel Cage

ANGULAR MISALIGNMENT

These are sensitive for axial deflection and cannot accommodate misalignment.

ISO SPECIFICATIONS

- Dimensions in accordance with ISO 104 (latest version)
- Precision class in accordance with ISO 199 (latest version)

SERIES

The standard series are 51100 | 51200 | 51300 | 51400.



51100



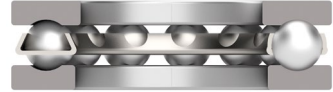
51200



51300



51400



NOMENCLATURE

Suffixes:

M : Brass cage. Typically for bore size over 100 mm

P0 - P6 : Precision class

EQUIVALENT LOAD EQUATIONS

Equivalent dynamic load P_e

$P = F_a$ [KN] where F_a = the axial load

Equivalent static load P_o

$P_o = F_a$ [KN]

Minimum load

For a thrust ball bearing to function correctly it requires an axial load to ensure that the rolling elements maintain contact with the raceways. This prevents wear due to sliding. F_{am} can be obtained from the formula below.

Single – acting thrust ball bearings

$$F_{am} = M \left(\frac{n \text{ Max}}{1000} \right)^2 \text{ [N]}$$

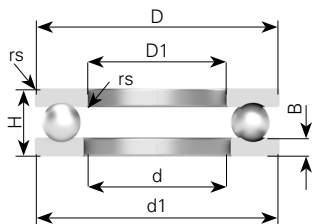
where F_{am} = minimum thrust load (N)

M = Factor for minimum load

n = speed in RPM

Thrust Ball Bearing

DATA TABLE - SINGLE ACTING



Part number	Principal dimensions			Basic load ratings			Speed limits		Weight	Dimensions			
	d	D	H	Dynamic	Static	Fatigue	Grease	Oil		rs min	D1	d1	M
				Cr	Cor	Pu	rpm		Kg				
	mm			kN			1 min ⁻¹			mm			
51100	10	24	9	10,0	14,0	0,64	6300	9000	0,02	0,3	11	24	0,001
51101	12	26	9	10,2	15,2	0,69	6000	8500	0,02	0,3	13	26	0,001
51201	12	28	11	13,2	19,0	0,86	5300	7500	0,03	0,6	14	28	0,002
51102	15	28	9	10,5	16,8	0,76	5600	8000	0,02	0,3	16	28	0,001
51202	15	32	12	16,5	24,8	1,13	4800	6700	0,04	0,6	17	32	0,004
51103	17	30	9	10,8	18,2	0,83	5300	7500	0,02	0,5	18	30	0,002
51203	17	35	12	17,0	27,2	1,24	4500	6800	0,05	0,6	19	35	0,004
51104	20	35	10	14,2	24,5	1,11	4800	6700	0,04	0,3	21	35	0,003
51204	20	40	14	22,2	37,5	1,70	3800	5300	0,08	0,6	22	40	0,008
51105	25	42	11	15,2	30,2	1,37	4300	6000	0,06	1,0	26	42	0,005
51205	25	47	15	27,8	50,5	2,30	3400	4300	0,11	0,6	27	47	0,013
51305	25	52	18	35,5	61,5	2,80	3000	4300	0,17	1,0	27	52	0,019
51106	30	47	11	16,0	34,2	1,55	4000	5600	0,06	0,6	32	47	0,007
51206	30	52	16	28,0	54,2	2,46	3200	4500	0,13	0,6	32	52	0,014
51306	30	60	21	42,8	78,5	3,57	2400	3600	0,26	1,0	32	60	0,028
51107	35	52	12	18,2	41,5	1,89	3800	5300	0,08	0,6	37	52	0,009
51207	35	62	18	39,2	78,2	3,55	2800	4000	0,21	1,0	37	62	0,028
51307	35	68	24	55,2	105,0	4,77	2000	3200	0,37	1,0	37	68	0,050
51108	40	60	13	26,8	62,8	2,85	3400	4800	0,11	0,6	42	60	0,016
51208	40	68	19	44,8	91,8	4,17	2400	3600	0,26	1,5	42	68	0,050
51308	40	78	26	69,2	135,0	6,14	1900	3000	0,53	1,0	42	78	0,080
51109	45	65	14	27,0	66,0	3,00	3200	4500	0,14	0,6	47	65	0,020
51209	45	73	20	47,8	105,0	4,77	2200	3400	0,30	1,0	47	73	0,043
51309	45	85	28	75,8	150,0	6,82	1700	2600	0,66	1,0	47	85	0,120
51110	50	70	14	27,2	69,2	3,15	3000	4300	0,15	0,6	52	70	0,024
51210	50	78	22	48,5	112,0	5,09	2000	3200	0,37	1,0	52	78	0,070
51310	50	95	31	96,6	202,0	9,18	1600	2400	0,92	1,1	52	95	0,180
51111	55	78	16	33,8	89,2	4,05	2800	4000	0,22	1,0	57	78	0,038
51211	55	90	25	67,5	158,0	7,18	1900	3000	0,58	1,0	57	90	0,110
51311	55	105	35	115,0	242,0	11,00	1500	2200	1,28	1,1	57	105	0,260
51112	60	85	17	40,2	108,0	4,91	2600	3800	0,27	1,0	62	85	0,053
51212	60	95	26	73,5	178,0	8,09	1800	2800	0,66	1,0	62	95	0,120
51312	60	110	35	118,0	262,0	11,91	1400	2000	1,37	1,1	62	110	0,280
51113	65	90	18	40,5	112,0	5,09	2400	3600	0,31	1,0	67	90	0,060
51213	65	100	27	74,8	188,0	8,55	1700	2600	0,72	1,0	67	100	0,140
51313	65	115	36	115,0	262,0	11,91	1300	1900	1,18	1,1	67	115	0,320

Thrust Ball Bearing

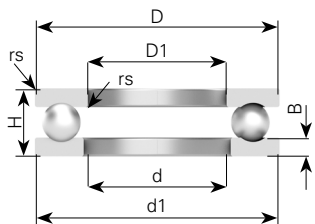
DATA TABLE - SINGLE ACTING



Part number	Principal dimensions			Basic load ratings			Speed limits		Weight	Dimensions			
	d	D	H	Dynamic	Static	Fatigue	Grease	Oil		rs min	D1	d1	M
				Cr	Cor	Pu							
	mm				kN		rpm	1 min ⁻¹	Kg		mm		
51114	70	95	18	40,8	115,0	5,23	2200	3400	0,33	1,5	72	95	0,067
51214	70	105	27	73,5	188,0	8,55	1600	2400	0,75	1,0	72	105	0,160
51314	70	125	40	148,0	340,0	15,45	1200	1800	1,98	1,1	72	125	0,530
51115	75	100	19	48,2	140,0	6,36	2000	3200	0,38	1,0	77	100	0,095
51215	75	110	27	74,8	198,0	9,00	1500	2200	0,82	1,0	77	110	0,180
51315	75	135	44	162,0	380,0	16,86	1100	1700	2,58	1,5	77	135	0,750
51116	80	105	19	48,5	145,0	6,59	1900	3000	0,40	1,0	82	105	0,100
51216	80	115	28	83,8	222,0	10,09	1400	2000	0,90	1,0	82	115	0,220
51316	80	140	44	160,0	380,0	16,47	1000	1600	2,69	1,5	82	140	0,800
51117	85	110	19	49,2	150,0	6,82	1800	2800	0,42	1,0	87	110	0,120
51217	85	125	31	102,0	280,0	12,42	1300	1900	1,21	1,0	88	125	0,180
51317	85	150	49	208,0	495,0	20,76	950	1500	3,47	1,5	88	150	1,100
51118	90	120	22	65,0	200,0	8,87	1700	2600	0,65	1,0	92	120	0,190
51218	90	135	35	115,0	315,0	13,50	1200	1800	1,65	1,1	93	135	0,530
51318	90	155	50	205,0	495,0	20,33	900	1400	3,69	1,5	93	155	1,200
51120	100	135	25	85,0	268,0	11,24	1600	2400	0,95	1,0	102	135	0,360
51220	100	150	38	132,0	375,0	15,25	1100	1700	2,21	1,1	103	150	0,670
51320 M	100	170	55	235,0	595,0	23,28	800	1200	4,86	1,5	103	170	1,800
51122 M	110	145	25	87,0	288	11,59	2500	2200	1,03	1,0	112	145	0,430
51222 M	110	160	38	138,0	412	16,12	2000	1600	2,39	1,1	113	160	0,800
51224 M	120	170	39	135,0	412	15,55	950	1500	2,62	1,1	123	170	0,480
51324 M	120	210	70	347,0	977	34,57	800	1100	10,71	2,1	123	205	1,000
51126 M	130	170	30	111,0	316	11,73	1400	1900	1,86	1,0	170	170	0,750
51226 M	130	190	45	212,0	620	22,28	950	1400	4,44	1,5	133	187	1,700
51128 M	140	180	31	107,0	377	13,55	1300	1800	1,88	1	142	178	0,850
51228 M	140	200	46	215,0	669	23,32	950	1400	4,33	1,5	143	197	1,900
51130 M	150	190	31	109,0	402	14,01	1200	1700	2,188	1	152	188	0,900
51230 M	150	215	50	257,0	795	26,75	900	1300	6,05	1,5	153	212	2,800
51330 M	150	250	80	377,0	1200	38,57	670	900	16,4	3	154	245	9,000
51430 M	150	300	120	668,0	2242	67,94	-	650	42,00	4,0	154	295	20,000
51132 M	160	200	31	112,0	427	14,47	1200	1700	2,2	1	162	198	1,000
51232 M	160	225	51	247,0	803	26,31	850	1200	6,5	1,5	163	222	3,200
51134 M	170	215	34	134,0	512	16,77	1100	1600	2,96	1,1	172	213	1,400
51234 M	170	240	55	269,0	874	27,75	800	1100	6,56	1,5	173	237	4,500
51334 M	170	280	87	463,0	1570	47,58	600	800	22,1	3	174	275	13,000

Thrust Ball Bearing

DATA TABLE - SINGLE ACTING



Part number	Principal dimensions			Basic load ratings			Speed limits		Weight	Dimensions			
	d	D	H	Dynamic	Static	Fatigue	Grease	Oil		rs min	D1	d1	M
				Cr	Cor	Pu	rpm		Kg				
	mm			kN			1 min ⁻¹				mm		
51136 M	180	225	34	135,0	528	16,87	1000	1500	3,082	1,1	183	222	1,500
51236 M	180	250	56	294,0	986	30,57	800	1100	8,7	1,5	183	247	5,000
51336 M	180	300	95	463,0	1580	46,36	560	750	28,10	3,0	184	295	18,000
51138 M	190	240	37	170,0	657	20,37	950	1400	3,94	1,1	193	237	2,400
51238 M	190	270	62	357,0	1019	30,54	750	1000	12	2	194	267	8,400
51338 M	190	320	105	607,0	1662	47,31	700	800	36,76	4,0	195	315	30,000
51140 M	200	250	37	169,0	602	18,24	950	1400	4,07	1,1	203	247	2,400
51240 M	200	280	62	333,0	1207	35,41	750	1000	12,2	2	204	275	8,000
51144 M	220	270	37	177,0	739	21,46	900	1300	4,6	1,1	223	267	3,000
51244 M	220	300	63	342,0	1308	36,87	700	950	13,2	2	224	295	9,500
51148 M	240	300	45	230,0	91	2,52	850	1200	7,3	1,5	243	297	5,000
51248 M	240	340	78	463,0	1889	50,42	600	800	23	2,1	244	335	18,000
51152 M	260	320	45	236,0	984	26,26	750	1000	8,1	1,5	263	317	5,600
51252 M	260	360	79	473,0	1967	50,78	560	750	23,3	2,1	264	355	22,000
51156 M	280	350	53	337,0	1435	36,75	700	950	12	1,5	283	347	10,000
51256 M	280	380	80	506,0	2168	54,25	560	750	26,5	2,1	284	375	24,000
51160 M	300	380	62	400,0	1530	37,72	630	850	17,4	2	304	376	14,000
51260 M	300	420	95	625,0	2872	68,80	480	630	41,7	3	304	415	40,000
51164 M	320	400	63	390,0	1580	37,85	600	800	18,5	2	324	396	16,000



PRODUCT CATALOG

THRUST BALL BEARING DOUBLE ACTING

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Thrust Ball Bearing

DOUBLE ACTING

DESIGN | CHARACTERISTICS | APPLICATIONS

DOUBLE ACTING THRUST BALL BEARING

Differs from the Single - acting thrust ball bearings in a way that it can carry the thrust load in 2 directions with a low to medium speeds. The thrust load is always carried between the central shaft washer and one of the housing washers. They are sensitive to angular deflection and characterized by extremely rigid guidance in axial direction.

Thrust ball bearings are separable bearings. The double acting bearing is made of 5 separable parts and consists of one shaft washer, two housing washers and 2 ball sets with cage.

The standard cage is made of a steel sheet

Double – acting thrust ball bearing

The double-acting type consists of a shaft washer (center washer) and two housing washer and two ball sets with cages. This bearing can carry thrust loadings in both directions.



Brass Cage M



Steel Cage

ANGULAR MISALIGNMENT

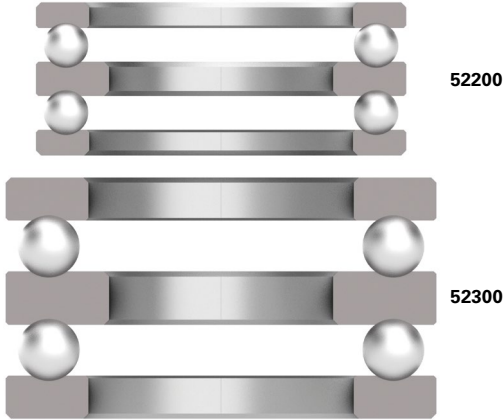
These are sensitive for axial deflection and cannot accommodate misalignment.

ISO SPECIFICATIONS

- Dimensions in accordance with ISO 104 (latest version)
- Precision class in accordance with ISO 199 (latest version)

SERIES

The standard series are 52200 | 52300.



NOMENCLATURE

Suffixes:

M : Brass cage. Typically for bore size over 100 mm

P0 - P6 : Precision class

EQUIVALENT LOAD EQUATIONS

Equivalent dynamic load P_e

$P = F_a$ [KN] where F_a = the axial load

Equivalent static load P_o

$P_o = F_a$ [KN]

Ball thrust bearings must have a minimum thrust load to function correctly. This ensures that sliding does not occur due to centrifugal forces acting on the ball and cage assembly.

Minimum load

For a thrust ball bearing to function correctly it requires an axial load to ensure that the rolling elements maintain contact with the raceways. This prevents wear due to sliding. F_{am} can be obtained from the formula below.

$$F_{am} = M \left(\frac{n \text{ Max}}{1000} \right)^2 \text{ [N]}$$

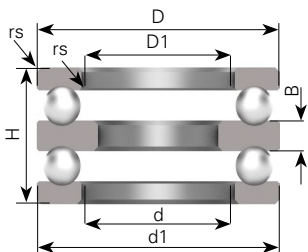
where F_{am} = minimum thrust load (N)

M = Factor for minimum load

n = speed in RPM

Thrust Ball Bearing

DATA TABLE - DOUBLE ACTING



Part number	Principal dimensions			Basic load ratings			Speed limits		Weight	Dimensions			
	d	D	H	Dynamic	Static	Fatigue	Grease	Oil		rs min	D1	d1	M
	mm			kN			rpm		Kg		mm		
							1 min ⁻¹						
52202	10	32	22	17	25	1,14	5000	6700	0,09	0,6	0,3	17	5
52204	15	40	26	22	38	1,73	4300	5600	0,15	0,6	0,3	22	6
52405	15	60	45	56	89	4,05	2600	3600	0,63	1,0	0,3	27	11
52205	20	47	28	28	50	2,27	3800	5000	0,23	0,6	0,3	27	7
52305	20	52	34	36	61	2,77	3200	4300	0,33	1,0	0,3	27	8
52406	20	70	52	73	126	5,73	2000	3000	1,00	1,0	0,6	32	12
52206	25	52	29	28	54	2,45	3600	4800	0,27	0,6	0,3	32	7
52306	25	60	38	43	79	3,59	2800	3800	0,49	1,0	0,3	32	9
52407	25	80	59	87	155	7,05	1800	2600	1,44	1,1	0,6	37	14
52207	30	62	34	41	84	3,82	3000	4000	0,42	1,0	0,3	37	8
52208	30	68	36	47	98	4,45	2800	3800	0,54	1,0	0,6	42	9
52307	30	68	44	56	105	4,77	2400	3400	0,71	1,0	0,3	37	10
52308	30	78	49	69	135	6,14	2000	3000	1,06	1,0	0,6	42	12
52408	30	90	65	113	205	9,32	1700	2400	2,08	1,1	0,6	42	15
52209	35	73	37	48	105	4,77	2600	3600	0,62	1,0	0,6	47	9
52309	35	85	52	81	163	7,41	1900	2800	1,29	1,0	0,6	47	12
52409	35	100	72	130	242	11,00	1600	2200	2,71	1,1	0,6	47	17
52210	40	78	39	49	111	5,05	2400	3400	0,71	1,0	0,6	52	9
52310	40	95	58	92	186	8,45	1800	2600	1,86	1,1	0,6	52	14
52410	40	110	78	148	283	12,86	1500	2000	3,56	1,5	0,6	52	18
52211	45	90	45	69	159	7,23	1900	2800	1,12	1,0	0,6	57	10
52311	45	105	64	119	246	11,18	1600	2200	2,51	1,1	0,6	57	15
52411	45	120	87	178	359	16,32	1300	1800	4,70	1,5	0,6	57	20
52212	50	95	46	74	179	8,14	1900	2800	1,25	1,0	0,6	62	10
52312	50	110	64	124	267	12,14	1600	2200	2,68	1,1	0,6	62	15
52412	50	130	93	201	397	18,05	1100	1600	6,33	1,5	0,6	62	21
52413	50	140	101	232	493	22,41	1000	1500	8,03	2,0	1,0	68	23
52213	55	100	47	75	189	8,59	1800	2600	1,36	1,0	0,6	67	10
52214	55	105	47	74	189	8,59	1800	2600	1,48	1,0	1,0	72	10
52313	55	115	65	128	287	13,05	1500	2000	2,90	1,1	0,6	67	15
52314	55	125	72	148	339	15,41	1400	1900	3,90	1,1	1,0	72	16
52215	60	110	47	77	209	9,50	1700	2400	1,57	1,0	1,0	77	10
52315	60	135	79	171	396	18,00	1200	1700	4,83	1,5	1,0	77	18
52216	65	115	48	79	218	9,91	1700	2400	1,69	1,0	1,0	82	10
52316	65	140	79	176	424	19,04	1200	1700	5,06	1,5	1,0	82	18

Thrust Ball Bearing

DATA TABLE - DOUBLE ACTING



Part number	Principal dimensions			Basic load ratings			Speed limits		Weight	Dimensions			
	d	D	H	Dynamic	Static	Fatigue	Grease	Oil		rs min	D1	d1	M
				Cr	Cor	Pu		rpm					
	mm			kN			1 min ⁻¹		Kg	mm			
52217	70	125	55	92	251	11,41	1600	2200	2,34	1,0	1,0	88	12
52317	70	150	87	206	489	21,19	1100	1600	6,43	1,5	1,0	88	19
52218	75	135	62	117	326	14,46	1500	2000	3,22	1,1	1,0	93	14
52318	75	155	88	213	524	22,21	1000	1500	6,60	1,5	1,0	93	19
52420	80	210	150	368	983	37,11	700	950	26,60	2,0	1,0	103	33
52220	85	150	67	147	410	17,19	1300	1800	4,29	1,1	1,0	103	15
52320	85	170	97	236	596	23,99	950	1400	8,90	1,5	1,0	103	21
52322	95	90	110	280	754	34,27	850	1200	13,80	2,0	1,0	113	24
52222	95	160	67	148	431	17,35	1200	1700	4,68	1,1	1,0	113	15
52224	100	170	68	154	472	18,47	1100	1600	5,24	1,1	1,1	123	15
52324	100	210	123	325	931	33,99	800	1100	17,20	2,1	1,1	123	27
52226	110	190	80	203	622	23,08	950	1400	7,74	1,5	1,1	133	18
52228 M	120	200	81	215	669	24,04	950	1400	8,95	1,5	1,1	143	18
52230 M	130	215	89	244	768	26,58	900	1300	10,60	1,5	1,1	153	20
52330 M	130	250	140	377	1200	39,57	670	900	27,10	2,1	1,1	154	31
52232 M	140	225	90	247	803	27,02	850	1200	12,20	1,5	1,1	163	20
52332 M	140	250	140	470	1570	51,10	630	850	26,20	2,1	1,1	154	31
52234 M	150	240	97	269	874	28,45	800	1100	15,20	1,5	1,1	173	21

Notes

This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form a uniform pattern of small squares across the entire surface. There are no margins, text, or other markings on the paper.



PRODUCT CATALOG

SPHERICAL ROLLER THRUST BEARING

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Spherical Roller Thrust Bearing

DESIGN | CHARACTERISTICS | APPLICATIONS

These bearings can accommodate heavy thrust loads and, due to raceways being inclined to the bearings axis, they can also accommodate radial loads up to a maximum of 55% of the thrust load and are suitable for taking high thrust loads at relatively high speed. Misalignment depends on the series (figures show below).

The bearings are fitted with asymmetrical barrel-shaped rollers.

It is essential that a minimum thrust load be present to avoid damage to the raceways by centrifugal forces (see formula below).

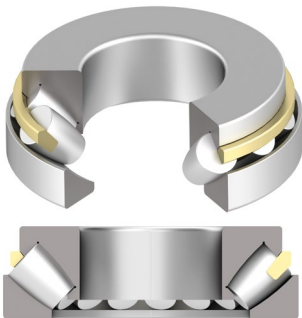
For static loads, a safety factor S_o of 4 should be used.

The steel cage version is available in the 294 series and is suitable for twin extruder gearboxes.

$$\frac{1.5 \text{ Cor}}{1000} F_{a \text{ min}} = [\text{KN}]$$

Where $F_{a \text{ min}}$ = minimum thrust load [KN]

Cor = static capacity [KN]



EM: Brass Cage



EX1: Steel Cage

ANGULAR MISALIGNMENT

Misalignment depends on the series (figures show below).

Series	Misalignent
292	2°
293	2.5°
294	3°

ISO SPECIFICATIONS

- Dimensions in accordance with ISO 104 (latest version)
- Precision class in accordance with ISO 199 (latest version)

SERIES



29200



29300



29400

NOMENCLATURE

Suffixes:

EM : Increased load rating | Brass cage

EX1 : Steel cage for series 294

P0 - P6 : Precision class

EQUIVALENT LOAD EQUATIONS

Equivalent dynamic load

$$P = F_a + 1.2 F_r \quad \text{providing} \quad F_r \leq 0.55 F_a$$

Equivalent static load

$$P_0 = F_a + 2.7 F_r \quad \text{providing} \quad F_r \leq 0.55 F_a$$

Equivalent static load

This can be calculated from

$$F_{am} = \frac{1.25 C_0}{1000} \quad [\text{kN}]$$

where: F_{am} = minimum axial load [kN]

F_r = radial component of load for bearings subjected to combined load [kN]

C_0 = basic static load [kN]

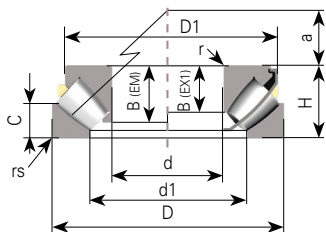
In many cases the axial load acting on the bearing produced by the weight of the supporting component parts and external forces is greater than the required minimum load. If this is not the case, then bearings must be preloaded. (e.g. using springs)

LUBRICATION

We recommend lubricating the spherical thrust roller bearing with oil. When the bearing is rotating a oil pump effect is created which let the oil circulate inside the bearing and will cool it down.

Spherical Roller Thrust Bearing

DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Weight	Radius	Calculation factors				
	d	D	H	Dynamic	Static	Fatigue	Grease	Oil			rs min	d1	D1	B	C
	mm			kN			rpm		Kg	mm		mm			
							1 min ⁻¹								
29412 EX1	60	130	42	390,0	1090	132,9	1800	2600	2,52	1,5	85,5	112	27	21	38
29413 EM	65	140	45	418,2	1126	136,3	1550	2200	3,41	2	91,5	125	36	21,9	42
29414 EX1	70	150	48	520,0	1250	148,1	1600	2200	4,13	2	99	129	31	23,8	44,8
29415 EX1	75	160	51	600,0	1430	166,2	1600	2200	4,56	2	105,5	137	33,5	24,5	47
29416 EX1	80	170	54	670,0	1630	185,9	1400	2000	5,50	2,1	112,5	146	35	26,5	50
29317 EM	85	150	39	300	1050	122	1500	2000	2,87	1,5	110,0	135	31	19,4	50
29417 EM	85	180	58	653	1815	203	1200	1600	7,19	2,1	119,5	160	46	27,5	54
29318 EM	90	155	39	370	1139	131	1500	2000	3,06	1,5	115,5	140	31	19,8	52
29418 EX1	90	190	60	815,0	2000	220	1300	1900	7,56	2,1	128	164	39	28,5	56
29320 EM	100	170	42	440	1400	156	1400	1800	3,91	1,5	127,5	155	32,5	21,2	58
29420 EX1	100	210	67	970,0	2910	311	1200	1700	10,80	3	141,5	186	43	32,2	62
29322 EM	110	190	48	542	1740	188	1200	1600	5,67	2	141,5	175	37	23,9	64
29422 EX1	110	230	73	1180	3000	312	1100	1600	13,40	3	223,5	199	47	34,7	69
29324 EM	120	210	54	685	2230	234	1000	1400	7,96	2,1	155,0	190	41	27,2	70
29424 EX1	120	250	78	1370	3450	350	900	1300	16,65	4	171	216	50,5	36,5	74
29326 EM	130	225	58	770	2520	259	900	1400	9,45	2,1	167,0	205	44,5	28,3	76
29426 EM	130	270	85	1382	4160	412	780	1100	22,06	4	181,0	240	66,5	41,1	81
29328 EM	140	240	60	868	2940	296	850	1200	11,20	2,1	178,0	220	46,5	29,6	82
29428 EM	140	280	85	1433	4436	433	780	1000	24,60	4	192,5	250	66,5	41,4	86
29330 EM	150	250	60	884	3065	304	850	1200	11,70	2,1	188,0	230	46	30	87
29430 EX1	150	300	90	1740	5220	499	800	1100	27,70	4	207,5	262	58	43,4	92
29332 EM	160	270	67	1021	3486	338	800	1100	15,50	3	204,0	245	51	33	92
29432 EX1	160	320	95	2080	5600	525	700	1000	32,70	5	223,5	279	60,5	45,5	99
29234 EM	170	240	42	439	1760	173	1600	5,54	1,5	199,0	225	32	20	92	
29334 EM	170	280	67	1044	3644	348	800	1000	16,30	3	214,5	255	51	32,9	96
29434 EX1	170	340	103	2360	6550	603	700	950	40	5	236	297	65,5	50	104
29236 EM	180	250	42	420	2010	195	750	1300	7,05	1,5	208,0	236	32	22	96
29336 EM	180	300	73	1244	4387	411	1000	20,70	3	227,5	275	55,2	35,8	103	
29436 EM	180	360	109	2275	7317	662	1760	5500	52,20	5	247,5	320	84,5	52,5	110
29238 EM	190	270	48	518	2460	234	1300	7,95	2	220,0	255	36	25,4	102	
29338 EM	190	320	78	1398	4955	456	580	760	25,50	4	240,0	295	59,5	39,2	110
29438 EX1	190	380	115	2850	8000	713	630	850	56,60	5	264,5	332	73	55,5	117
29240 EM	200	280	48	546	2518	236	1300	9,08	2	230,0	263	39	24	108	
29340 EM	200	340	85	1582	5566	504	650	800	32	4	253,5	310	64	42,7	116
29440 EM	200	400	122	2785	9070	796	550	760	73	5	275,0	360	93,5	59	122

Spherical Roller Thrust Bearing

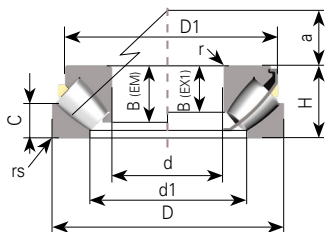
DATA TABLE



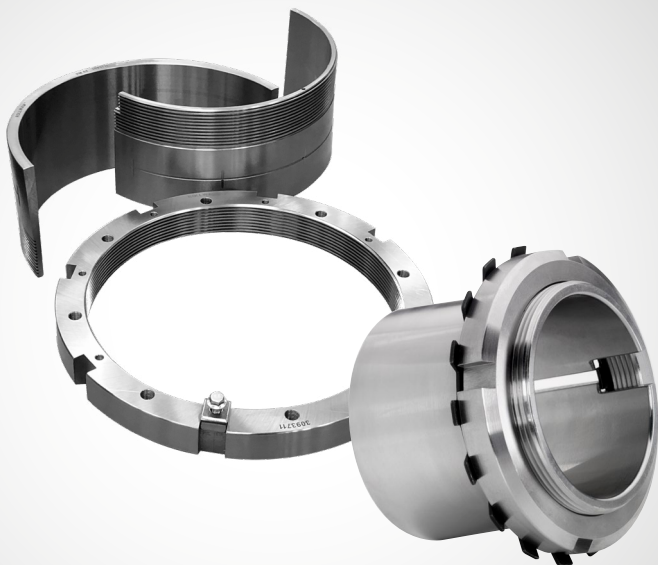
Part number	Principal dimensions			Basic load ratings			Speed limits		Weight	Radius	Calculation factors				
	d	D	H	Dynamic	Static	Fatigue	Grease	Oil			rs min mm	d1	D1	B	C
				Cr	Cor	Pu	rpm	Kg							
	mm			kN			1 min ⁻¹								
29244 EM	220	300	48	694	2974	272		1200	9,84	2	249,5	285	36	25,4	117
29344 EM	220	360	85	1608	5822	516	650	800	34,50	4	275,0	330	64	42,6	125
29444 EM	220	420	122	2870	9634	829	500	680	74,20	6	275,0	360	93,5	59	122
29248 EM	240	340	60	977	4077	361		1000	17,10	2,1	278,0	320	44	31,7	130
29348 EM	240	380	85	1700	6412	557	630	800	36,30	4	297,0	350	64	42,1	135
29448 EM	240	440	122	2978	10298	870	500	630	83	6	316,0	400	93,5	60,1	142
29252 EM	260	360	60	1050	4598	399		1000	18,50	2,1	300,5	340	45,5	30,4	139
29352 EM	260	420	95	2110	8050	680	550	710	51,50	5	323,0	385	71,8	48,2	148
29452 EX1	260	480	132	4050	12900	1062	500	670	97,80	6	346	427,9	86	63	154
29256 EM	280	380	60	1050	4598	392		900	19,50	2,1	321,0	360	45	31	150
29356 EM	280	440	95	2220	8767	728	550	710	54	5	343,0	405	71,8	48	158
29456 EM	280	520	145	4131	14645	1178	430	560	137	6	370,5	470	110	72,4	166
29260 EM	300	420	73	1466	6488	539		710	31	3	348,0	395	54,5	36,4	162
29360 EM	300	480	109	2682	10400	843	500	700	69,60	5	370,5	440	81	55,9	168
29460 EM	300	540	145	4250	15449	1225	400	500	146	6	392,0	490	110	72,4	175
29264 EM	320	440	73	1521	6893	563		630	32,80	3	368,5	415	54	37,4	172
29364 EM	320	500	109	2833	11360	907	450	560	80	5	391,5	465	81	55,2	180
29464 EM	320	580	155	4917	18167	1411	380	500	179	7,5	417,5	525	118,5	76,7	191
29268 EM	340	460	73	1570	7304	588		630	34,50	3	389,0	435	54,5	36,5	183
29368 EM	340	540	122	3373	13425	1050	400	500	106	5	419,5	500	90,5	60,6	192
29468 EM	340	620	170	5504	20070	1529	340	450	228	7,5	446,0	560	128	84,5	201
29272 EM	360	500	85	1989	9084	715		560	50,40	4	417,0	475	63	42,7	194
29372 EM	360	560	122	3442	13990	1079		500	140	5	440,0	520	91	60,8	202
29472 EM	360	640	170	5682	21212	1596		450	234	7,5	467,5	580	129	83,1	210
29276 EM	380	520	85	2002	9307	723		560	52,80	4	437,5	490	65	43,1	202
29376 EM	380	600	132	3962	16164	1224		500	140	6	466,0	555	98,5	66,9	216
29476 EM	380	670	175	6025	22737	1686		430	263	7,5	490,5	610	130	85,9	230
29280 EM	400	540	85	2065	9839	754		700	55,10	4	457,5	510	63,3	42,6	212
29380 EM	400	620	132	4040	16810	1257		450	146	6	487,5	575	98	66,9	225
29480 EM	400	710	185	6757	25820	1883		380	314	7,5	517,5	645	140	94	236
29284 EM	420	580	95	2536	12067	908		560	74,90	5	483,5	550	72	49,7	225
29384 EM	420	650	140	4434	18466	1362		420	170	6	512,5	600	103,5	70,7	235
29484 EM	420	730	185	6969	27200	1963		370	325	7,5	538,0	665	142	92,1	244
29288 EM	440	600	95	2618	12747	948		560	79	5	503,5	570	72	49,6	235
29388 EM	440	680	145	4757	20018	1456		400	192	6	536,5	630	108	73,7	245

Spherical Roller Thrust Bearing

DATA TABLE



Part number	Principal dimensions			Basic load ratings			Speed limits		Weight	Radius	Calculation factors					
	d	D	H	Dynamic	Static	Fatigue	Grease	Oil			rs min	d1	D1	B	C	a
				Cr	Cor	Pu	rpm		Kg	mm						
	mm			kN			1 min ⁻¹				mm					
29488 EM	440	780	206	8073	31032	2200		350	421	9,5	570,0	710	152	105	260	
29292 EM	460	620	95	2644	13085	962		500	80,90	5	524,5	590	72	49,4	245	
29392 EM	460	710	150	5205	22264	1598		400	216	6	558,5	660	112	76,6	257	
29492 EM	460	800	206	8325	32668	2294		350	435	9,5	592,5	730	149	107	272	
29296 EM	480	650	103	2982	14620	1061		480	98	5	549,0	620	76,5	52,1	259	
29396 EM	480	730	150	5214	22550	1603		400	224	6	579,5	675	112	76	270	
29496 EM	480	850	224	9419	36691	2535		320	534,20	9,5	623,0	770	166,5	111,8	280	
292500 EM	500	670	103	3012	14987	1076		450	101	5	569,5	640	76,5	52	268	
293500 EM	500	750	150	5322	23422	1648		360	231	6	600,0	700	112	76,2	280	
294500 EM	500	870	224	9520	40000	2739		320	559	9,5	643,0	790	170	109,1	290	
292530 EM	530	710	109	3356	16859	1189		400	108	5	603,0	675	81	55,2	288	
293530 EM	530	800	160	6057	26973	1863		320	270	7,5	639,5	745	119,5	81	295	
294530 EM	530	920	236	10703	42908	2888		300	650	9,5	682,0	840	177	118,5	309	
292560 EM	560	750	115	3100	8600	597		350	140	5	640,0	715	84	56,8	302	
293560 EM	560	850	175	5790	29700	2016		280	320	7,5						
294560 EM	560	980	250	10210	47800	3160		250	740	12	890,0	727	92	120	328	
292600 EM	600	800	122	3420	20100	1367		300	172	5	688,0	760	39	60	321	
293600 EM	600	900	180	6350	32600	2172		250	368	7,5	731,0	870	61	87	335	
294600 EM	600	1030	258	12730	52273	3397		200	880	12	766,0	940	200	128,7	347	
292630 EM	630	850	132	4770	24500	1639		250	218	6	728,0	814,5	94	67,3	338	
293630 EM	630	950	190	7070	37000	2427		200	438	9,5	880,0	761	68	92	359	
294630 EM	630	1090	280	13700	58200	3722		200	1000	12	995,0	815	107	137	365	
292670 EM	670	900	140	4900	26000	1709		380	225	6	773,0	855	93	74	364	
293670 EM	670	1000	200	7720	40300	2600		150	501	9,5						
292710 EM	710	950	145	4840	29400	1900			261	6						
293710 EM	710	1060	212	8570	45100	2859		260	620	9,5	995,0	857,5	150	103,5	724	
294710 EM	710	1220	308	16800	71000	4386		220	1500	15	1130	910	113	148,5	415	
292750 EM	750	1000	150	5180	31900	2029		200	311	6	854,5	955	108	76	406	
293750 EM	750	1120	224	9370	50600	3156		250	696	9,5						
294750 EM	750	1280	315	15000	76000	4624		300	1536	18	972,0	1164	222	158	436	
292800 EM	800	1060	155	5620	35300	2205		340	339	7,5	1010,0	907,5	50	80	426	
293800 EM	800	1180	230	10110	54900	3366			780	9,5	1099	958	78	117	440	
292850 EM	850	1120	160	6080	38900	2388			389	7,5						
294850 EM	850	1440	354	28600	100000	5869		150	2090	7,5	1098,0	1330	221	172	494	
292900 EM	900	1180	170	6590	42000	2537		250	444	7,5	1017,0	1129,5	122	86	477	
292950 EM	950	1250	180	8430	46900	2786		240	537	7,5	1081,0	1185	58	88	507	



PRODUCT CATALOG

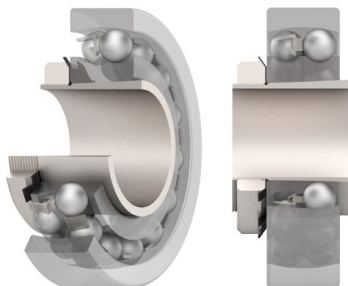
ACCESSORIES
SLEEVES | NUTS | LOCKING DEVICES

In this section:	Page
Design Characteristics Applications ISO Specification.....	174
Nomenclature Tolerance.....	175-177
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Adapter Sleeve	177-183
Withdrawal Sleeve.....	184-190
Locking Nut.....	191-192
Locking Device	193-194

DESIGN | CHARACTERISTICS | APPLICATIONS

Adapter sleeves are used to locate tapered bore bearings on cylindrical shafts. This allows less accurate machining of the shafts and ease of location.

Adapter sleeves are available in metric or inch bore sizes - the external taper is 1 : 12.



Adapter sleeve



Withdrawal sleeve



Locking device



Locking nut

ISO SPECIFICATIONS

- Sleeve dimensions in accordance with ISO 2982-1
- Nuts and washers dimensions in accordance with ISO 2982-2

NOMENCLATURE

Prefixes:

- H : Adapter sleeve for Metric shaft
- HA - HE : Adapter sleeve for inch size shaft
- AH : Withdrawal sleeve
- AHX : Withdrawal sleeve with modified thread diameter
- KM : Nut, included in H ($d \leq 220$ mm)
- MB : Locking device
- HM : Nut designed for locking clip
- MS : Locking clip ($d > 220$ mm)
- HMV...E : Hydraulic dismounting nut

Suffixes:

- OH : Hydraulic sleeve
- G : Modified thread
- 2P : Split sleeve

TOLERANCES

PERMISSIBLE GEOMETRICAL INACCURACY FOR SLEEVES

	Permissible geometrical inaccuracy (out-of-roundness taper)	Maximum inclination in degrees
Adapter sleeves and withdrawal sleeves	IT 5/2	h7
	IT 5/2	h8
	IT 6/2	h9

SHAFT TOLERANCES FOR ADAPTER SLEEVES AND WITHDRAWAL SLEEVES

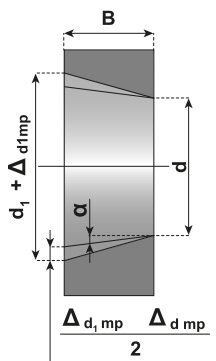
d		h7		IT 5/2	h8		IT 5/2	h9		IT 6/2
mm										
over	up to	min.	max.	max.	min.	max.	max.	min.	max.	max.
0	0	0	0	0	0	0	0	0	0	0
6	10	0	-15	3	0	-22	3	0	-36	4.5
10	18	0	-18	4	0	-27	4	0	-43	5.5
18	30	0	-21	4.5	0	-39	4.5	0	-52	6.5
30	50	0	-25	5.5	0	-39	5.5	0	-62	8
50	80	0	-30	6.5	0	-46	6.5	0	-74	9.5
80	120	0	-35	7.5	0	-54	7.5	0	-87	11
120	180	0	-40	9	0	-63	9	0	-100	12.5
180	250	0	-46	10	0	-72	10	0	-115	14.5
250	315	0	-52	11.5	0	-81	11.5	0	-130	16
315	400	0	-57	12.5	0	-89	12.5	0	-140	18
400	500	0	-63	13.5	0	-97	13.5	0	-155	20

Note: IT basic tolerances indicate accepted from circularity and cylindricity.

TOLERANCES FOR TAPERED BORES – TAPER 1:12

NOMINAL DIMENSIONS

d		h7		IT 5/2	h8		IT 5/2	h9		IT 6/2
mm										
over	up to	min.	max.	max.	min.	max.	max.	min.	max.	max.
0	0	0	0	0	0	0	0	0	0	0
6	10	0	-15	3	0	-22	3	0	-36	4.5
10	18	0	-18	4	0	-27	4	0	-43	5.5
18	30	0	-21	4.5	0	-39	4.5	0	-52	6.5
30	50	0	-25	5.5	0	-39	5.5	0	-62	8
50	80	0	-30	6.5	0	-46	6.5	0	-74	9.5
80	120	0	-35	7.5	0	-54	7.5	0	-87	11
120	180	0	-40	9	0	-63	9	0	-100	12.5
180	250	0	-46	10	0	-72	10	0	-115	14.5
250	315	0	-52	11.5	0	-81	11.5	0	-130	16
315	400	0	-57	12.5	0	-89	12.5	0	-140	18
400	500	0	-63	13.5	0	-97	13.5	0	-155	20



$\alpha = 2^\circ 23' 9.4'' = 2.38594^\circ$
 $= 0.041643 \text{ rad}$ half the angle of taper

PRECISION CLASS P0

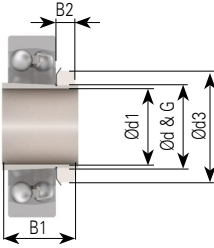
Tolerances in μm

d mm		$\Delta d_{mp}^{1)}$		$\Delta d_{1mp} - \Delta d_{mp}^{2)}$		$\sqrt{dp}^{3)}$
over	to	upper	lower	upper	lower	max.
-	10	+15	0	+15	0	10
10	18	+18	0	+18	0	10
18	30	+21	0	+21	0	13
30	50	+25	0	+25	0	15
50	80	+30	0	+30	0	19
80	120	+35	0	+35	0	25
120	180	+40	0	+40	0	31
180	250	+46	0	+46	0	38
250	315	+52	0	+52	0	44
315	400	+57	0	+57	0	50
400	500	+63	0	+63	0	56

1) Single plane mean bore diameter deviation at smallest theoretical opening

2) Mean diameter deviation of large diameter less mean diameter deviation from small diameter

3) Bore diameter variation in a single radial plane

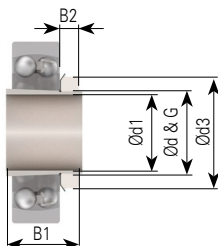


Taper 1:12

Part number	Principal dimensions						Weight	Accessories included	
	d1	d	d3	B1	B2	G		Locking Nut	Locking Device
	mm						Kg	Part number	Part number
H 204	17	20	32	24	7	M 20x1	0,04	KM 4	MB 4
H 2304	17	20	32	31	7	M 20x1	0,05	KM 4	MB 4
H 304	17	20	32	28	7	M 20x1	0,04	KM 4	MB 4
H 205	20	25	38	26	8	M 25x1,5	0,07	KM 5	MB 5
H 2305	20	25	38	35	8	M 25x1,5	0,09	KM 5	MB 5
H 305	20	25	38	29	8	M 25x1,5	0,07	KM 5	MB 5
H 206	25	30	45	27	8	M 30x1,5	0,01	KM 6	MB 6
H 2306	25	30	45	38	8	M 30x1,5	0,13	KM 6	MB 6
H 306	25	30	45	31	8	M 30x1,5	0,11	KM 6	MB 6
H 207	30	35	52	29	9	M 35x1,5	0,12	KM 7	MB 7
H 2307	30	35	52	43	9	M 35x1,5	0,16	KM 7	MB 7
H 307	30	35	52	35	9	M 35x1,5	0,14	KM 7	MB 7
HE 308	31,75	40	58	36	10	M 40x1,5	0,22	KM 8	MB 8
H 208	35	40	58	31	10	M 40x1,5	0,17	KM 8	MB 8
H 2308	35	40	58	46	10	M 40x1,5	0,22	KM 8	MB 8
H 308	35	40	58	36	10	M 40x1,5	0,19	KM 8	MB 8
H 209	40	45	65	33	11	M 45x1,5	0,23	KM 9	MB 9
H 2309	40	45	65	50	11	M 45x1,5	0,28	KM 9	MB 9
H 309	40	45	65	39	11	M 45x1,5	0,25	KM 9	MB 9
H 210	45	50	70	35	12	M 50x1,5	0,27	KM 10	MB 10
H 2310	45	50	70	55	12	M 50x1,5	0,36	KM 10	MB 10
H 310	45	50	70	42	12	M 50x1,5	0,30	KM 10	MB 10
H 211	50	55	75	37	12,5	M 55x2	0,31	KM 11	MB 11
H 2311	50	55	75	59	12,5	M 55x2	0,42	KM 11	MB 11
H 311	50	55	75	45	12,5	M 55x2	0,34	KM 11	MB 11
H 212	55	60	80	38	13	M 60x2	0,35	KM 12	MB 12
H 2312	55	60	80	62	13	M 60x2	0,48	KM 12	MB 12
H 312	55	60	80	47	13	M 60x2	0,39	KM 12	MB 12
H 213	60	65	85	40	14	M 65x2	0,40	KM 13	MB 13
H 2313	60	65	85	65	14	M 65x2	0,56	KM 13	MB 13
H 313	60	65	85	50	14	M 65x2	0,46	KM 13	MB 13
H 214	60	70	92	41	14	M 70x2	0,59	KM 14	MB 14
H 2314	60	70	92	68	14	M 70x2	0,90	KM 14	MB 14
H 314	60	70	92	52	14	M 70x2	0,72	KM 14	MB 14
H 215	65	75	98	43	15	M 75x2	0,71	KM 15	MB 15

Accessories

DATA TABLE - ADAPTER SLEEVE



Part number	Principal dimensions						Weight	Accessories included	
	d1	d	d3	B1	B2	G		Locking Nut	Locking Device
	mm						Kg	Part number	Part number
H 2315	65	75	98	73	15	M 75x2	1,05	KM 15	MB 15
H 315	65	75	98	55	15	M 75x2	0,83	KM 15	MB 15
H 216	70	80	105	46	17	M 80x2	0,88	KM 16	MB 16
H 2316	70	80	105	78	17	M 80x2	1,28	KM 16	MB 16
H 316	70	80	105	59	17	M 80x2	1,03	KM 16	MB 16
H 217	75	85	110	50	18	M 85x2	1,02	KM 17	MB 17
H 2317	75	85	110	82	18	M 85x2	1,45	KM 17	MB 17
H 317	75	85	110	63	18	M 85x2	1,18	KM 17	MB 17
H 218	80	90	120	52	18	M 90x2	1,19	KM 18	MB 18
H 2318	80	90	120	86	18	M 90x2	1,69	KM 18	MB 18
H 318	80	90	120	65	18	M 90x2	1,37	KM 18	MB 18
H 219	85	95	125	55	19	M 95x2	1,37	KM 19	MB 19
H 2319	85	95	125	90	19	M 95x2	1,92	KM 19	MB 19
H 319	85	95	125	68	19	M 95x2	1,56	KM 19	MB 19
H 220	90	100	130	58	20	M 100x2	1,49	KM 20	MB 20
H 2320	90	100	130	97	20	M 100x2	2,15	KM 20	MB 20
H 3120	90	100	130	76	20	M 100x2	1,80	KM 20	MB 20
H 320	90	100	130	71	20	M 100x2	1,69	KM 20	MB 20
H 221	95	105	140	60	20	M 105x2	1,72	KM 21	MB 21
H 321	95	105	140	74	20	M 105x2	1,95	KM 21	MB 21
H 222	100	110	145	63	21	M 110x2	1,93	KM 22	MB 22
H 2322	100	110	145	105	21	M 110x2	2,74	KM 22	MB 22
H 3122	100	110	145	81	21	M 110x2	2,25	KM 22	MB 22
H 322	100	110	145	77	21	M 110x2	2,18	KM 22	MB 22
H 3024	110	120	145	72	22	M 120x2	1,93	KML 24	MBL 24
H 2324	110	120	155	112	22	M 120x2	3,19	KM 24	MB 24
H 3124	110	120	155	88	22	M 120x2	2,64	KM 24	MB 24
H 3026	115	130	155	80	23	M 130x2	2,85	KML 26	MBL 26
H 2326	115	130	165	121	23	M 130x2	4,60	KM 26	MB 26
H 3126	115	130	165	92	23	M 130x2	3,66	KM 26	MB 26
H 3028	125	140	165	82	24	M 140x2	3,16	KML 28	MBL 28
H 2328	125	140	180	131	24	M 140x2	5,55	KM 28	MB 28
H 3128	125	140	180	97	24	M 140x2	4,34	KM 28	MB 28
H 3030	135	150	180	87	26	M 150x2	3,89	KML 30	MBL 30
H 2330	135	150	195	139	26	M 150x2	6,63	KM 30	MB 30

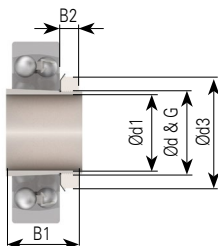


Taper 1:12

Part number	Principal dimensions						Weight	Accessories included	
	d1	d	d3	B1	B2	G		Locking Nut	Locking Device
	mm						Kg	Part number	Part number
H 3130	135	150	195	111	26	M 150x2	5,52	KM 30	MB 30
H 3032	140	160	190	93	27,5	M 160x3	5,21	KML 32	MBL 32
H 2332	140	160	210	147	28	M 160x3	9,14	KM 32	MB 32
H 3132	140	160	210	119	28	M 160x3	7,67	KM 32	MB 32
H 3034	150	170	200	101	28,5	M 170x3	5,99	KML 34	MBL 34
H 2334	150	170	220	154	29	M 170x3	10,20	KM 34	MB 34
H 3134	150	170	220	122	29	M 170x3	8,38	KM 34	MB 34
H 3036	160	180	210	109	29,5	M 180x3	6,83	KML 36	MBL 36
H 3036 OH	160	180	210	109	29,5	M 180x3	6,70	KML 36	MBL 36
H 3936	160	180	210	87	29,5	M 180x3	5,70	KML 36	MBL 36
H 2336	160	180	230	161	30	M 180x3	11,30	KM 36	MB 36
H 2336 OH	160	180	230	161	30	M 180x3	11	KM 36	MB 36
H 3136	160	180	230	131	30	M 180x3	9,50	KM 36	MB 36
H 3136 OH	160	180	230	131	30	M 180X3	9,15	KM 36	MB 36
H 3038	170	190	220	112	30,5	M 190x3	7,45	KML 38	MBL 38
H 3038 OH	170	190	220	112	30,5	M 190x3	7,25	KM 38	MBL 38
H 3938	170	190	220	89	30,5	M 190x3	6,19	KML 38	MBL 38
H 2338	170	190	240	169	31	M 190x3	12,60	KM 38	MB 38
H 2338 OH	170	190	240	169	31	M 190x3	12	KM 38	MB 38
H 3138	170	190	240	141	31	M 190x3	10,80	KM 38	MB 38
H 3138 OH	170	190	240	141	31	M 190X3	10,50	KM 38	MB 38
H 3040	180	200	240	120	31,5	M 200x3	9,19	KML 40	MBL 40
H 3040 OH	180	200	240	120	31,5	M 200x3	8,90	KML 40	MBL 40
H 3940	180	200	240	98	31,5	M 200x3	7,89	KML 40	MBL 40
H 2340	180	200	250	176	32	M 200x3	13,90	KM 40	MB 40
H 2340 OH	180	200	250	176	32	M 200x3	13,50	KM 40	MB 40
H 3140	180	200	250	150	32	M 200x3	12,10	KM 40	MB 40
H 3140 OH	180	200	250	150	32	M 200X3	12	KM 40	MB 40
H 3044	200	220	260	126	30	Tr 220x4	10,30	HM 3044	MS 3044
H 3044 OH	200	220	260	126	30	Tr 220x4	9,90	HM 3044	MS 3044
H 3944	200	220	260	96	30	Tr 220x4	8,16	HM 3044	MS 3044
H 2344	200	220	280	186	35	Tr 220x4	17	HM 44T	MB 44
H 2344 OH	200	220	280	186	35	Tr 220x4	17	HM 44T	MB 44
H 3144	200	220	280	161	35	Tr 220x4	15	HM 44T	MB 44
H 3144 OH	200	220	280	161	35	Tr 200x3	15	HM 44T	MB 44

Accessories

DATA TABLE - ADAPTER SLEEVE



Part number	Principal dimensions						Weight	Accessories included	
	d1	d	d3	B1	B2	G		Locking Nut	Locking Device
	mm						Kg	Part number	Part number
H 3048	220	240	290	133	34	Tr 240x4	13,2	HM 3048	MS 3048
H 3048 OH	220	240	290	133	34	Tr 240x4	12	HM 3048	MS 3052-48
H 3948	220	240	290	101	34	Tr 240x4	11	HM 3048	MS 3048
H 2348	220	240	300	199	37	Tr 240x4	20	HM 48T	MB 48
H 2348 OH	220	240	300	199	37	Tr 240x4	19	HM 48T	MB 48
H 3148	220	240	300	172	37	Tr 240x4	17,6	HM 48T	MB 48
H 3148 OH	220	240	300	172	37	Tr 240x4	16,5	HM 48T	MB 48
H 3052	240	260	310	145	34	Tr 260x4	15,3	HM 3052	MS 3052
H 3052 OH	240	260	310	145	34	Tr 260x4	13,5	HM 3052	MS 3052-48
H 3952	240	260	310	116	34	Tr 260x4	12,8	HM 3052	MS 3052
H 2352	240	260	330	211	39	Tr 260x4	24,5	HM 52T	MB 52
H 2352 OH	240	260	330	211	39	Tr 260x4	23	HM 52T	MB 52
H 3152	240	260	330	190	39	Tr 260x4	22,3	HM 52T	MB 52
H 3152 OH	240	260	330	190	39	Tr 260x4	21	HM 52T	MB 52
H 3056	260	280	330	152	38	Tr 280x4	17,7	HM 3056	MS 3056
H 3056 OH	260	280	330	152	38	Tr 280x4	16	HM 3056	MS 3056
H 3156 OH	260	280	330	195	41	Tr 280x4	19,3	HM 3056	MS 3056
H 3956	260	280	330	121	38	Tr 280x4	15,3	HM 3056	MS 3056
H 2356	260	280	350	224	41	Tr 280x4	28,4	HM 56T	MB 56
H 2356 OH	260	280	350	224	41	Tr 280x4	27	HM 56T	MB 56
H 3156	260	280	350	195	41	Tr 280x4	25,1	HM 56T	MB 56
H 3060	280	300	360	168	42	Tr 300x4	22,8	HM 3060	MS 3060
H 3060 OH	280	300	360	168	42	Tr 300x4	20,5	HM 3060	MS 3060
H 3960	280	300	360	140	42	Tr 300x4	20	HM 3060	MS 3060
H 3160	280	300	380	208	40	Tr 300x4	30,2	HM 3160	MS 3160
H 3160 OH	280	300	380	208	40	Tr 300x4	29	HM 3160	MS 3160
H 3260	280	300	380	240	40	Tr 300x4	34,1	HM 3160	MS 3160
H 3260 OH	280	300	380	240	40	Tr 300x4	32	HM 3160	MS 3160
H 3064	300	320	380	171	42	Tr 320x5	24,6	HM 3064	MS 3064
H 3064 OH	300	320	380	171	42	Tr 320x5	22	HM 3064	MS 3068-64
H 3964	300	320	380	140	42	Tr 320x5	21,5	HM 3064	MS 3064
H 3164	300	320	400	226	42	Tr 320x5	34,9	HM 3164	MS 3164
H 3164 OH	300	320	400	226	42	Tr 320x5	32	HM 3164	MS 3164
H 3264	300	320	400	258	42	Tr 320x5	39,3	HM 3164	MS 3164
H 3264 OH	300	320	400	258	42	Tr 320x5	35	HM 3164	MS 3164

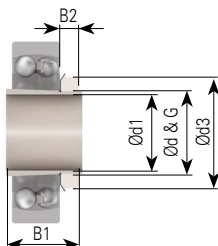


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Part number	Principal dimensions						Weight	Accessories included	
	d1	d	d3	B1	B2	G		Locking Nut	Locking Device
	mm						Kg	Part number	Part number
H 3068	320	340	400	187	45	Tr 340x5	28,7	HM 3068	MS 3068
H 3068 OH	320	340	400	187	45	Tr 340x5	27	HM 3068	MS 3068-64
H 3968	320	340	400	144	45	Tr 340x5	24,5	HM 3068	MS 3068
H 3168	320	340	440	254	55	Tr 340x5	50	HM 3168	MS 3168
H 3168 OH	320	340	440	254	55	Tr 340x5	50	HM 3168	MS 3172-68
H 3268	320	340	440	288	55	Tr 340x5	54,6	HM 3168	MS 3168
H 3268 OH	320	340	440	288	55	Tr 340x5	51,5	HM 3168	MS 3172-68
H 3072	340	360	420	188	45	Tr 360x5	30,5	HM 3072	MS 3072
H 3072 OH	340	360	420	188	45	Tr 360x5	29	HM 3072	MS 3072
H 3972	340	360	420	144	45	Tr 360x5	25,2	HM 3072	MS 3072
H 3172	340	360	460	259	58	Tr 360x5	56	HM 3172	MS 3172
H 3172 OH	340	360	460	259	58	Tr 360x5	56	HM 3172	MS 3172-68
H 3272	340	360	460	299	58	Tr 360x5	60,6	HM 3172	MS 3172
H 3272 OH	340	360	460	299	58	Tr 360x5	60,5	HM 3172	MS 3172-68
H 3076	360	380	450	193	48	Tr 380x5	35,8	HM 3076	MS 3076
H 3076 OH	360	380	450	193	48	Tr 380x5	35,5	HM 3076	MS 3080-76
H 3976	360	380	450	164	48	Tr 380x5	31,5	HM 3076	MS 3076
H 3176	360	380	490	264	60	Tr 380x5	61,7	HM 3176	MS 3176
H 3176 OH	360	380	490	264	60	Tr 380x5	61,5	HM 3176	MS 3176
H 3276	360	380	490	310	60	Tr 380x5	69,6	HM 3176	MS 3176
H 3276 OH	360	380	490	310	60	Tr 380x5	69,5	HM 3176	MS 3176
H 3080	380	400	470	210	52	Tr 400x5	41,3	HM 3080	MS 3080
H 3080 OH	380	400	470	210	52	Tr 400x5	40	HM 3080	MS 3080-76
H 3980	380	400	470	168	52	Tr 400x5	35	HM 3080	MS 3080
H 3180	380	400	520	272	62	Tr 400x5	73	HM 3180	MS 3180
H 3180 OH	380	400	520	272	62	Tr 400x5	73	HM 3180	MS 3184-80
H 3280	380	400	520	328	62	Tr 400x5	81	HM 3180	MS 3180
H 3280 OH	380	400	520	328	62	Tr 400x5	87	HM 3180	MS 3184-80
H 3084	400	420	490	212	52	Tr 420x5	43,7	HM 3084	MS 3084
H 3084 OH	400	420	490	212	52	Tr 420x5	47	HM 3084	MS 3084
H 3984	400	420	490	168	52	Tr 420x5	36,6	HM 3084	MS 3084
H 3184	400	420	540	304	70	Tr 420x5	84,2	HM 3184	MS 3184
H 3184 OH	400	420	540	304	70	Tr 420x5	80	HM 3184	MS 3184-80
H 3284	400	420	540	352	70	Tr 420x5	96	HM 3184	MS 3184
H 3284 OH	400	420	540	352	70	Tr 420x5	96	HM 3184	MS 3184-80
H 3088	410	440	520	228	60	Tr 440x5	65,2	HM 3088	MS 3088

Accessories

DATA TABLE - ADAPTER SLEEVE



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Part number	Principal dimensions						Weight	Accessories included	
	d1	d	d3	B1	B2	G		Locking Nut	Locking Device
	mm						Kg	Part number	Part number
H 3088 OH	410	440	520	228	60	Tr 440X5	65	HM 3088	MS 3092-88
H 3988	410	440	520	189	60	Tr 440x5	58	HM 3088	MS 3088
H 3188	410	440	560	307	70	Tr 440X5	104	HM 3188	MS 3188
H 3188 OH	410	440	560	307	70	Tr 440X5	95	HM 3188	MS 3192-88
H 3288	410	440	560	361	70	Tr 440X5	118	HM 3188	MS 3188
H 3288 OH	410	440	560	361	70	Tr 440X5	117	HM 3188	MS 3192-88
H 3092	430	460	540	234	60	Tr 460X5	71	HM 3092	MS 3092
H 3092 OH	430	460	540	234	60	Tr 460x5	71	HM 3092	MS 3092-88
H 3992	430	460	540	189	60	Tr 460x5	60	HM 3092	MS 3092
H 3192	430	460	580	326	75	Tr 460X5	116	HM 3192	MS 3192
H 3192 OH	430	460	580	326	75	Tr 460X5	119	HM 3192	MS 3192-88
H 3292	430	460	580	382	75	Tr 460X5	134	HM 3192	MS 3192
H 3292 OH	430	460	580	382	75	Tr 460X5	134	HM 3192	MS 3192-88
H 3096	450	480	560	237	60	Tr 480X5	75	HM 3096	MS 30/96
H 3096 OH	450	480	560	237	60	Tr 480X5	75	HM 3096	MS 30/500-96
H 3996	450	480	560	200	60	Tr 480x5	66	HM 3096	MS 30/96
H 3196	450	480	620	335	75	Tr 480X5	135	HM 3196	MS 3196
H 3196 OH	450	480	620	335	75	Tr 480X5	135	HM 3196	MS 3196
H 3296	450	480	620	397	75	Tr 480X5	153	HM 3196	MS 3196
H 3296 OH	450	480	620	397	75	Tr 480X5	153	HM 3196	MS 3196
H 30/500	470	500	580	247	68	Tr 500x5	82	HM 30/500	MS 30/500
H 30/500 OH	470	500	580	247	68	Tr 500x5	82	HM 30/500	MS 30/500-96
H 39/500	470	500	580	208	68	Tr 500x5	74,3	HM 30/500	MS 30/500
H 31/500	470	500	630	356	80	Tr 500x5	145	HM 31/500	MS 31/500
H 31/500 OH	470	500	630	356	80	Tr 500x5	145	HM 31/500	MS 31/500
H 32/500	470	500	630	428	80	Tr 500x5	166	HM 31/500	MS 31/500
H 32/500 OH	470	500	630	428	80	Tr 500x5	170	HM 31/500	MS 31/500
H 30/530	500	530	630	265	68	Tr 530x6	105	HM 30/530	MS 30/530
H 30/530 OH	500	530	630	265	68	Tr 530x6	105	HM 30/530	MS 30/600-530
H 39/530	500	530	630	216	68	Tr 530x6	87,9	HM 30/530	MS 30/530
H 39/530 OH	500	530	630	216	68	Tr 530x6	87,9	HM 30/530	MS 30/600-530
H 31/530	500	530	670	364	80	Tr 530x6	161	HM 31/530	MS 31/530
H 32/530	500	530	670	447	80	Tr 530x6	192	HM 31/530	MS 31/530
H 30/560	530	560	650	282	75	Tr 560x6	112	HM 30/560	MS 30/560
H 30/560 OH	530	560	650	282	75	Tr 560x6	112	HM 30/560	MS 30/560
H 39/560	530	560	650	227	75	Tr 560x6	95	HM 30/560	MS 30/560

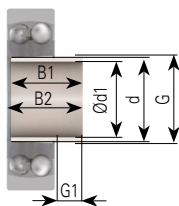


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Part number	Principal dimensions						Weight	Accessories included	
	d1	d	d3	B1	B2	G		Locking Nut	Locking Device
	mm						Kg	Part number	Part number
H 39/560 OH	530	560	650	227	75	Tr 560x6	95	HM 30/560	MS 30/560
H 31/560	530	560	710	377	85	Tr 560x6	185	HM 31/560	MS 31/560
H 32/560	530	560	710	462	85	Tr 560x6	219	HM 31/560	MS 31/560
H 30/600	560	600	700	289	75	Tr 600x6	147	HM 30/600	MS 30/600
H 30/600 OH	560	600	700	289	75	Tr 600x6	147	HM 30/600	MS 30/600-530
H 39/600	560	600	700	239	75	Tr 600x6	127	HM 30/600	MS 30/600
H 39/600 OH	560	600	700	239	75	Tr 600x6	127	HM 30/600	MS 30/600-530
H 31/600	560	600	750	399	85	Tr 600x6	234	HM 31/600	MS 31/600
H 32/600	560	600	750	487	85	Tr 600x6	278	HM 31/600	MS 31/600
H 30/630	600	630	730	301	75	Tr 630x6	138	HM 30/630	MS 30/630
H 30/630 OH	600	630	730	301	75	Tr 630x6	138	HM 30/630	MS 30/630
H 39/630	600	630	730	254	75	Tr 630x6	120	HM 30/630	MS 30/630
H 39/630 OH	600	630	730	254	75	Tr 630x6	124	HM 30/630	MS 30/630
H 31/630	600	630	800	424	95	Tr 630x6	254	HM 31/630	MS 31/630
H 32/630	600	630	800	521	95	Tr 630x6	300	HM 31/630	MS 31/630
H 30/670	630	670	780	324	80	Tr 670x6	191	HM 30/670	MS 30/670
H 30/670 OH	630	670	780	324	80	Tr 670x6	190	HM 30/670	MS 30/670
H 39/670	630	670	780	264	80	Tr 670x6	163	HM 30/670	MS 30/670
H 39/670 OH	630	670	780	264	80	Tr 670x6	162	HM 30/670	MS 30/670
H 31/670	630	670	850	456	106	Tr 670x6	340	HM 31/670	MS 31/670
H 32/670	630	670	850	558	106	Tr 670x6	401	HM 31/670	MS 31/670
H 30/710	670	710	830	342	90	Tr 710x7	223	HM 30/710	MS 30/710
H 30/710 OH	670	710	830	342	90	Tr 710x7	228	HM 30/710	MS 30/710
H 39/710	670	710	830	286	90	Tr 710x7	196	HM 30/710	MS 30/710
H 39/710 OH	670	710	830	286	90	Tr 710x7	183	HM 30/710	MS 30/710
H 31/710	670	710	900	467	106	Tr 710x7	378	HM 31/710	MS 31/710
H 32/710	670	710	900	572	106	Tr 710x7	444	HM 31/710	MS 31/710
H 30/750	710	750	870	356	90	Tr 750x7	246	HM 30/750	MS 30/750
H 39/750	710	750	870	291	90	Tr 750x7	211	HM 30/750	MS 30/750
H 31/750	710	750	950	493	112	Tr 750x7	451	HM 31/750	MS 31/750
H 32/750	710	750	950	603	112	Tr 750x7	507	HM 31/750	MS 31/750
H 30/800	750	800	920	366	90	Tr 800x7	300	HM 30/800	MS 30/800
H 39/800	750	800	920	303	90	Tr 800x7	259	HM 30/800	MS 30/800
H 31/800	750	800	1000	505	112	Tr 800x7	515	HM 31/800	MS 31/800
H 32/800	750	800	1000	618	112	Tr 800x7	610	HM 31/800	MS 31/800
H 30/900 OH	850	900	1030	400	100	Tr 900x7	387	HM 30/900	MS 30/900-850

Accessories

DATA TABLE - WITHDRAWAL SLEEVE



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Part number	Principal dimensions						Weight	Accessories included	
	d1	d	B1	B2	G	G1		Dismounting Nut	Hydraulic Nut
	mm						Kg	Part number	Part number
AH 308	35	40	29	32	M 45x1,5	6	0,09	KM 9	HMV 9E
AH 2308	35	40	40	43	M 45x1,5	7	0,13	KM 9	HMV 9E
AH 309	40	45	31	34	M 50x1,5	6	0,11	KM 10	HMV 10E
AH 2309	40	45	44	47	M 50x1,5	7	0,16	KM 10	HMV 10E
AH 310	45	50	35	38	M 60x20	7	0,16	KM 12	HMV 12E
AH 2310	45	50	50	53	M 60x2	8	0,24	KM 12	HMV 12E
AH 311	50	55	37	40	M 65x2	7	0,19	KM 13	HMV 13E
AH 2311	50	55	54	57	M 65x2	9	0,29	KM 13	HMV 13E
AH 312	55	60	40	43	M 70x2	8	0,22	KM 14	HMV 14E
AH 2312	55	60	57	60	M 70x2	10	0,34	KM 14	HMV 14E
AH 313	60	65	42	45	M 75x2	8	0,25	KM 15	HMV 15E
AH 2313	60	65	61	64	M 75x2	12	0,40	KM 15	HMV 15E
AH 314	65	70	43	47	M 80x2	8	0,28	KM 16	HMV 16E
AH 2314	65	70	65	69	M 85x2	10	0,53	KM 17	HMV 17E
AH 315	70	75	45	49	M 85x2	8	0,31	KM 17	HMV 17E
AH 2315	70	75	69	53	M 90x2	12	0,61	KM 18	HMV 18E
AH 316	75	80	48	52	M 90x2	8	0,37	KM 18	HMV 18E
AH 2316	75	80	72	76	M 95x2	12	0,67	KM 19	HMV 19E
AH 317	80	85	52	56	M 100x2	9	0,48	KM 20	HMV 20E
AH 2317	80	85	75	79	M 100x2	13	0,75	KM 20	HMV 20E
AH 318	85	90	53	57	M 105x2	9	0,52	KM 21	HMV 21E
AH 2318	85	90	80	84	M 105x2	14	0,85	KM 21	HMV 21E
AH 319	90	95	57	61	M 110x2	10	0,59	KM 22	HMV 22E
AH 2319	90	95	85	89	M 110x2	15	0,98	KM 22	HMV 22E
AH 320	95	100	59	63	M 115x2	10	0,66	KM 23	HMV 23E
AH 2320	95	100	90	94	M 120x2	15	1,23	KM 24	HMV 24E
AH 322	100	110	63	67	M 130x2	12	1,26	KM 26	HMV 26E
AH 3122	100	110	68	72	M 125x2	11	1,28	KM 25	HMV 25E
AH 2322	100	110	98	102	M 130x2	16	2,11	KM 26	HMV 26E
AH 24122	105	110	82	91	M 115x2	13	0,71	KM 23	HMV 23E
AH 3024	110	120	60	64	M 130x2	13	1,15	KM 26	HMV 26E
AH 3124	110	120	75	79	M 140x2	12	1,67	KM 28	HMV 28E
AH 2324	110	120	105	109	M 140x2	17	2,47	KM 28	HMV 28E
AH 24024	115	120	73	82	M 125x2	13	0,70	KM 25	HMV 25E
AH 24124	115	120	93	102	M 130x2	13	1	KM 26	HMV 26E

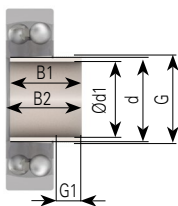


Taper 1:12

Part number	Principal dimensions						Weight	Accessories included	
	d1	d	B1	B2	G	G1		Dismounting Nut	Hydraulic Nut
	mm						Kg	Part number	Part number
AH 3026	120	130	67	71	M 140x2	14	1,41	KM 28	HMV 28E
AH 3126	120	130	78	82	M 150x2	12	1,87	KM 30	HMV 30E
AH 2326	120	130	115	119	M 150x2	19	3,02	KM 30	HMV 30E
AH 24026	125	130	83	93	M 135x2	14	0,88	KM 27	HMV 27E
AH 24126	125	130	94	104	M 140x2	14	1,15	KM 28	HMV 28E
AH 3028	130	140	68	73	M 150x2	14	1,55	KM 30	HMV 30E
AH 3128	130	140	83	88	M 160x3	14	2,21	KM 32	HMV 32E
AH 2328	130	140	125	130	M 160x3	20	3,60	KM 32	HMV 32E
AH 24028	135	140	83	93	M 145x2	14	0,95	KM 29	HMV 29E
AH 24128	135	140	99	109	M 150x2	14	1,30	KM 30	HMV 30E
AH 3030	140	150	72	5	M 160x3	15	1,76	KM 32	HMV 32E
AH 3130	140	150	96	101	M 170x3	15	2,70	KM 34	HMV 34E
AH 2330	140	150	135	140	M 170x3	24	4,22	KM 34	HMV 34E
AH 24030	145	150	90	101	M 155x3	15	1,05	KM 31	HMV 31E
AH 24130	145	150	115	126	M 160x3	15	1,55	KM 32	HMV 32E
AH 3032	150	160	77	82	M 170x3	16	2,06	KM 34	HMV 34E
AH 24032	150	160	95	106	M 170x3	15	2,30	KM 34	HMV 34E
AH 3132	150	160	103	108	M 180x3	16	3,21	KM 36	HMV 36E
AH 24132	150	160	124	135	M 170x3	15	3	KM 34	HMV 34E
AH 3232	150	160	124	130	M 180x3	20	4,08	KM 36	HMV 36E
AH 2332	150	160	140	146	M 180x3	24	4,72	KM 36	HMV 36E
AH 3034	160	170	85	90	M 180x3	17	2,43	KM 36	HMV 36E
AH 3134	160	170	104	109	M 190x3	16	3,40	KM 38	HMV 38E
AH 24034	160	170	106	117	M 180x3	16	2,70	KM 36	HMV 36E
AH 24134	160	170	125	136	M 180x3	16	3,25	KM 36	HMV 36E
AH 3234	160	170	134	140	M 190x3	24	4,80	KM 38	HMV 38E
AH 2334	160	170	146	152	M 190x3	24	5,25	KM 38	HMV 38E
AH 3136	160	180	116	122	M 200x3	19	4,22	KM 40	HMV 40E
AH 3036	170	180	92	98	M 190x3	17	2,81	KM 38	HMV 38E
AH 3036 OH	170	180	92	98	M 190x3	17	2,80	KM 38	HMV 38E
AH 2236	170	180	105	110	M 200x3	17	3,73	KM 40	HMV 40E
AH 24036	170	180	116	127	M 190x3	16	3,20	KM 38	HMV 38E
AH 3136 OH	170	180	116	122	M 200x3	19	3,90	KM 38	HMV 38E
AH 24136	170	180	134	145	M 190x3	16	3,75	KM 38	HMV 38E
AH 3236	170	180	140	146	M 200x3	24	5,32	KM 40	HMV 40E

Accessories

DATA TABLE - WITHDRAWAL SLEEVE



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Part number	Principal dimensions						Weight	Accessories included	
	d1	d	B1	B2	G	G1		Dismounting Nut	Hydraulic Nut
	mm						Kg	Part number	Part number
AH 3236 OH	170	180	140	146	M 200x3	24	4,85	KM 38	HMV 38E
AH 2336	170	180	154	160	M 200x3	26	5,83	KM 40	HMV 40E
AH 2336 OH	170	180	154	160	M 200x3	26	6,05	KM 40	HMV 40E
AH 3038	180	190	96	102	Tr 205x4	18	3,32	HML 41T	HMV 41E
AH 3038 OH	180	190	96	102	Tr 205x4	18	3,30	HML 41T	HMV 40E
AH 2238	180	190	112	117	Tr 210x4	18	4,25	HM 42T	HMV 42E
AH 24038	180	190	118	131	M 200x3	18	3,55	KM 40	HMV 40E
AH 3138	180	190	125	131	Tr 210x4	20	4,89	HM 42T	HMV 42E
AH 3138 OH	180	190	125	131	Tr 210x4	20	4,50	HM 42T	HMV 40E
AH 3238	180	190	145	152	Tr 210x4	25	5,90	HM 42T	HMV 42E
AH 3238 OH	180	190	145	152	Tr 210x4	25	5,90	HM 42T	HMV 40E
AH 24138	180	190	146	159	M 200x3	18	4,45	KM 40	HMV 40E
AH 2338	180	190	160	167	Tr 210x4	26	6,63	HM 42T	HMV 42E
AH 2338 OH	180	190	160	167	Tr 210x4	26	6,70	HM 42T	HMV 42E
AH 3940	190	200	77	83	Tr 210x4	16	2,62	HM 42T	HMV 40E
AH 3040	190	200	102	108	Tr 215x4	19	3,80	HM L43T	HMV 43E
AH 3040 OH	190	200	102	108	Tr 215x4	19	3,70	HM 42T	HMV 42E
AH 2240	190	200	118	123	Tr 220x4	19	4,68	HM 44T	HMV 44E
AH 24040	190	200	127	140	Tr 210x4	18	4	HM 42T	HMV 42E
AH 3140	190	200	134	140	Tr 220x4	21	5,49	HM 44T	HMV 44E
AH 3140 OH	190	200	134	140	Tr 220x4	21	5,65	HM 3044	HMV 44E
AH 3240	190	200	153	160	Tr 220x4	25	6,68	HM 44T	HMV 44E
AH 3240 OH	190	200	153	160	Tr 220x4	25	6,60	HM 3044	HMV 44E
AH 24140 OH	190	200	158	171	Tr 210x4	18	5,05	HM 42T	HMV 42E
AH 2340	190	200	170	177	Tr 220x4	30	7,54	HM 44T	HMV 44E
AH 2340 OH	190	200	170	177	Tr 220x4	30	7,60	HM 44T	HMV 44E
AH 3044	200	220	111	117	Tr 235x4	20	7,40	HM L47T	HMV 47E
AH 3044 OH	200	220	111	117	Tr 235x4	20	7,30	HM 46T	HMV 46E
AH 2244	200	220	130	136	Tr 240x4	20	9,10	HM 48T	HMV 48E
AH 3144	200	220	145	151	Tr 240x4	23	10,40	HM 48T	HMV 48E
AH 3144 OH	200	220	145	151	Tr 240x4	23	9,30	HM 3048	HMV 48E
AH 24144 OH	200	220	170	184	Tr 230x4	20	10,50	HM 46T	HMV 46E
AH 2344	200	220	181	189	Tr 240x4	30	13,50	HM 48T	HMV 48E
AH 2344 OH	200	220	181	189	Tr 240x4	30	13,50	HM 48T	HMV 48E
AH 3048	220	240	116	123	Tr 260x4	21	8,75	HM 52T	HMV 52E

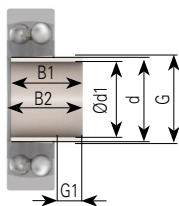


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Part number	Principal dimensions						Weight	Accessories included	
	d1	d	B1	B2	G	G1		Dismounting Nut	Hydraulic Nut
	mm						Kg	Part number	Part number
AH 3048 OH	220	240	116	123	Tr 260x4	21	7,95	HM 3052	HMV 52E
AH 2248	220	240	144	150	Tr 260x4	21	11,1	HM 52T	HMV 52E
AH 2248 OH	220	240	144	150	Tr 260x4	21	11,5	HM 3052	HMV 52E
AH 3148	220	240	154	161	Tr 260x4	25	12	HM 52T	HMV 52E
AH 3148 OH	220	240	154	161	Tr 260x4	25	12	HM 3052	HMV 52E
AH 2348	220	240	189	197	Tr 260x4	30	15,5	HM 52T	HMV 52E
AH 2348 OH	220	240	189	197	Tr 260x4	30	14	HM 52T	HMV 52E
AH 3052	240	260	128	135	Tr 280x4	23	10,7	HM 56T	HMV 56E
AH 3052 H	240	260	128	135	Tr 280x4	23	9,6	HM 3056	HMV 56E
AH 3052 OH	240	260	128	135	Tr 280x4	23	9,6	HM 3056	HMV 56E
AH 3952 G	240	260	155	100	Tr 280x4	18	7,7	HM 58T	HMV 58E
AH 2252	240	260	155	161	Tr 290x4	23	14,0	HM 58T	HMV 58E
AH 2252 OH	240	260	155	161	Tr 290x4	23	12,5	HM 58T	HMV 58E
AH 3152	240	260	172	179	Tr 290x4	26	16,2	HM 58T	HMV 58E
AH 3152 OH	240	260	172	179	Tr 290x4	26	15,5	HM 3056	HMV 56E
AH 2352	240	260	205	213	Tr 290x4	30	19,6	HM 58T	HMV 58E
AH 2352 OH	240	260	205	219	Tr 290x4	30	17,5	HM 58T	HMV 58E
AH 3056	260	280	131	139	Tr 300x4	24	12	HM 3060	HMV 60E
AH 3056 OH	260	280	131	139	Tr 300x4	24	11	HM 3060	HMV 60E
AH 2256	260	280	155	163	Tr 310x5	24	15,2	HM 62T	HMV 62E
AH 2256 OH	260	280	155	163	Tr 300x4	24	15	HM 3160	HMV 60E
AH 3156	260	280	175	183	Tr 310x5	28	17,5	HM 62T	HMV 62E
AH 3156 OH	260	280	175	183	Tr 310x5	28	17	HM 3160	HMV 60E
AH 24156 OH	260	280	202	219	Tr 300x4	22	16,3	HM 60T	HMV 60
AH 2356	260	280	212	220	Tr 310x5	30	17,1	HM 3160	HMV 60E
AH 2356 OH	260	280	212	220	Tr 310x5	30	19,5	HM 62T	HMV 62E
AH 3060	280	300	145	153	Tr 320x5	26	14,4	HM 3064	HMV 64E
AH 3060 OH	280	300	145	153	Tr 320X5	26	13	HM 3064	HMV 64E
AH 2260	280	300	170	178	Tr 330X5	26	18,1	HM 66T	HMV 66E
AH 2260 OH	280	300	170	178	Tr 330X5	26	18	HM 3164	HMV 64E
AH 3160	280	300	192	200	Tr 330X5	30	20,8	HM 66T	HMV 66E
AH 3160 OH	280	300	192	200	Tr 330X5	30	20,5	HM 3164	HMV 64E
AH 3260	280	300	228	236	Tr 330X5	34	26	HM 66T	HMV 66E
AH 3260 OH	280	300	228	236	Tr 330X5	34	23,5	HM 3164	HMV 64E
AH 3064	300	320	149	157	Tr 345X5	27	17	HM 3068	HMV 68E
AH 3064 OH	300	320	149	157	Tr 345X5	27	17	HM 3068	HMV 68E

Accessories

DATA TABLE - WITHDRAWAL SLEEVE



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Part number	Principal dimensions						Weight	Accessories included	
	d1	d	B1	B2	G	G1		Dismounting Nut	Hydraulic Nut
	mm						Kg	Part number	Part number
AH 2264	300	320	180	190	Tr 350X5	27	20,2	HM 70T	HMV 70E
AH 2264 OH	300	320	180	190	Tr 350X5	27	20	HM 3168	HMV 68E
AH 3164	300	320	209	217	Tr 350X5	31	24,5	HM 70T	HMV 70E
AH 3164 OH	300	320	209	217	Tr 350X5	31	24,5	HM 3168	HMV 68E
AH 3264	300	320	246	254	Tr 350X5	36	30,6	HM 70T	HMV 70E
AH 3264 OH	300	320	246	254	Tr 350X5	36	27	HM 3168	HMV 68E
AH 3068	320	340	162	171	Tr 365X5	28	19	HM 3072	HMV 72E
AH 3068 OH	320	340	162	171	Tr 365X5	28	19	HM 3072	HMV 72E
AH 3168	320	340	225	234	Tr 370X5	33	29	HM 74T	HMV 74E
AH 3168 OH	320	340	225	234	Tr 370X5	33	28,5	HM 3172	HMV 72E
AH 3268	320	340	264	273	Tr 370X5	38	35,4	HM 74T	HMV 74E
AH 3268 OH	320	340	264	273	Tr 370X5	38	32	HM 3172	HMV 72E
AH 24168 OH	320	340	269	288	Tr 360x5	26	27,1	HM 72T	HMV 72
AH 3072	340	360	167	176	Tr 385X5	30	21	HM 3076	HMV 76E
AH 3072 OH	340	360	167	176	Tr 385X5	30	21	HM 3076	HMV 76E
AH 3172	340	360	229	238	Tr 400X5	33	30,5	HM 3180	HMV 80E
AH 3172 OH	340	360	229	238	Tr 400X5	35	30,5	HM 3176	HMV 76E
AH 24172 OH	340	360	269	289	Tr 380X5	26	30,8	HM 3176	HMV 76E
AH 3272	340	360	274	283	Tr 400X5	40	41,5	HM 3180	HMV 80E
AH 3272 OH	340	360	274	283	Tr 380X5	40	35,5	HM 3176	HMV 76E
AH 3076	360	380	170	180	Tr 410X5	31	22,5	HM 3080	HMV 80E
AH 3076 OH	360	380	170	180	Tr 410X5	31	22,5	HM 3080	HMV 80E
AH 3176	360	380	232	242	Tr 420X5	36	35,7	HM 3184	HMV 84E
AH 3176 OH	360	380	232	242	Tr 420X5	36	33	HM 3180	HMV 80E
AH 3276	360	380	284	294	Tr 420X5	42	45,6	HM 3184	HMV 84E
AH 3276 OH	360	380	284	294	Tr 420X5	42	42	HM 3180	HMV 80E
AH 3080	380	400	183	193	Tr 430X5	33	26	HM 3080	HMV 84E
AH 3080 OH	380	400	183	193	Tr 430X5	33	26	HM 3080	HMV 84E
AH 3180	380	400	240	250	Tr 440X5	38	39,5	HM 3188	HMV 88E
AH 3180 OH	380	400	240	250	Tr 440X5	38	36	HM 3184	HMV 84E
AH 3280	380	400	302	312	Tr 440X5	44	51,7	HM 3188	HMV 88E
AH 3280 OH	380	400	302	312	Tr 440X5	44	48	HM 3184	HMV 84E
AH 3084	400	420	186	196	Tr 450X5	34	28	HM 3088	HMV 88E
AH 3084 OH	400	420	186	196	Tr 450X5	34	28	HM 3088	HMV 88E
AH 3184	400	420	266	276	Tr 460X5	40	27,9	HM 3088	HMV 88E
AH 3184 OH	400	420	266	276	Tr 460X5	40	43	HM 3188	HMV 88E

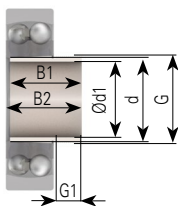


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Part number	Principal dimensions						Weight	Accessories included	
	d1	d	B1	B2	G	G1		Dismounting Nut	Hydraulic Nut
	mm						Kg	Part number	Part number
AH 3284	400	420	321	331	Tr 460X5	46	46,5	HM 3192	HMV 92E
AH 3284 OH	400	420	321	331	Tr 440X5	46	54,5	HM 3188	HMV 88E
AH 3088	420	440	194	205	Tr 470X5	35	31	HM 3092	HMV 92E
AH 3088 OH	420	440	194	205	Tr 470X5	35	31	HM 3092	HMV 92E
AH 3188	420	440	270	281	Tr 480X5	42	49,8	HM 3196	HMV 96E
AH 3188 OH	420	440	270	281	Tr 480X5	42	46	HM 3192	HMV 92E
AH 3288	420	440	330	341	Tr 460X5	48	64,5	HM 3192	HMV 92E
AH 3288 OH	420	440	330	341	Tr 460X5	48	64,5	HM 3192	HMV 92E
AH 3092	440	460	202	213	Tr 490X5	37	34	HM 3096	HMV 96E
AH 3092 OH	440	460	202	213	Tr 490X5	37	34	HM 3096	HMV 96E
AH 3192	440	460	285	296	Tr 510X6	43	51,5	HM 3196	HMV 96E
AH 3192 OH	440	460	285	296	Tr 510X6	43	51,5	HM 3196	HMV 96E
AH 3292	440	460	349	360	Tr 480X5	50	80	HM 3196	HMV 96E
AH 3292 OH	440	460	349	360	Tr 480X5	50	80	HM 3196	HMV 96E
AH 3996 OH	460	480	158	157	Tr 500X5	28	25,8	HM 31/500	HMV 100E
AH 3096	460	480	205	217	Tr 520X6	38	34	HM 30/500	HMV 100E
AH 3096 OH	460	480	205	217	Tr 520X6	38	34	HM 30/500	HMV 100E
AH 3196	460	480	295	307	Tr 530X6	45	63	HM 31/500	HMV 100E
AH 3196 OH	460	480	295	307	Tr 530X6	45	63	HM 31/500	HMV 100E
AH 3296	460	480	364	376	Tr 500X5	52	81	HM 31/500	HMV 100E
AH 3296 OH	460	480	364	376	Tr 500X5	52	81	HM 31/500	HMV 100E
AH 30/500	480	500	209	221	Tr 530X6	40	41	HM 30/530	HMV 106E
AH 30/500 OH	480	500	209	221	Tr 530X6	40	41	HM 30/530	HMV 106E
AH 31/500	480	500	313	325	Tr 530X6	47	66,5	HM 31/530	HMV 106E
AH 31/500 OH	480	500	313	325	Tr 530X6	47	66,5	HM 31/530	HMV 106E
AH 30/530	500	530	230	242	Tr 560X6	45	61,9	HM 30/560	HMV 112E
AH 30/530 OH	500	530	230	242	Tr 560X6	45	63,5	HM 30/560	HMV 112E
AH 31/530	500	530	325	337	Tr 560x6	53	93,4	HM 31/560	HMV 112E
AH 32/530	500	530	412	424	Tr 580x6	57	133	HM 116T	HMV 16E
AH 30/560	530	560	240	252	Tr 600X6	45	73,5	HM 30/600	HMV 120E
AH 30/560 OH	530	560	240	252	Tr 600X6	45	73,5	HM 30/600	HMV 120E
AH 31/560	530	560	335	347	Tr 600x6	55	108	HM 31/600	HMV 120E
AH 30/600	560	600	245	259	Tr 630X6	45	77	HM 30/630	HMV 126E
AH 30/600 OH	560	600	245	259	Tr 630X6	45	77	HM 30/630	HMV 126E
AH 30/630	600	630	258	272	Tr 670X6	46	89,7	HM 30/670	HMV 134E

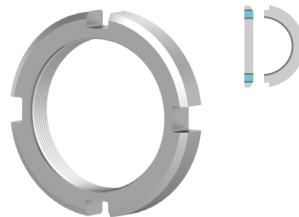
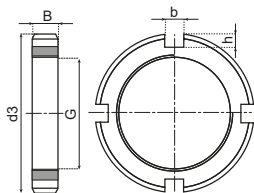
Accessories

DATA TABLE - WITHDRAWAL SLEEVE



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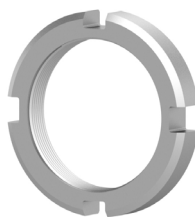
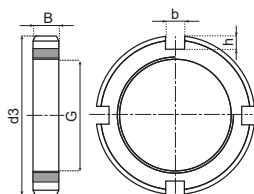
Part number	Principal dimensions						Weight	Accessories included	
	d1	d	B1	B2	G	G1		Dismounting Nut	Hydraulic Nut
	mm						Kg	Part number	Part number
AH 30/630 OH	600	630	258	272	Tr 670X6	46	88,5	HM 30/670	HMV 134E
AH 31/630	600	630	375	389	Tr 670x6	60	140	HM 31/670	HMV 134E
AH 32/630	600	630	475	489	Tr 680x6	63	191	HM 136T	HMV 36E
AH 30/670 OH	630	370	280	294	Tr 710X7	50	125	HM 30/710	HMV 142E
AH 30/670	630	670	280	294	Tr 710X7	50	127	HM 30/710	HMV 142E
AH 32/670	630	670	500	514	Tr 720x7	62	256	HM 144T	HMV 44E
AH 30/710	670	710	286	302	Tr 750X7	50	138	HM 30/750	HMV 150E
AH 30/710 OH	670	710	286	302	Tr 750X7	50	138	HM 30/750	HMV 150E
AH 32/710	670	710	500	516	Tr 760x7	65	282	HM 31/750	HMV 152E
AH 30/750	710	750	300	316	Tr 800x7	50	159	HM 30/800	HMV 160E
AH 31/750	710	750	425	441	Tr 800x7	60	238	HM 31/800	HMV 160E
AH 32/750	710	750	540	556	Tr 800x7	65	320	HM 31/800	HMV 160E
AH 30/800	750	800	308	326	Tr 850x7	50	204	HM 30/850	HMV 170E
AH 31/800	750	800	438	456	Tr 850x7	63	305	HM 31/850	HMV 170E
AH 32/800	750	800	550	568	Tr 850x7	67	401	HM 31/850	HMV 170E
AH 30/850	800	850	325	343	Tr 900x7	53	230	HM 30/900	HMV 180E
AH 31/850	800	850	462	480	Tr 900x7	62	345	HM 31/900	HMV 180E
AH 32/850	800	850	585	603	Tr 900x7	70	461	HM 31/900	HMV 180E
AH 30/900	850	900	335	355	Tr 950x8	55	253	HM 30/950	HMV 190E
AH 31/900	850	900	475	495	Tr 950x8	63	379	HM 31/950	HMV 190E
AH 32/900	850	900	585	605	Tr 950x8	70	489	HM 31/950	HMV 190E
AH 30/950	900	950	355	375	Tr 1000x8	55	285	HM 30/1000	HMV 200E
AH 31/950	900	950	500	520	Tr 1000x8	62	426	HM 31/1000	HMV 200E
AH 32/950	900	950	600	620	Tr 1000x8	70	533	HM 31/1000	HMV 200E



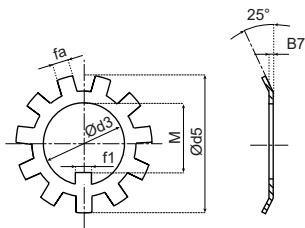
NUT	Principal dimensions				lock		Weight	Suitable for use with locking device type (not included)
	bore	outer	width	thread	width	depth		
	mm						Kg	
Part number	d	d3	B	G	b	h	-	
KM 0	10	18	4	M 10x0.75	4	3	0,004	MB 0
KM 1	12	22	4	M 12x1	4	3	0,006	MB 1
KM 2	15	25	5	M 15x1	5	4	0,009	MB 2
KM 3	17	28	5	M 17x1	5	4	0,015	MB 3
KM 4	20	32	6	M 20x1	6	4	0,025	MB 4
KM 5	25	38	7	M 25x1.5	7	5	0,028	MB 5
KM 6	30	45	7	M 30x1.5	7	5	0,039	MB 6
KM 7	35	52	8	M 35x1.5	8	5	0,059	MB 7
KM 8	40	58	9	M 40x1.5	9	6	0,078	MB 8
KM 9	45	65	10	M 45x1.5	10	6	0,11	MB 9
KM 10	50	70	11	M 50x1.5	11	6	0,14	MB 10
KM 11	55	75	11	M 55x2	11	7	0,15	MB 11
KM 12	60	80	11	M 60x2	11	7	0,16	MB 12
KM 13	65	85	12	M 65x2	12	7	0,19	MB 13
KM 14	70	92	12	M 70x2	12	8	0,23	MB 14
KM 15	75	98	13	M 75x2	13	8	0,27	MB 15
KM 16	80	105	15	M 80x2	15	8	0,36	MB 16
KM 17	85	110	16	M 85x2	16	8	0,41	MB 17
KM 18	90	120	16	M 90x2	16	10	0,51	MB 18
KM 19	95	125	17	M 95x2	17	10	0,55	MB 19
KM 20	100	130	18	M 100x2	18	10	0,64	MB 20
KM 21	105	140	18	M 105x2	18	12	0,79	MB 21
KM 22	110	145	19	M 110x2	19	12	0,87	MB 22
KM 23	115	150	19	M 115x2	19	12	0,91	MB 23
KML 24	120	145	20	M 120x2	20	12	0,69	MBL 24
KM 24	120	155	20	M 120x2	20	12	0,97	MB 24
KM 25	125	160	21	M 125x2	21	12	1,09	MB 25
KML 26	130	155	21	M 130x2	21	12	0,8	MBL 26
KM 26	130	165	21	M 130x2	21	12	1,09	MB 26
KM 27	135	175	22	M 135x2	22	14	1,39	MB 27
KML 28	140	165	22	M 140x2	22	12	0,92	MBL 28
KM 28	140	180	22	M 140x2	22	14	1,4	MB 28
KM 29	145	190	24	M 145x2	24	14	1,8	MB 29
KML 30	150	180	24	M 150x2	24	14	1,25	MBL 30
KM 30	150	195	24	M 150x2	24	14	1,88	MB 30

Accessories

DATA TABLE - LOCKING NUT



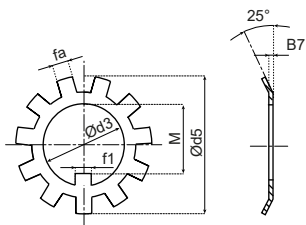
NUT	Principal dimensions				lock		Weight	Suitable for use with locking device type (not included)
	bore	outer	width	thread	width	depth		
	mm						Kg	
Part number	d	d3	B	G	b	h	-	
KM 31	155	200	25	M 155x3	25	16	2,09	MB 31
KML 32	160	190	25	M 160x3	25	14	1,39	MBL 32
KM 32	160	210	25	M 160x3	25	16	2,29	MB 32
KM 33	165	210	26	M 165x3	26	16	2,31	MB 33
KML 34	170	200	26	M 170x3	26	16	1,56	MBL 34
KM 34	170	220	26	M 170x3	26	16	2,54	MB 34
KML 36	180	210	27	M 180x3	27	16	1,78	MBL 36
KM 36	180	230	27	M 180x3	27	18	2,78	MB 36
KML 38	190	220	28	M 190x3	28	16	1,84	MBL 38
KM 38	190	240	28	M 190x3	28	18	3,05	MB 38
KML 40	200	240	29	M 200x3	29	18	2,61	MBL 40
KM 40	200	250	29	M 200x3	29	18	3,37	MB 40
HM 42 T	210	270	30	Tr 210x4	20	10	4,87	MB 42
HM 44 T	220	280	32	Tr 220x4	20	10	3,35	MB 44
HM 46 T	230	290	34	Tr 230x4	20	10	5,8	MB 46
HM 48 T	240	300	34	Tr 240x4	20	10	6,2	MB 48
HM 50 T	250	320	36	Tr 250x4	20	10	7,1	MB 50
HM 52 T	260	330	36	Tr 260x4	24	12	8,4	MB 52
HM 54 T	270	340	36	Tr 270x4	24	12	9,4	MB 54
HM 56 T	280	350	38	Tr 280x4	24	12	9,6	MB 56



LOCKING DEVICE	Principal dimensions			Inner lip		outer lip		Weight	Suitable for use with locking device type (not included)
	bore	outer	width	width	depth	width	number of lips	Kg	
	mm							m	
Part number	d3	d5	B7	f1	M	fa			
MB 0	10	21	1	3	8,5	3	9	0,001	KM 0
MB 1	12	25	1	3	10,5	3	11	0,002	KM 1
MB 2	15	28	1	4	13,5	4	11	0,003	KM 2
MB 3	17	32	1	4	15,5	4	11	0,003	KM 3
MB 4	20	36	1	4	18,5	4	11	0,004	KM 4
MB 5	25	42	1,25	5	23	5	13	0,006	KM 5
MB 6	30	49	1,25	5	27,5	5	13	0,008	KM 6
MB 7	35	57	1,25	6	32,5	5	13	0,011	KM 7
MB 8	40	62	1,25	6	37,5	6	13	0,013	KM 8
MB 9	45	69	1,25	6	42,5	6	13	0,015	KM 9
MB 10	50	74	1,25	6	47,5	6	13	0,016	KM 10
MB 11	55	81	1,5	8	52,5	7	17	0,022	KM 11
MB 12	60	86	1,5	8	57,5	7	17	0,024	KM 12
MB 13	65	92	1,5	8	62,5	7	17	0,03	KM 13
MB 14	70	98	1,5	8	66,5	8	17	0,032	KM 14
MB 15	75	104	1,5	8	71,5	8	17	0,035	KM 15
MB 16	80	112	1,8	10	76,5	8	17	0,046	KM 16
MB 17	85	119	1,8	10	81,5	8	17	0,053	KM 17
MB 18	90	126	1,8	10	86,5	10	17	0,061	KM 18
MB 19	95	133	1,8	10	91,5	10	17	0,066	KM 19
MB 20	100	142	1,8	12	96,5	10	17	0,077	KM 20
MB 21	105	145	1,8	12	100,5	12	17	0,083	KM 21
MB 22	110	154	1,8	12	105,5	12	17	0,091	KM 22
MB 23	115	159	2	12	110,5	12	17	0,11	KM 23
MBL 24	120	151	2	14	115	12	17	0,07	KML 24
MB 24	120	164	2	14	115	12	17	0,11	KM 24
MB 25	125	170	2	14	120	12	17	0,12	KM 25
MBL 26	130	161	2	14	125	12	17	0,08	KML 26
MB 26	130	175	2	14	125	12	17	0,12	KM 26
MB 27	135	185	2	14	130	14	17	0,14	KM 27
MBL 28	140	171	2	16	135	12	17	0,09	KML 28
MB 28	140	192	2	16	135	14	17	0,14	KM 28
MB 29	145	202	2	16	140	14	17	0,17	KM 29
MBL 30	150	188	2	16	145	14	17	0,1	KML 30
MB 30	150	205	2	16	145	14	17	0,18	KM 30

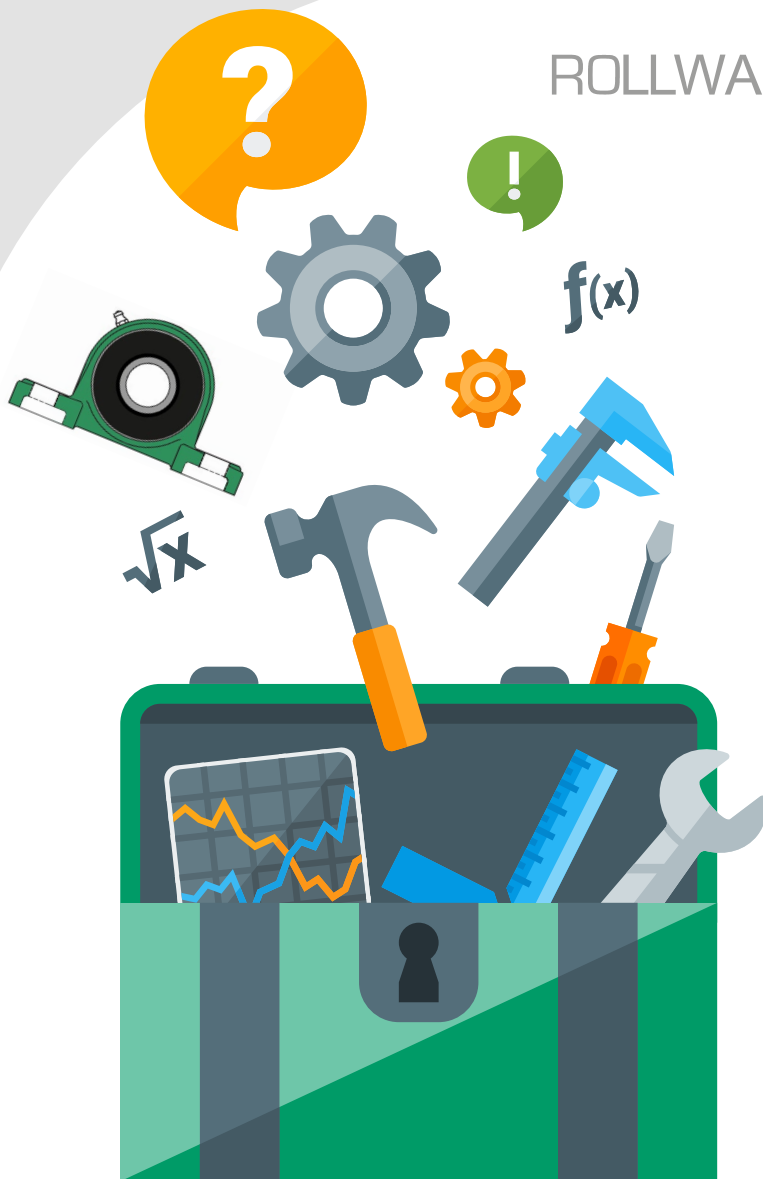
Accessories

DATA TABLE - LOCKING DEVICE



LOCKING DEVICE	Principal dimensions			Inner lip		outer lip		Weight	Suitable for use with locking device type (not included)
	bore	outer	width	width	depth	width	number of lips	Kg	
	mm							m	
Part number	d3	d5	B7	f1	M	fa			
MB 31	155	212	2,5	16	147,5	16	19	0,2	KM 31
MBL 32	160	199	2,5	18	154	14	19	0,14	KML 32
MB 32	160	217	2,5	18	154	16	19	0,22	KM 32
MB 33	165	222	2,5	18	157,5	16	19	0,24	KM 33
MBL 34	170	211	2,5	18	164	16	19	0,15	KML 34
MB 34	170	232	2,5	18	164	16	19	0,24	KM 34
MBL 36	180	221	2,5	20	174	16	19	0,16	KML 36
MB 36	180	242	2,5	20	174	18	19	0,26	KM 36
MBL 38	190	231	2,5	20	184	16	19	0,17	KML 38
MB 38	190	252	2,5	20	184	18	19	0,26	KM 38
MBL 40	200	248	2,5	20	194	18	19	0,22	KML 40
MB 40	200	262	2,5	20	194	18	19	0,28	KM 40
MB 44	220	292	3	24	213	20	19	0,35	HM 44
MB 48	240	312	3	24	233	20	19	0,45	HM 48
MB 52	260	342	3	28	253	24	19	0,65	HM 52
MB 56	280	362	3	28	273	24	19	0,74	HM 56

ROLLWAY®



PRODUCT CATALOG

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 **RegalRexnord™**

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Bearing Selection

The following procedure gives the steps to be followed when bearings are selected from the information contained in this catalogue. It will be found satisfactory for most applications.

1. a. Determine the speed of the bearing
b. Calculate the loads on the bearings.
2. Establish if accurate alignment can be obtained between the bearing seatings. If it cannot, then bearings that accommodate misalignment should be selected.
3. If the bearings rotate under load decide the life required, calculate the required dynamic load rating 'Cr' values, and then select suitable bearings that have comparable 'Cr' values.
If the bearings do not rotate under load selected then use the static load rating 'Co'.
4. Check if the bearings are suitable for the speed and decide if grease or oil is to be the lubricant.
5. Refer to shaft and housing tolerance in technical section to ensure required bearing seating fits.
6. Finally:
 - Decide if 'Standard' or 'Extra Precision' limits of accuracy are required.
 - Select the most suitable range of radial clearance.
 - Choose the abutment diameters.
 - Choose suitable closures.
 - Issue mounting and handling instructions for the bearings if necessary.

SELECTING BEARING TYPE

Each type of bearing has different properties making it suitable for certain applications. The factors to be considered when choosing a bearing are numerous so guidance is given to the main points when selecting a bearing. Special consideration must be given to aspects relating to the running and operating. Consideration must also be given to the aspects relating to at least one of the principal dimensions of the bearing as determined by the machine design or shaft size.

LOAD AND DIRECTION OF LOAD

The magnitude and direction of the external loads along with built in factors of safety are two of the main points which determine the bearing size, and in some instances the bearing type to be used. The important factors are the speed of rotation, temperature, the amount of precision required, mounting conditions and running noise.

The following illustrations indicate the magnitude and direction of the external loads the bearings can provide.

RADIAL LOADS

For light and medium radial loads ball bearings are generally used. Whereas for heavy loads and large shaft diameters, roller bearings are often the only choice.

Cylindrical roller bearings are available in several types. Types NU (with outer ring ribs) and N (with inner ring ribs) are only suitable for radial loads, whereas the NUP, NJ and NJ with angle ring HJ can be used to take certain combined loads.

THRUST LOADS

Thrust ball bearings are only suitable for light or medium purely axial loads. Double-acting thrust ball bearings can carry thrust loads in either direction. Spherical roller thrust bearings are used where heavy thrust loads are to be absorbed and in addition can carry a certain amount of radial load acting simultaneously.

COMBINED LOADS

If a radial and thrust load act on a bearing simultaneously this is termed as a 'Combined Load'. The most important feature affecting the ability of carry axial loads is the angle of contact in relation to the shaft axis. The greater the angle, the more suitable the bearing is to accommodate axial loading. Combined loads are carried by deep groove ball bearings, self-aligning ball bearings single and double row angular contact ball bearings, spherical roller bearings, cylindrical roller bearing of the locating types and taper roller bearings.

LIMITING SPEED

The speeds at which bearings can rotate are limited by the bearing type, the operating load and the permissible operating temperature of the lubricant.

Bearings with low frictional resistance and correspondingly low internal heat generation are most suitable for high speeds with proper attention being given to the correct bearing clearance after mounting.

For radial loads, the bearings most suitable are deep groove ball bearings or cylindrical roller bearings. For combined loads angular contact bearings should be selected.

MISALIGNMENT

Self-aligning ball bearings, spherical roller bearings and spherical roller thrust bearings allow, at assembly, for the correction of misalignment where the shaft can be misaligned relative to the housing. Values for permissible angular misalignment are listed in the tables which precede the bearing sizes of those particular types.

LOW NOISE LEVEL

Even though the running noise of roller bearings can blend in with the background noise of other moving parts. It is sometimes of prime importance to reduce this to a minimum level for electric motors used for example in lifts for hospitals and hotels and other domestic appliances. Such applications usually demand the fitting of a deep-groove ball bearing selected for low noise level.

RIGIDITY

This is sometimes a very important requirement, especially on machine tool spindles, where rigidity controls the bearing selection. In applications of this nature single or double row cylindrical roller bearing, or taper roller bearings are best suited, compared with the point contact of ball bearings. The stiffness can be further enhanced by pre-loading.



Bearing Selection

AXIAL MOVEMENT

In a normal bearing arrangement supporting a shaft it is usual to locate one bearing (fixed) and allow the non-locating bearing (free) to float in the housing thus preventing axial pre-load as a result of thermal expansion of the shaft. Axial movement produced by thermal expansion can be accommodated by the use of a cylindrical roller bearing of the N or NU pattern. This allows axial movement to occur by displacement of the rollers over the track.

TAPERED BORE AND SLEEVE MOUNTING

Tapered bore bearings are used for easier mounting and adjustments of the radial clearance. It is usual to fit sleeve bearings on a bright drawn steel bar thus cutting machining costs and easing assembly. Withdrawal sleeves are used to ease the removal of the bearing. The residual clearance should be checked with the tables relating to the axial drive-up for spherical roller bearings, for that particular bearing size.

PRECISION

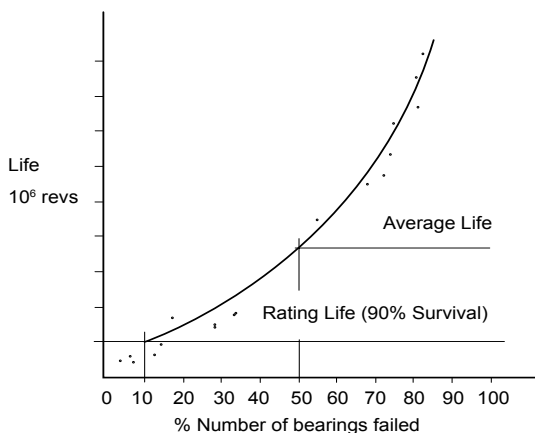
Rolling bearings with a higher degree of precision than normal are required for shafts where running accuracy is of prime importance eg, machine tools spindles and shafts rotating at very high speeds (see section relating to bearing tolerances).

DETERMINATION OF ROLLING BEARING SIZE

To determine the size of the bearing, static and dynamic load conditions and design life requirements must be considered. The load ratings for the size and type are given in the bearing tables on the appropriate pages.

DYNAMIC LOADING

When a batch of apparently identical bearings is tested under identical load, speed and operating conditions, a wide difference is obtained in the lives of the bearings. Typical results are plotted on the graph; this graph shows the 'rating life' – sometimes called the '90 percent survival life', this is the calculated life obtained by following the procedure set out in this catalogue. Also shown is the average life, which is appreciably greater than the 'rating life'.



The reason for this difference is that even with the best steel minute imperfections exist in the material and, as the area of contact between the rolling elements and rings under load is very small, these imperfections upset the distribution and intensity of stress in the material. Variations in contact area resulting from the manufacturing tolerances on the rings and rolling elements also contribute towards this difference.

In addition to the load conditions on a bearing, failure can also result from other factors, notably lack of attention to lubrication, protection or accuracy of mounting, these cannot be included in the basic load/life formulae.

The required basic static load rating C_0 of a bearing can be determined using the equation

$$C_0 = S_0 P_0$$

where:

C_0 = basic load rating [KN]

P_0 = equivalent static load [KN]

S_0 = static safety factor

For bearings operating in elevated temperatures the hardness of the bearing material will be reduced.

Values of S_0 for a few typical non rotating bearing applications are shown below and may be used as a guide.

Application	S_0 Factor
Variable pitch propeller blades on aircraft	0.5
Dams on aircraft	1.0
Swing bridges	1.5
Crane hooks for large cranes without additional dynamic forces	1.5
Small cranes for bulk goods with large additional dynamic forces	1.6

On rotating bearings where the load fluctuates dramatically or, where heavy shock loads occur during a fraction of a revolution, it is necessary to check that the basic static load rating is adequate. Heavy shock loads could cause permanent deformation in the form of indentation being unevenly distributed over the raceway. Shock loads are also generally such that they cannot be calculated exactly. In some cases they may also cause deformation of the housing and therefore producing unfavorable load distribution. Depending on the operating conditions the maximum load should not exceed a value determined by the static safety factor S_0 .

Values for S_0 for certain operating conditions can be used.

Application	S_0 Factor (min ^m)
Operation is smooth and vibration free	0.5
Operation is normal and vibration conditions normal	1.0
Pronounced shock loads	1.5 - 2
Demand on smooth running is of prime importance	2.0

Bearing Life and Load Ratings

BASIC DYNAMIC LOAD RATING C_r

Basic dynamic load rating (C_r) is defined as that constant radial load which a group of apparently identical radial ball bearings, angular contact ball bearings and radial roller bearings can endure for a rating life of one million revolutions.

For thrust ball bearings, the basic dynamic load rating is that constant, central, axial load which a group of apparently identical thrust bearings can endure for a rating life of one million revolutions.

STATIC LOAD RATING C_o

The static load C_o is defined as a load acting on a non-rotating bearing. Permanent deformations appear in rolling elements and raceways under static load of moderate magnitude and increase gradually with increasing load. The permissible static load is, therefore, dependent upon the permissible magnitude of permanent deformation.

Experience shows that a total permanent deformation of 0.0001 of the rolling element diameter, occurring at the most heavily loaded rolling element and raceway contact, can be tolerated in most bearing applications without impairment of bearing operation.

RATING LIFE

Rating life (L) is defined as the number of revolutions (or hours at some constant speed) that 90% of a group of apparently identical bearings will exceed before the first evidence of fatigue develops. This may be referred to as B10 life.

LIFE EQUATION

The expression $L_u = (C/P)^3 [10^6 \text{ revs}]$ is used to establish a mathematical relationship for the rating life as a function of the load.

L_u = rating life in millions of revolutions of the inner ring with constant direction of loading

C = basic dynamic load rating in [KN]

P = equivalent dynamic load rating in [KN]

p = exponent for life equation

$p = 3$ for ball bearings

$p = 10/3$ for roller bearings

In most cases it is common practice to employ the rating life L_h (hours). The relationship between L_u and L_h with constant rotational speed n (rpm) is:

$$L_u = \frac{L_h \cdot n \cdot 60}{10^6} \cdot [10^6 \text{ revs}]$$

If the rating life of 1×10^6 revs, to which the basic load rating C refers, is resolved into a reference life $L_h = 500$ hours, and a reference rotation speed of $n = 33.1/3$ rpm it follows that

for ball bearings: $\left(\frac{C}{P}\right)^3$

for roller bearings: $\left(\frac{C}{P}\right)^{10/3}$

$$L_u = \frac{Lh.n.60}{500.33.1/3.60} = \left(\frac{C}{P} \right)^3 [10^6 \text{ revs}]$$

$$\text{or: } \sqrt[3]{\frac{LH}{500}} = \sqrt[3]{\frac{33.1/3}{n} \cdot \frac{C}{P}}$$

$$\text{letting: } \sqrt[3]{\frac{33.1/3}{n}} = \text{speed factor } f_n \text{ (equation 1)}$$

$$\text{and: } \sqrt[3]{\frac{LH}{500}} = \text{life factor } f_L \text{ (equation 2)}$$

The rating life equation may be obtained in the form life factor: $f_L = \frac{C \cdot f_n}{P}$

$$\text{basic load rating required: } C = \frac{P \cdot f_L}{f_n} [KG]$$

The relationship of equation 1 and 2 are graphically represented in nomograms below. Also on page 14 are charts showing the L10 life in relation to C/P for ball and roller bearings. To determine the size of a rolling bearing for a particular field of operation it is necessary to establish the nominal life corresponding to the field of application.

EXAMPLE

A deep groove ball bearing is required to run at speed $n=850$ RPM under constant radial load of $f_r = 5$ KN and is to achieve a basic rating life L_{10h} of 20.000 hours.

From the nomogram using the right hand column (L_{10}) a line drawn from 20.000 to the left hand column (n RPM) this passes through the centre column (C/P L_{10} 10.6) at 10:1000 therefore a bearing is required with a basic load rating C of at least $C = 10 \times 5$ KN. Reading from the tables relating to deep groove ball bearings it can be seen that a bearing ref 6309 has a C value of 52.7 KN. Of course the choice of bearing is also governed by the shaft and housing parameters.

For motor vehicles and rolling stock the service life is expressed as a function of the wheel diameter and kilometers travelled as per formulae below:

$$L_{10} = \frac{1000}{\pi D} \cdot L_{10s} \quad \text{or} \quad L_{10s} = \frac{\pi D}{1000} L_{10}$$

Where:

L_{10} = nominal life in 10^6 RPM

L_{10s} = life in 10^6 kilometers traveled

D = diameter of wheel in meters. Values for selecting service life in kilometers covered are in table below.



Bearing Life and Load Ratings

Vehicle type	L10s/10 ⁶ km
Wheel bearings for motor vehicles:	
Cars	0.2
Trucks, buses	0.4
Axle boxes for rolling stock – freight cars	0.8
Suburban traffic	1.5
Long distance coaches	3
Rail cars	3-1
Diesel and electric locomotives	3-4

Depending on the working temperature of the bearings, their service life is reduced at elevated temperatures. This is to be taken into consideration when the service life is established by the application of temperature factor f_t specified in table below:

Working temperature °C	150	200	250	300
Symbol	S0	S1	S2	S3
f_t	1	0.73	0.42	0.22

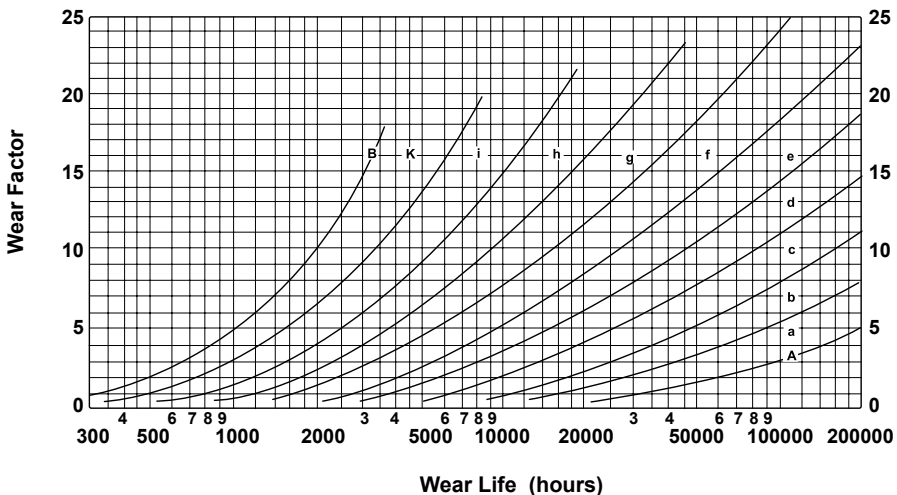
The following table provides recommendations for factor f_v along with typical applications and life factor f_L .

Application	Fields of operating conditions	Factor f_v	Factor f_L
Motor vehicles - gear boxes - axle drives - water pumps - wheel bearings	g – k h – k k h – l	3 – 8 3 – 6 5 – 7 4 – 6	1.7 – 2.2 2 – 3 1.5 – 2 1.6 – 2.5
Railbound vehicles - haulage trolleys - trams - passenger coaches and freight cars - motor coaches and locomotives - gears	f – h e – f c – d d – e c – d	12 – 15 8 – 12 8 – 12 6 – 10 3 – 6	2.5 – 3 3.5 – 4 3 – 3.5 3.5 – 4 3 – 4.5
Motors - electric motors for household appliances - traction motors and standard motors - large motors	i – k c – d b – d	3 – 5 3 – 5 3 – 5	1.5 – 2 3.5 – 4.5 4 – 4.5

Bearing Life and Load Ratings

Application	Fields of operating conditions	Factor f_v	Factor f_L
Machine-tools - lathe spindles and milling spindles - boring and grinding machine spindles - machine tool gears - electric and pneumatic tools	a – b c – d c – d g – h	0.5 – 1.5 0.5 – 1 3 – 8 3 – 6	3 – 4.5 2.5 – 3.5 3 – 4 1.8 – 2.7
Woodworking machines - milling cutter and cutter shaft - main bearing - rod bearing	e – f e – g c – d	0.5 – 3 3 – 4 2 – 3	3 – 4 3 – 4 2 – 3
Gears general engineering - universal gears - large-sized gears, stationary	d – c c – d	3 – 1 2 – 3	2 – 3 2 – 3
Materials handling - belt drives opencast mining - medium-sized and large fans - centrifugal pumps and compressors	c – d c – l d – f	5 – 12 3 – 5 3 – 5	4 – 6 3 – 4.5 3 – 4.5
Crushers, mills, screens etc. - jaw crushers, roll crushers	f – g	8 – 12	3 – 3.5
Hammer mills - hammer mills and impact mills - tube mills - vibrating mills - vibrating screens	d – c f – g f – g e – f	5 – 8 12 – 18 3 – 5 4 – 6	3.5 – 4.5 3 – 5 2 – 3 2.5 – 3

The wear life diagram indicates the operating conditions with the least wear factor at curve A and the heaviest wear occurring at curve B. The area between A and B being subdivided into individual fields from a to k shows how the operating conditions deteriorate progressively.



Bearing Life and Load Ratings

ADJUSTED RATING LIFE

Adjustments to life equations

$$L_{10} = \left(\frac{C}{P} \right)^p$$

The above formula is adequate for conventional applications but in exceptional cases other factors must be considered which influence the life of the bearing. To accommodate these factors the ISO life equation is

$$L_{na} = a_1.a_2.a_{iso} \cdot \left(\frac{C}{P} \right)^p \quad \text{or} \quad L_{na} = a_1.a_2.a_3.L_{10}$$

Where:

L_{na} = adjusted rating life in 10^6 revolutions the index being the difference between the specified probability life and 100%

a_1 = life adjustment factor for reliability

a_2 = life adjustment for material

a_{iso} = life adjustment for operating conditions including tribology

Calculations for the adjusted rating life are based on the pre-conditions mentioned in the above formulae ie. That bearing loads can be calculated with accuracy considering all aspects of the loads involved along with shaft deflection etc. Also, that reliability of the bearing materials are in accordance with the corresponding C values and that normal operating conditions $a_1=a_2=a_3=1$ and that two life equations become identical.

Life adjustment factor a_1 for reliability

The a_1 factor is used to determine lives which are obtained or exceeded with a greater probability than 90% (L10). The table below lists the factors for failure probability values between 10% and 1% L10 being the normal rating life.

Probability %	Failure probability %	Life before fatigue appears	Factor a_1
90	10	L10	1
95	5	L5	0.62
95	4	L4	0.53
97	3	L3	0.44
98	2	L2	0.33
99	1	L1	0.21

Life adjustment factor a_2 for material

The factor a_2 accounts for the properties of the material and its heat treatment. $a_2=1$ is applicable to the high quality steels used in the production of normal bearing series. For elevated temperatures see reduction in dynamic load rating in table below.

Working temperature °C	150	200	250	300
Symbol	S0	S1	S2	S3
ft	1	0.73	0.42	0.22

Life adjustment factor a_{iso} for operating conditions

The efficiency of lubrication is determined primarily by the degree of separation between the rolling elements and raceways. The highest life values are reached when there is a hydrodynamic state of lubrication where metal to metal contact does not exist between rolling elements and raceway and under the cleanest conditions which would normally prevail in an adequately sealed bearing arrangement.

The a_{iso} factor can be calculated or estimated graphically. We cover the graphical method on the next page.



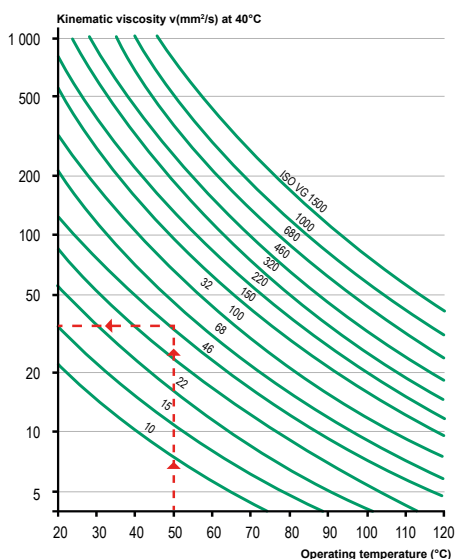
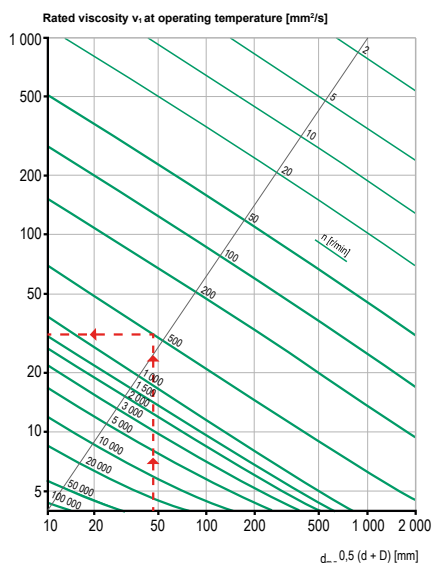
Bearing Life and Load Ratings

Define the rated viscosity V1

Define the rated viscosity based on bearing mean diameter (Dm) and speed (n). In the left graphic, find the intersection between n and Dm. Report it on the V1 axis to obtain the rated viscosity.

DEFINE THE REQUIRED ISO VG VISCOSITY

Define the required ISO VG viscosity suitable for the application (Right graphic). Mark the V_1 value on the Y axis and the operating temperature (t) on the X axis. Select a ISO VG hyperbolic above the intersection of V_1 and t. select 1 or 2 above.



FACTOR KAPPA (K)

The a_{iso} factor is based on the viscosity ratio Kappa (K). It is defined as the ratio of the actual lubricant viscosity V for the viscosity v_1 required for adequate lubrication. K should be higher than 1. With thinner lubricating films, there is an increase in metal to metal contact and life expectancy decreases.

$$kappa = V / V_1 \gg 1 \gg 4$$

Cleanliness Factor (ec)

Level of contamination	ec	
	$D_{pw} < 100 \text{ mm}$	$D_{pw} \geq 100 \text{ mm}$
Extreme cleanliness Particle size of the order of lubricant film thickness; laboratory conditions	1	1
High cleanliness Oil filtered through extremely fine filter; conditions typical of bearing greased for life and sealed	0,8 to 0,6	0,9 to 0,8
Normal cleanliness Oil filtered through fine filter; conditions typical of bearings greased for life and shielded	0,6 to 0,5	0,8 to 0,6
Slight contamination Slight contamination in lubricant	0,5 to 0,3	0,6 to 0,4
Typical contamination Conditions typical of bearings without integral seals; coarse filtering; wear particles and ingress from surroundings	0,3 to 0,1	0,4 to 0,2
Severe contamination Bearing environment heavily contaminated and bearing arrangement with inadequate sealing	0,1 to 0	0,1 to 0
Very severe contamination	0	0

Select the appropriate ec for the application.



Bearing Life and Load Ratings

CALCULATE THE LOAD RATIO

$$e_c Cu / Pe$$

Where:

e_c = Cleanliness factor

Cu = Fatigue limit load rating

Pe = Equivalent load

a_{iso} factor is

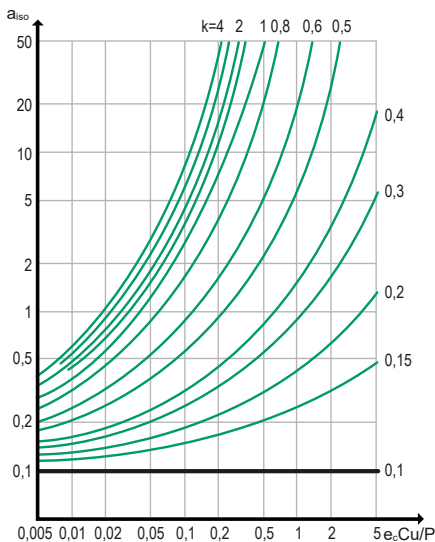
$$a_{iso} = f(k, e_c Cu / Pe)$$

Where:

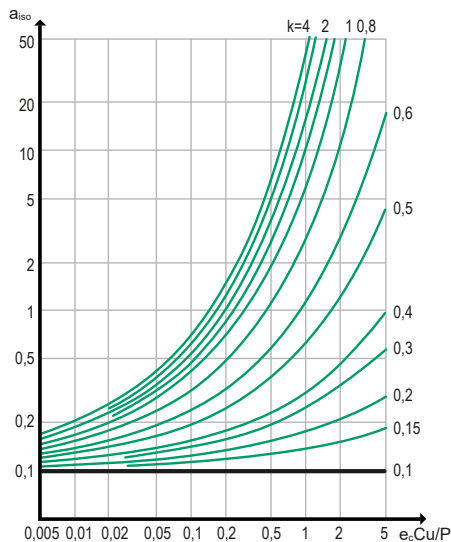
k = Kappa factor

In the below graphics, report the load factor on the X axis and select the kappa hyperbolic.

Report the intersection point on the a_{iso} axis. The a_{iso} adjustment factor. depending the bearing type, use the left graphic for ball bearing or right graphic for roller bearing



BALL



ROLLER

SERVICE LIFE

Since the fatigue life modified by the adjustment factors a , a_2 and a_{iso} only considers material fatigue as the cause of failure, the calculated life corresponds to the service life only if the following points are met:

- (a) Lubrication conditions are constant throughout.
- (b) Loads and speeds used for analysis are a true reflection of the actual operating conditions.
- (c) Operating viscosity is based on actual operating temperature.
- (d) Lubricant contamination is limited during the whole running time.
- (e) The service life limited by wear and break down of lubrication is not shorter than the fatigue life.

Wear of the acting surfaces is primarily caused by contamination which over a period of time may penetrate the bearing. The situation is made worse by inadequate lubrication and corrosion due to condensation. The amount of wear experienced in a bearing is dependent on the operating conditions, lubrication and effective sealing arrangement.

WEAR FACTOR

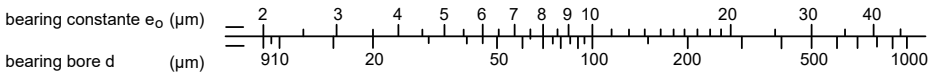
The permissible amount of wear is expressed by the wear factor f_v .

$$f_v = \frac{v}{e_o}$$

where:

v = permissible increase in radial clearance (mm)

e_o = bearing constant depending on the bore diameter – see below for e_o values in relationship with bore diameter mm.



Limiting Speed

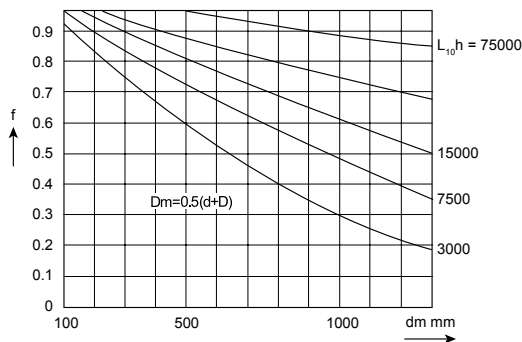
LIMITING SPEED

The maximum rotational speed of ball and roller bearings depends upon various factors. The size and design of the bearing, type of lubrication whether grease or oil, type of cage fitted and the internal clearance of the bearing when mounted.

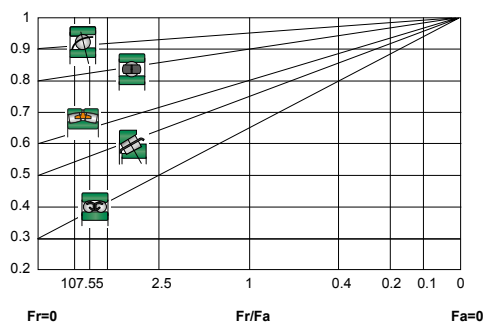
If the radial run-out, which produces out of balance forces, is reduced, then higher speeds can be obtained for such as machine-tool applications, hence the use of high precision bearings. Reduction of cage weight will also reduce out of balance forces as when made from light alloy or plastic. Cages that are centred on the inner or outer races rather than the rolling elements are used for high speed applications.

The surface of the riding lips being specially ground and lubrication between the sliding surface must be maintained. Heavier loads influence the speed and also effect the basic rating life of L10h75000 hours.

In such cases the speeds listed in the tables should be multiplied by a factor f which you can obtain from the fig. 1.



For combined loads the speeds indicated in the bearing tables are to be multiplied by the reduction factor f_1 given in diagram fig. 2.



For ball thrust bearings there must be a minimum load applied to counteract the centrifugal forces of the balls on rotation. Factor M is indicated in the bearing tables against the appropriate bearing size.

Bearing rings and rolling elements are subjected to high stresses on a very small contact area and must have a high resistance to wear as well as high elastic and fatigue limits. Primarily these are manufactured from high-carbon chromium bearing steel with a chemical composition as indicated in the table 1 below and are in accordance with SAE 52100 - 100 Cr6.

HIGH CARBON CHROMIUM BEARING STEEL Steel Grade	Chemical Composition %					
	C	Mn	Si	Cr	S	P
105Cr4	1.00..1.10	0.25..0.40	0.15..0.35	0.90...1.15	<0.025	<0.030
100Cr6 / ROL 2	0.90..1.05	0.25..0.40	0.15..0.35	1.40..1.65	<0.025	<0.025
100CrMn6	0.90..1.05	1.00..1.20	0.50..0.70	1.40...1.60	0.020	<0.025

CAGE MATERIALS

Types of cages for bearings vary in accordance with the operating conditions. The most common are those made from pressed steel. Machined cages are made from high strength copper alloys or carbon steel and for high speeds manufactured from plastic or phenolic resins.

HEAT TREATMENT

Bearings are generally used up to a temperature of maximum + 150°C. In case of higher temperatures, bearings with special heat treatments should be used. Sealed bearings, 2RS type, should be used at operating temperatures up to +80°C. If this temperature is exceeded, the efficacy of lubricants is considerably reduced.

In order to use bearings at a higher operating temperature, the bearings have to be subjected to a special heat treatment. This will ensure the dimensional stability, but will reduce the lifetime by a factor (ft) as per the table.

Operating temp °C	150	200	250	300
Symbol	S0	S1	S2	S3
ft	1	0.73	0.42	0.22

Handling of Bearings

CARE & FITTING OF BEARINGS

STORAGE

1. Store ball and roller bearings in a clean, dry place in their original wrappings. This will preserve them from deterioration.
2. Use older stocks first.
3. Do not stack too many large bearings on top of each other otherwise the protective oil could be squeezed out from between the bearing and its wrapping, thus leading to corrosion problems. Also, never store large bearings upright, but lay them flat.

FITTING

4. Absolute cleanliness is essential when handling bearings. They should not be removed from their wrappings until required for fitting. A smooth metal topped bench that can be wiped clean is a great advantage. All tools, shafts, housings and other components must be perfectly clean. If fitting operations are delayed or interrupted, the assembly should be wrapped with grease proof paper to exclude dirt and dust.
5. All bearings are usually coated with a rust preventative oil, unless pre-lubricated and/or packed to suit individual requirements. There is no need to remove this oil unless:
 - It is sufficient to cause serious dilution of the oil or grease used in the bearing. This normally applies to smaller bearings where the rust preventative oil represents a large proportion of the required amount of lubricant.
 - Low torque is required.
 - A synthetic lubricant is used that may not be compatible with the protecting oil.
6. To remove the rust preventative oil, wash the bearing in a good-quality washing fluid; white spirit or good-quality paraffin are suitable. Allow the bearings to drain thoroughly. Finally dry them, the following being satisfactory methods.

Place the bearing in an oven or on a hot plate, temperature of 65-80°C should be adequate.

Direct dry, clean, compressed air on to the bearings. The cage and rings of smaller bearings must be held firmly otherwise a sudden blast of air would rapidly accelerate the free bearing parts; this could cause the balls to skid, thus damaging the highly finished internal surfaces of the bearing.

The fits of the rings on their seating's are very important. Therefore, ensure that the shaft and housing seatings are of correct size and of good shape.

7. All shoulders must be smooth and square with the axis of rotation.
8. Never drive one ring on to its seating by blows on the other. Such blows would irretrievably damage the balls or rollers and raceways.
9. Apply pressure evenly around the rings. A press is better than a hammer.
10. Should a hammer be used, mild steel or brass tube of suitable size, faced up square, should be interposed between it and the bearing. This will distribute the force of the blows (or rather taps), which should be given progressively around the ring.

11. When the parts of a separable roller bearing are brought together, the inner ring, the outer ring and the rollers must all be square one with the other. If not square, then the rollers would not slide freely, and force would have to be used to bring the parts together. Such force would result in the rollers and raceways becoming scored and this, in addition to causing noisy running, could cause early failure of the bearing.
12. Where the ring of a bearing is to be against an abutment, make sure it is properly seated.
13. For heavy interference fits, inner rings may be shrunk onto their seatings after heating in clean mineral oil at a temperature of approximately 100%. Be sure that the bearing is in contact with the abutment shoulder after it has cooled.
14. In the case of taper clamping sleeve and nut bearings, the clamping nut must not be overtightened, this could expand the inner ring and eliminate all clearance within the bearing, or even fracture the inner ring.
15. It is recommended that when using pin spanners they should have a length of approximately five times the shaft diameter, one or two light hammer blows should be given to the handle of the spanner after the nut has been tightened as far as possible by hand pressure; this should tighten the nut sufficiently. It is good practice, if possible, to check that the sleeve is still clamped firmly to the shaft after a few days running.

As an additional precaution it is recommended that, whenever possible, the bearings are fitted so that the rotation of the shaft tends to tighten the nut on the sleeve.

When using torque spanners it is recommended that the following torques be applied to the clamping nut.

For LIGHT series bearings

Shaft Diameter	Torque on Nut
1" and 25m/m	7.6 Kgm/M (55 lbs ft)
1 1/2" and 40 m/m	12.4 Kgm/M (90 lbs ft)
2" and 50 m/m	17.25 Kgm/M (125 lbs ft)
3" and 75 m/m	30.3 Kgm/m (220 lbs ft)

For MEDIUM series bearings increase the above figures by approximately 50 percent.

DISMANTLING AND REPLACEMENT

16. Unnecessary removal of a bearing should be avoided, particularly where interference fits have been used. Removal can damage a bearing and, in some instances, cause deterioration of the interference fit. Very often it is sufficient to clean and relubricate the bearing in its fitted position.

Only remove a bearing if you need to inspect it closely. Symptoms that guide are the condition of the lubricant, the bearing temperature and noise level.

With roller journal bearings there is sometimes a ball locating bearing. this may be only push fit on the shaft, and therefore facilitates easy dismantling.

Handling of Bearings

17. In certain applications some form of extractor may be necessary. This must act directly on the ring to be removed. Never try to remove the inner ring by applying force to the outer ring, or vice versa.
18. Thrust bearings offer no difficulty as push fits should be used; but, take care to keep the rings square or they will bind.
19. Carefully protect bearings from dirt moisture while they are out of their housings.

It is advisable to wash them thoroughly immediately after removal, by the following procedure.

- Immerse in a washing fluid such as clean white spirit or good-quality paraffin. The washing fluid must not attack the bearing components. After Soaking, move each separate bearing around in the fluid, using a basket or other container if convenient. Occasional slow oscillations of the bearing rings will help to dislodge dried out grease and other matter.
- When clean, thoroughly drain and dry.



The Radial clearance is the total internal clearance between the balls or rollers in a bearing and their raceways measured normal to the axis of the bearing. This clearance compensates for (a) expansion of the inner ring and/or contraction of the outer ring when interference fits are used, (b) for differential expansion of the two ring when the inner ring of a bearing operates at a higher temperature than the outer ring; (c) accommodates the minute inaccuracies unavoidable with even the most modern methods of machining; (d) affects the end play and also affects their capacity for carrying axial loads – the greater the radial clearance, the greater the capacity for supporting axial load.

When bearings with small radial clearances are used, special attention must be given to the selection of seating dimensions.

Once ball and roller bearings are mounted and running, a small amount of radial or running clearance is normally desirable. In the case of bearings under radial load, quieter running is generally obtained when this clearance is a minimum.

Radial clearance figures for Ball and Roller bearings mentioned in our Tables are in accordance with I.S.O. 5753 recommendations.

For normal applications the general guide given in Table 1 below may be used. Excessive radial tightness in the bearing should be avoided under all conditions.

STORAGE

TABLE 1 – SUMMARIZING THE CORRECT RADIAL CLEARANCE

Radial clearance of bearing	Fit of races on seating	Possibility of temperature changes reducing radial clearance
C2	No appreciable interference either race	absent
CN	One race only interference fit	absent
C3	One race only interference fit	present
C3	Both races interference fit	absent
C4	Both races interference fit	present

C2 fit: These bearings have the smallest amounts of radial clearance. They should only be used where freedom from all play is required in the assembled bearing and there is no possibility of the initial radial clearances being eliminated by external causes. Therefore, special attention must be given to the seating dimensions, as the expansion of the inner ring or contraction of the outer ring may cause tight bearings.

CN fit: This grade of radial clearance is intended for use where only one ring is made an interference fit and there is no appreciable loss of clearance due to temperature differences. Ball and Roller bearings for general engineering applications are usually of this clearance.

C3 fit: This grade of radial clearance should be used when both rings of a bearing are made an interference fit, or when only one ring is an interference fit but there is likely to be some loss of clearance due to temperature differences. It is the grade normally employed for roller bearings on general engineering applications, especially where there is a tendency for “creep” to take place due to out-of-balance loading.

Fits and Clearance

It is also the grade normally used for ball bearings that take axial loading, but for some purposes even “C4” fit bearings may be required.

C4 fit: Where there will be some loss of clearance due to temperature differences and both races must be an interference fit, this is the grade of radial clearance to adopt. One example of its use is in bearings for vibration screen.

Where seating limits give an interference fit tighter than the recommended figures, or where temperature differences could cause radial tightness, the correct clearance can be established by calculating the maximum loss of clearance at both extremes of the following basis. A suitable clearance grade from the tables can then be selected.

Total loss of clearance = RI + RO + RT + RM

RI = Expansion of inner ring raceway due to shaft interference. (See table below).

RO = Contraction of outer ring raceway due to housing interference. (See table below).

RT = Loss of clearance due to the inner ring being at a higher temperature than the outer ring.

RM = Loss of clearance due to increase in seating interference resulting from nonferrous seating expanding or contracting at different rates from bearing steel.

Table 2 below gives approximate values for RO and RI assuming a solid shaft and substantial housing.

TABLE 2

Bearing series	Inner ring raceway expansion RI	Outer ring raceway Contraction RO
Extra light	100% interference	80% interference
Light	80% interference	60% interference
Medium and heavy	70% interference	50% interference

For the clearance tables, refer to the bearing type chapter

SHAFT TOLERANCES FOR CYLINDRICAL BORE BEARINGS

Type of Load	Bearing type	Diameter	Axial Movement Magnitude of Load	Tolerance field	
Rotating Outer Ring Load	Ball& Roller Bearing	All sizes	Angular contact ball bearing and tapered roller bearing adjustment via inner ring	g6 h6 h6	(g5) (h5) (j6)
Rotating Inner Ring or indeterminate Load	Ball Bearing	Up to 40mm	normal load	J6	(j5)
		Up to 100mm	low load normal & high load	J6 k6	(j5) (k5)
		Up to 200mm	low load normal & high load	K6 m6	(k5) (m5)
		Over 200mm	normal load high load, shock load	M6 n6	(m5) (n5)
-	Roller Bearing	Up to 60mm	low load normal & high load	J6 k6	(j5) (k5)
		Up to 200mm	low load normal load high load	K6 m6 n6	(k5) (m5) (n5)
		Up to 500mm	normal load high load, shock load	m6 p6	(m5)
		Over 500mm	normal load high load	N6 p6	(n5)

Shaft and Housing Fits

SHAFT TOLERANCES FOR THRUST BEARINGS

Type of Load	Bearing type	Diameter	Operating conditions	Tolerance field	
Thrust load	thrust ball bearings	all sizes		J6	
	thrust ball bearings double acting	all sizes		J6	(k6)
	cylindrical roller thrust bearing	all sizes		h6	(j6)
	thrust cylindrical roller & cage assembly	all sizes		h10	
	thrust cylindrical roller & cage assembly or thrust needle roller & cage assembly	all sizes		h8	
Combined Load	spherical roller thrust bearing	all sizes	point load on shaft washer	j6	
		up to 200mm	circumferential	j6	(k6)
		over 200 mm	load on shaft washer	k6	(m6)

ADAPTER SLEEVES, WITHDRAWAL SLEEVES

	Permissible geometrical inaccuracy (out-of-roundness taper)	Tolerance field
Adapter sleeves and withdrawal sleeves	IT 5/2	H7
	IT 5/2	h8
	IT 6/2	h9

SHAFT TOLERANCES FOR ADAPTER SLEEVES AND WITHDRAWAL SLEEVES

d mm		H7		IT 5/2	h8		IT 5/2	h9		IT 6/2
μm										
over	up to	upper	lower	max.	upper	lower	max.	upper	lower	max.
0	0	0	0	0	0	0	0	0	0	0
6	10	0	-15	3	0	-22	3	0	-36	4.5
10	18	0	-18	4	0	-27	4	0	-43	5.5
18	30	0	-21	4.5	0	-39	4.5	0	-52	6.5
30	50	0	-25	5.5	0	-39	5.5	0	-62	8
50	80	0	-30	6.5	0	-46	6.5	0	-74	9.5
80	120	0	-35	7.5	0	-54	7.5	0	-87	11
120	180	0	-40	9	0	-63	9	0	-100	12.5
180	250	0	-46	10	0	-72	10	0	-115	14.5
250	315	0	-52	11.5	0	-81	11.5	0	-130	16
315	400	0	-57	12.5	0	-89	12.5	0	-140	18
400	500	0	-63	13.5	0	-97	13.5	0	-155	20

Note: IT basic tolerances indicate accepted from circularity and cylindricity

HOUSING TOLERANCES FOR RADIAL BEARING

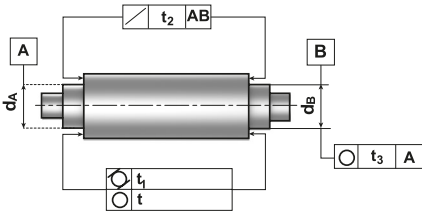
Type of Load	Axial Movement Magnitude of Load	Operation Conditions	Tolerance field	
Rotating inner Ring Load	Outer Ring slides in Housing	closeness of tolerance function of running accuracy	H7	(H6)
		high running accuracy	H7	(J6)
		standard running accuracy	H7	(J6)
		temperature increase through shaft	G7	
Rotating Outer Ring Load or indeterminate load	low load	with high running accuracy requirements K6, M6, N6 and P6	K7	(KJ6)
	normal load, shock load		M7	(M6)
	high load, shock load		N7	(N6)
	high load, heavy shock load thin-walled housings		P7	(P6)

Shaft and Housing Fits

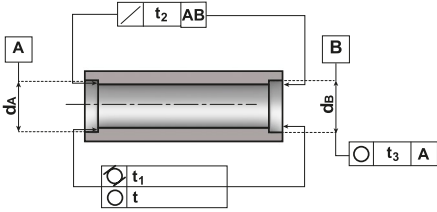
SHAFT TOLERANCES FOR THRUST BEARINGS

Type of load	Bearing type	Operating conditions	Tolerance field	
Thrust load	thrust ball bearings	standard running accuracy	E8	(K6)
		high running accuracy	E6	
	cylindrical roller thrust bearing		H7	
		thrust cylindrical roller & cage assembly	H11	
		thrust cylindrical roller & cage assembly	H10	
	spherical roller thrust bearing	normal load	E8	
		high load	G7	
Radial & axial loads on spherical roller thrust bearings	stationary load on housing washer		H7	
	rotating load on housing washer		M7	

Accuracy of shaft



Accuracy of housing



Description	Fit	Symbol of tolerance		Allowable tolerances depending on precision classes				
				P0	P6	P5	P4(SP)	P2(UP)
Dimensional accuracy	shaft	--		IT 6	IT 5	IT 4	IT 4	IT 3
	housing			IT 7	IT 6	IT 5	IT 5	IT 4
Roundness	shaft		t_1	IT 4	IT 3	IT 2	IT 1	IT 0
	housing			IT 5	IT 4	IT 3	IT 2	IT 1
Cylindricity	shaft		t_2	IT 3	IT 3	IT 2	IT 1	IT 0
	housing			IT 4	IT 3	IT 3	IT 2	IT 1
Runout	shaft		t_3	IT 3	IT 3	IT 2	IT 1	IT 0
	housing			IT 4	IT 3	IT 2	IT 2	IT 1
Eccentricity	shaft		t_e	IT 5	IT 4	IT 4	IT 3	IT 3
	housing			IT 6	IT 5	IT 5	IT 4	IT 3

Shaft and Housing Fits

BASIC TOLERANCE RANGE ISO-IT

d; D		IT 0	IT 1	IT 2	IT 3	IT 4	IT 5	IT 6	IT 7	IT 8
from	to									
mm		μm								
1	3	0.5	0.8	1.2	2	2	4	6	10	14
3	6	0.6	1	1.5	2.5	4	5	8	12	18
6	10	0.6	1	1.5	2.5	4	6	9	15	22
10	18	0.8	1.2	2	3	5	8	11	18	27
18	30	1	1.5	2.5	4	6	9	13	21	33
30	50	1	1.5	2.5	4	7	11	16	25	39
50	80	1.2	2	3	5	8	13	19	30	46
80	120	1.5	2.5	4	6	10	15	22	35	54
120	180	2	3.5	5	8	12	18	25	40	63
180	250	3	4.5	7	10	14	20	28	46	72
250	315	4	6	8	12	16	23	32	52	81
315	400	5	7	9	13	18	25	36	57	89
400	500	6	8	10	15	20	27	40	63	97

DEVIATION OF SHAFT DIAMETERS 0,001 mm

Nominal diameter		g5		g6		h5		h6		h8		h10		j5	
over	inc	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	6	-4	-9	-4	-12	0	-5	0	-8	0	-18	0	-48	+3	-2
6	10	-5	-11	-5	-14	0	-6	0	-9	0	-22	0	-58	+4	-2
10	18	-6	-4	-6	-17	0	-8	0	-11	0	-27	0	-70	+5	-3
18	30	-7	-16	-7	-20	0	-9	0	-13	0	-33	0	-84	+5	-4
30	50	-9	-20	-9	-25	0	-11	0	-16	0	-39	0	-100	+6	-5
50	80	-10	-23	-10	-29	0	-13	0	-19	0	-46	0	-120	+6	-7
80	120	-12	-27	-12	-34	0	-15	0	-22	0	-54	0	-140	+6	-9
120	180	-14	-32	-14	-39	0	-18	0	-25	0	-63	0	-160	+7	-11
180	250	-15	-35	-15	-44	0	-20	0	-29	0	-72	0	-185	+7	-13
250	315	-17	-40	-17	-49	0	-23	0	-32	0	-81	0	-210	+7	-16
316	400	-18	-43	-18	-54	0	-25	0	-36	0	-89	0	-230	+7	-18
400	500	-20	-47	-20	-60	0	-27	0	-40	0	-97	0	-250	+7	-20

DEVIATION OF HOUSING DIAMETERS 0,001 mm

Nominal diameter		E8		G6		G7		H6		H7		H10		H11		J6	
over	inc	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
6	10	+47	+25	+14	+5	+20	+5	+9	0	+15	0	+58	0	+90	0	+5	-4
10	18	+59	+32	+17	+6	+24	+6	+11	0	+18	0	+70	0	+110	0	+6	-5
18	30	+73	+40	+20	+7	+28	+7	+13	0	+21	0	+84	0	+130	0	+8	-5
30	50	+89	+50	+25	+9	+34	+9	+16	0	+25	0	+100	0	+160	0	+10	-6
50	80	+106	+60	+29	+10	+40	+10	+19	0	+30	0	+120	0	+190	0	+13	-6
80	120	+126	+72	+34	+12	+47	+12	+22	0	+35	0	+140	0	+220	0	+16	-6
120	180	+148	+85	+39	+14	+54	+14	+25	0	+40	0	+160	0	+250	0	+18	-7
180	250	+172	+100	+44	+15	+61	+15	+29	0	+46	0	+185	0	+290	0	+22	-7
250	315	+191	+110	+49	+17	+69	+17	+32	0	+52	0	+210	0	+320	0	+25	-7
315	400	+214	+125	+54	+18	+75	+18	+36	0	+57	0	+230	0	+360	0	+29	-7
400	500	+232	+135	+60	+20	+83	+20	+40	0	+63	0	+250	0	+400	0	+33	-7

DEVIATION OF HOUSING DIAMETERS 0,001 mm

Nominal diameter		j6		k5		k6		m5		m6		n5		n6		p6	
over	inc	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	6	+6	-2	+6	+1	+9	+1	+9	+4	+12	+4	+13	+8	+16	+8	+20	+12
6	10	+7	-2	+7	+1	+10	+1	+12	+6	+15	+6	+16	+10	+19	+10	+24	+15
10	18	+8	-3	+9	+	+12	+1	+15	+7	+18	+7	+20	+12	+23	+12	+29	+18
18	30	+9	-4	+11	+2	+15	+2	+17	+8	+21	+8	+24	+15	+28	+15	+35	+22
30	50	+11	-5	+13	+2	+18	+2	+20	+9	+25	+9	+28	+17	+33	+17	+42	+26
50	80	+12	-7	+15	+2	+21	+2	+24	+11	+30	+11	+33	+20	+39	+20	+51	+32
80	120	+13	-9	+18	+3	+25	+3	+28	+13	+35	+13	+38	+23	+45	+23	+59	+37
120	180	+14	-11	+21	+3	+28	+3	+33	+15	+40	+15	+45	+27	+52	+27	+66	+43
180	250	+16	-13	+24	+4	+33	+4	+37	+17	+46	+17	+51	+31	+60	+31	+79	+50
250	315	+16	-16	+27	+4	+36	+4	+43	+20	+52	+20	+57	+34	+66	+34	+88	+56
316	400	+18	-18	+29	+4	+40	+4	+46	+21	+57	+21	+62	+37	+73	+37	+98	+62
400	500	+20	-20	+32	+5	+45	+5	+50	+23	+63	+23	+67	+40	+80	+40	+108	+68

Shaft and Housing Fits

DEVIATION OF SHAFT DIAMETERS 0,001 mm

Nominal diameter		j6		k5		k6		m5		m6		n5		n6		p6	
over	inc	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	6	+6	-2	+6	+1	+9	+1	+9	+4	+12	+4	+13	+8	+16	+8	+20	+12
6	10	+7	-2	+7	+1	+10	+1	+12	+6	+15	+6	+16	+10	+19	+10	+24	+15
10	18	+8	-3	+9	+	+12	+1	+15	+7	+18	+7	+20	+12	+23	+12	+29	+18
18	30	+9	-4	+11	+2	+15	+2	+17	+8	+21	+8	+24	+15	+28	+15	+35	+22
30	50	+11	-5	+13	+2	+18	+2	+20	+9	+25	+9	+28	+17	+33	+17	+42	+26
50	80	+12	-7	+15	+2	+21	+2	+24	+11	+30	+11	+33	+20	+39	+20	+51	+32
80	120	+13	-9	+18	+3	+25	+3	+28	+13	+35	+13	+38	+23	+45	+23	+59	+37
120	180	+14	-11	+21	+3	+28	+3	+33	+15	+40	+15	+45	+27	+52	+27	+66	+43
180	250	+16	-13	+24	+4	+33	+4	+37	+17	+46	+17	+51	+31	+60	+31	+79	+50
250	315	+16	-16	+27	+4	+36	+4	+43	+20	+52	+20	+57	+34	+66	+34	+88	+56
316	400	+18	-18	+29	+4	+40	+4	+46	+21	+57	+21	+62	+37	+73	+37	+98	+62
400	500	+20	-20	+32	+5	+45	+5	+50	+23	+63	+23	+67	+40	+80	+40	+108	+68

DEVIATION OF HOUSING DIAMETERS 0,001 mm

Nominal diameter		J7		K6		K7		M6		M7		N6		N7		P6		P5	
over	inc	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
6	10	+8	-7	+2	-7	+5	-10	-3	-12	0	-15	-7	-16	-4	-19	-12	-21	-9	-24
10	18	+10	-8	+2	-9	+6	-12	-4	-15	0	-18	-9	-20	-5	-23	-15	-26	-11	-29
18	30	+12	-9	+2	-11	+6	-15	-4	-17	0	-21	-11	-24	-7	-28	-18	-31	-14	-35
30	50	+14	-11	+3	-13	+7	-18	-4	-20	0	-25	-12	-28	-8	-33	-21	-37	-17	-42
50	80	+18	-12	+4	-15	+9	-21	-5	-24	0	-30	-14	-33	-9	-39	-26	-45	-21	-51
80	120	+22	-13	+4	-18	+10	-25	-6	-28	0	-35	-16	-38	-10	-45	-30	-52	-24	-59
120	180	+26	-14	+4	-21	+12	-28	-8	-33	0	-40	-20	-45	-12	-52	-36	-61	-28	-68
180	250	+30	-16	+5	-24	+13	-33	-8	-37	0	-46	-22	-51	-14	-60	-41	-70	-33	-79
250	315	+36	-16	+5	-27	+16	-36	-9	-41	0	-52	-25	-57	-14	-66	-47	-79	-36	-88
315	400	+39	-18	+7	-29	+17	-40	-10	-46	0	-57	-26	-62	-16	-73	-51	-87	-41	-98
400	500	+43	-20	+8	-32	+18	-45	-10	-50	0	-63	-27	-67	-17	-80	-55	-95	-45	-108

FITS

Tolerances for the boundary dimensions of bearings are to ISO standards. To ensure satisfactory performance of the bearing under variable operating conditions, it is necessary to select suitable fits between the inner ring and the shaft and the outer ring and the housing.

When selecting the correct fits from the ISO range of shaft and housing tolerances, it is necessary to consider adequate radial support of the bearing, ease of mounting and dismounting, and allowance for axial movement of the free bearing.

Selection of the fit also depends on the loading on the bearing and on the operating temperature. It should be noted that tight fits reduce the internal clearance of the bearing, and allowance should be made when selecting the bearing clearance.

TOLERANCES

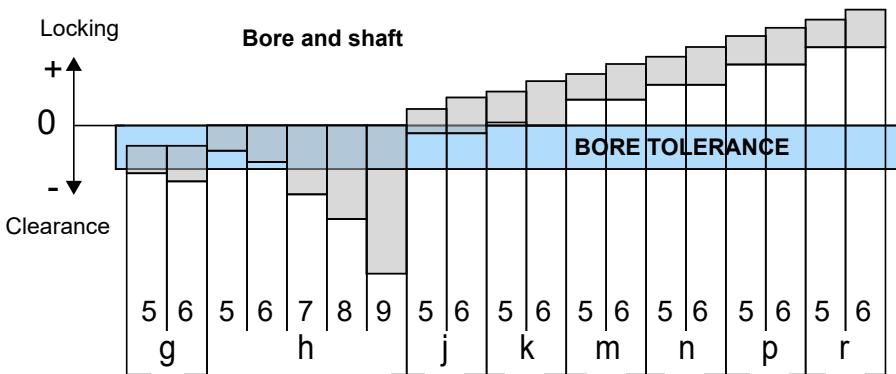
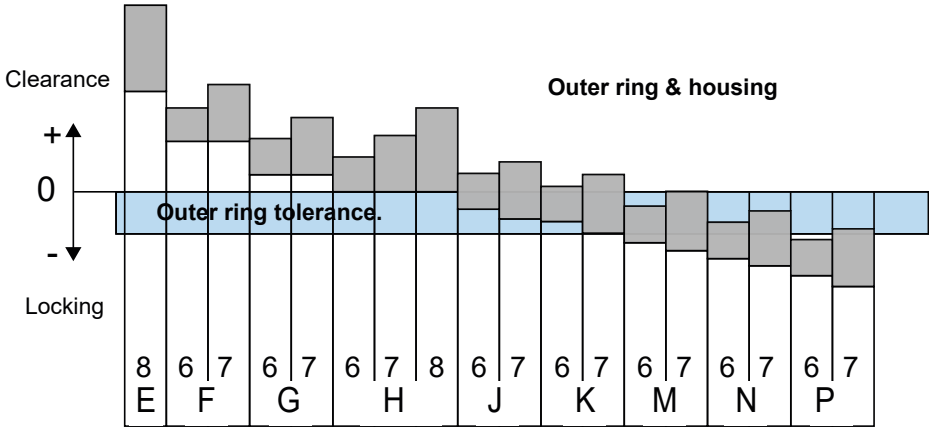
The boundary dimensions and tolerances of rolling bearings have been standardized by ISO. Bearings are manufactured to normal class 0 tolerances, unless otherwise stated. Tolerances are also listed for the closer-than-normal limits required, for example, in machine tool and high speed applications.

The more common ISO norms referred to are as follows:

ISO 15-2011	Rolling bearings – Radial bearings – Boundary dimensions
ISO 104-2002	Thrust bearings with flat housing washers – Boundary dimensions
ISO 199-2005	Rolling bearings – Thrust ball bearings – Tolerances
ISO 355-2007	Metric tapered roller bearing - Boundary dimensions
ISO 464-2002	Rolling bearings with locating snap ring – Dimensions
ISO 492-2002	Radial bearings – Tolerances
ISO 1132-2001	Rolling bearings – Tolerances – Definitions
ISO 5753-2009	Rolling bearings – Radial internal clearances



Shaft and housing fits



INTRODUCTION

The dimensional and running accuracies of our bearings are standardized according to ISO.

BORE DIAMETER

d	Nominal bore diameter
d_1	Nominal large diameter of tapered bore
d_s	Single bore diameter
Δd_s	Deviation of a single bore diameter
v_{ds}	Bore diameter variation
D_m	Mean bore diameter
Δd_m	Mean bore diameter deviation
D_{mp}	Single plane mean bore diameter
Δd_{mp}	Single plane mean bore diameter deviation
Δd_{1mp}	Deviation of mean large diameter from nominal-tapered bore
V_{DP}	Bore diameter variation in a single radial plane
V_{DMP}	Mean bore diameter variation
α	Taper angle

OUTSIDE DIAMETER

D	Nominal outside diameter
D_s	Single outside diameter
v_{Ds}	Deviation of a single outside diameter
D_m	Mean outside diameter
ΔD_m	Mean outside diameter deviation
D_{mp}	Single plane mean outside diameter
ΔD_{mp}	Single plane outside diameter deviation
V_{DP}	Outside diameter variation in a single radial plane
V_{DMP}	Mean outside diameter variation



Tolerances

ROLLING BEARING TOLERANCE SYMBOL

OUTSIDE DIAMETER

B	Nominal inner ring width
V	Nominal outer ring width
Bs	Single inner ring width
Cs	Single outer ring width
ΔB_s	Deviation of a single inner ring width
ΔC_s	Deviation of a single outer ring width
$\sqrt{B_s}$	inner ring width variation
$\sqrt{C_s}$	Outer ring width variation
Bm	Mean inner ring width

RADIAL RUN OUT

Kla	Radial run out of assembled bearing inner ring
Kea	Radial run out of assembled bearing outer ring
Sd	Face run out with bore
SD	Variation of outside surface inclination with face
Sl _a	Assembled bearing inner ring face run out with raceway
Se _a	Assembled bearing outer ring face run out with raceway
D1	Nominal diameter of outer ring flange
T	Nominal width of tapered roller bearing
ΔT_s	Deviation in width of tapered roller bearing at single position
T1	Nominal width of tapered roller bearing-cone
ΔT_{1s}	Deviation of width of tapered roller bearing-cone
T2	Nominal width of tapered roller bearing-cup
ΔT_{2s}	Deviation of width of tapered roller bearing-cup
d2	Nominal shaft washer diameter – double acting thrust bearing
Δd_{2p}	Deviation of shaft washer mean bore diameter single plane
Dw	Nominal diameter of roller
Dwm	Mean diameter of roller
Lw	Nominal length of roller

PRECISION CLASS P0 - INNER RING

d mm		Δdmp		V _{dp} Diameter ranges			V _{dmp}	K _{ia}	ΔBs				V _{Bs}
				7,8,9	0,1	2,3,4					Modified ²⁾		
over	up to	upper	lower	max.			max.	max.	upper	lower	upper	lower	max.
0,6 ¹⁾	2,5	0	-8	10	8	6	6	10	0	-40	-	-	12
2,5	10	0	-8	10	8	6	6	10	0	-120	0	-250	15
10	18	0	-8	10	8	6	6	10	0	-120	0	-250	20
18	30	0	-10	13	10	8	8	13	0	-120	0	-250	20
30	50	0	-12	15	12	9	9	15	0	-120	0	-250	20
50	80	0	-15	19	19	11	11	20	0	-150	0	-380	25
80	120	0	-20	25	25	15	15	25	0	-200	0	-380	25
120	180	0	-25	31	31	19	19	30	0	-250	0	-500	30
180	250	0	-30	38	38	23	23	40	0	-300	0	-500	30
250	315	0	-35	44	44	26	26	50	0	-350	0	-500	35
315	400	0	-40	50	50	30	30	60	0	-400	0	-500	40
400	500	0	-45	56	56	34	34	65	0	-450	0	-630	50
500	630	0	-50	63	63	38	38	70	0	-500	-	-	60
630	800	0	-75	-	-	-	-	80	0	-750	-	-	70
800	1000	0	-100	-	-	-	-	90	0	-1000	-	-	80
1000	1250	0	-125	-	-	-	-	100	0	-1250	-	-	100
1250	1600	0	-160	-	-	-	-	120	0	-1600	-	-	120
1600	2000	0	-200	-	-	-	-	140	0	-2000	-	-	140
-	-	-	-	-	-	-	-	-	-	-	-	-	-

Tolerances in μm

1) Including this dimension

2) Only for bearings mounted in sets

Tolerances

PRECISION CLASS RADIAL BEARING - METRIC SIZE - PRECISION CLASS PO

OUTER RING

D mm		ΔDmp		V _{dp2)} Open Bearings Diameter ranges			Sealed bearings	V _{dmp2)}	K _{ea}	ΔCs	VCs
				7,8,9	0,1	2,3,4	2,3,4				
over	up to	upper	lower	max.			max.	max.	max.		
2,5 ¹⁾	6	0	-8	10	8	6	10	6	10	Identical with ΔBs and VBs of the inner ring of the same bearing	
6	18	0	-8	10	8	6	10	6	10		
18	30	0	-9	12	9	7	12	6	10		
30	50	0	-11	14	11	8	16	8	13		
50	80	0	-13	16	13	10	20	9	15		
80	120	0	-15	19	19	11	26	11	20		
120	150	0	-18	23	23	14	30	15	25		
150	180	0	-25	31	31	19	38	19	30		
180	250	0	-30	38	38	23	-	23	40		
250	315	0	-35	44	44	26	-	26	50		
315	400	0	-40	50	50	30	-	30	60		
400	500	0	-45	56	56	34	-	34	65		
500	630	0	-50	63	63	38	-	38	70		
630	800	0	-75	94	94	55	-	-	80		
800	1000	0	-100	125	125	75	-	-	90		
1000	1250	0	-125	-	-	-	-	-	100		
1250	1600	0	-160	-	-	-	-	-	120		
1600	2000	0	-200	-	-	-	-	-			
2000	2500	0	-250	-	-	-	-	-	140		

Tolerances in μm

- 1) Including this dimension
- 2) Main diameter variation before fitting snap rings

PRECISION CLASS RADIAL BEARINGS WITH TAPERED BORE

Precision class P0

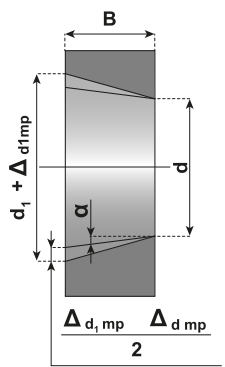
Tolerances in μm

d mm		$\Delta d_{mp}^{1)}$		$\Delta d_{1mp} - \Delta d_{mp}^{2)}$		$\sqrt{dp}^{3)}$
over	to	upper	lower	upper	lower	max.
-	10	+15	0	+15	0	10
10	18	+18	0	+18	0	10
18	30	+21	0	+21	0	13
30	50	+25	0	+25	0	15
50	80	+30	0	+30	0	19
80	120	+35	0	+35	0	25
120	180	+40	0	+40	0	31
180	250	+46	0	+46	0	38
250	315	+52	0	+52	0	44
315	400	+57	0	+57	0	50
400	500	+63	0	+63	0	56

- 1) Single plane main bore diameter deviation at smallest theoretical opening
- 2) Main diameter deviation of large diameter less main diameter eviation from smaller diameter
- 3) Bore diameter variation in a single radial plane

Tolerances For Tapered Bores – Taper 1:12

Nominal dimensions



$\alpha = 2^{\circ}23'9,4'' = 2.38594^{\circ} = 0.041643 \text{ rad}$
half the angle of taper

Tolerances

PRECISION CLASS RADIAL BEARINGS - METRIC SIZE - PRECISION CLASS P6

PRECISION CLASS P6 - INNER RING

d mm		Δdmp		V _{dp} Diameter ranges			V _{dmp}	K _{ia}	ΔBs				V _{Bs}
				7,8,9	0,1	2,3,4					Modified ²⁾		
over	up to	upper	lower	max.			max.	max.	upper	lower	upper	lower	max.
0,6 ¹⁾	2,5	0	-7	9	7	5	5	5	0	-40	-	-	12
2,5	10	0	-7	9	7	5	5	6	0	-120	0	-250	15
10	18	0	-7	9	7	5	5	7	0	-120	0	-250	20
18	30	0	-8	10	8	6	6	8	0	-120	0	-250	20
30	50	0	-10	13	10	8	8	10	0	-120	0	-250	20
50	80	0	-12	15	15	9	9	10	0	-150	0	-380	25
80	120	0	-15	19	19	11	11	13	0	-200	0	-380	25
120	180	0	-18	23	23	14	14	18	0	-250	0	-500	30
180	250	0	-22	28	28	17	17	20	0	-300	0	-500	30
250	315	0	-25	31	31	19	19	25	0	-350	0	-500	35
315	400	0	-30	38	38	23	23	30	0	-400	0	-630	40
400	500	0	-35	44	44	26	26	35	0	-450	-	-	50
500	630	0	-40	50	50	30	30	40	0	-500	-	-	60

1) Including this dimension

2) Only for bearings mounted in sets
Tolerances in μm

OUTER RING

D mm		ΔDm p		VDp ²⁾ Open Bearings Diameter ranges			Sealed bearings	VDmp ²⁾	K _{ea}	ΔCs	VCs
				7,8,9,	0,1	2,3,4	2,3,4				
over	up to	upper	lower	max.			max.	max.	max.		
2,5 ¹⁾	6	0	-7	9	7	5	9	5	8	Identical with ΔBs and VBs of the inner ring of the same bearing	
6	18	0	-7	9	7	5	9	5	8		
18	30	0	-8	10	8	6	10	6	9		
30	50	0	-9	11	9	7	13	7	10		
50	80	0	-11	14	11	8	16	8	13		
80	120	0	-13	16	16	10	20	10	18		
120	150	0	-15	19	19	11	25	11	20		
150	180	0	-18	23	23	14	30	14	23		
180	250	0	-20	25	25	15	-	15	25		
250	315	0	-25	31	31	19	-	19	30		
315	400	0	-28	35	35	21	-	21	35		
400	500	0	-33	41	41	25	-	25	40		
500	630	0	-38	48	48	29	-	29	50		
630	800	0	-45	56	56	34	-	34	60		
800	1000	0	-60	75	75	45	-	45	75		

Tolerances in μm

Tolerances

PRECISION CLASS RADIAL BEARINGS - METRIC SIZE - PRECISION CLASS P5

PRECISION CLASS P5 - INNER RING

d mm		cylindrical bore			Δds		tapered bore				ΔBs	√Bs	K _{ia}	Sd	Sia
		Δdmp, Δds √dp	V _{dp} Δd1mp - Δdmp												
from	to	lower	upper	max.	lower	upper	max.	lower	upper	lower	upper	max.	max.	max.	max.
18	30	-6	0	3	0	+10	3	0	+4	-100	0	5	3	8	8
30	50	-8	0	4	0	+12	4	0	+6	-120	0	5	4	8	8
50	80	-9	0	5	0	+15	5	0	+6	-150	0	6	4	8	8
80	120	-10	0	5	0	+20	5	0	+8	-200	0	7	5	9	9
120	180	-13	0	7	0	+25	7	0	+8	-250	0	8	6	10	10
180	250	-15	0	8	0	+30	8	0	+10	-300	0	10	8	11	13
250	315	-15	0	9	0	+35	9	0	+12	-350	0	13	8	13	15
315	400	-23	0	12	0	+40	12	0	+12	-400	0	15	10	15	20
400	500	-27	0	14	0	+45	14	0	+14	-400	0	17	10	17	23

Tolerances in μm

PRECISION CLASS P5 - OUTER RING

D mm		$\Delta D_{mp}, \Delta D_s$		V_{dp}	K_{ea}	SD	Sea
from	to	lower	upper	max.	max.	max.	max.
30	50	-7	0	4	5	8	8
50	80	-9	0	5	5	8	10
80	120	-10	0	5	6	9	11
120	150	-11	0	6	7	10	13
150	180	-13	0	7	8	10	14
180	250	-15	0	8	10	11	15
250	315	-18	0	9	11	13	18
315	400	-20	0	10	13	13	20
400	500	-23	0	12	15	15	23
500	630	-28	0	14	17	18	25
630	800	-35	0	18	20	20	30

Tolerances in μm

PRECISION CLASS P4 - INNER RING

d mm		cylindrical bore			Δds		tapered bore				ΔBs	√Bs	K _{ia}	Sd	Sia
		Δdmp, Δds V _{dp}					V _{dp} Δd1mp - Δdmp								
from	to	lower	upper	max.	lower	upper	max.	lower	upper	lower	upper	max.	max.	max.	max.
18	30	-5	0	2.5	0	+6	2.5	0	+2	-25	0	1.5	1.5	3	3
30	50	-6	0	3	0	+7	3	0	+3	-30	0	2	2	3	3
50	80	-7	0	3.5	0	+8	3.5	0	+3	-40	0	3	2	4	3
80	120	-8	0	4	0	+10	4	0	+4	-50	0	3	3	4	4
120	180	-10	0	5	0	+12	5	0	+4	-60	0	4	3	5	6
180	250	-12	0	6	0	+14	6	0	+5	-75	0	5	4	6	7
250	315	-15	0	8	0	+15	8	0	+6	-100	0	5	4	6	8
315	400	-19	0	10	0	+17	10	0	+6	-100	0	6	5	7	9
400	500	-23	0	12	0	+19	12	0	+7	-100	0	7	5	8	10

Tolerances in μm

PRECISION CLASS UP - OUTER RING

D mm		$\Delta Dmp, \Delta Ds$		V_{dp}	K_{ea}	SD	Sea
from	to	lower	upper	max.	max.	max.	max.
30	50	-5	0	3	3	2	4
50	80	-6	0	3	3	2	4
80	120	-7	0	4	3	3	5
120	150	-8	0	4	4	3	6
150	180	-9	0	5	4	3	7
180	250	-10	0	5	5	4	9
250	315	-12	0	6	6	4	9
315	400	-14	0	7	7	5	12
400	500	-17	0	9	8	5	12
500	630	-20	0	10	9	6	14
630	800	-25	0	13	11	7	17

Tolerances in μm

Tolerances

PRECISION CLASS TAPERED ROLLER BEARING - METRIC SIZE

PRECISION CLASS P0

PRECISION CLASS P0 - INNER RING

d mm		ΔD_{mp}		$\sqrt{dp}$	$\sqrt{dmp}$	K_{ia}
over	up to	upper	lower	max.	max.	max.
10	18	0	-12	12	9	15
18	30	0	-12	12	9	18
30	50	0	-12	12	9	20
50	80	0	-15	15	11	25
80	120	0	-20	20	15	30
120	180	0	-25	25	19	35
180	250	0	-30	30	23	50
250	315	0	-35	35	26	60
315	400	0	-40	40	30	70

Tolerances in μm

OUTER RING

D mm		ΔD_{mp}		$\sqrt{Dp}$	$\sqrt{Dmp}$	K_{ea}
over	up to	upper	lower	max.	max.	max.
18	30	0	-12	12	9	18
30	50	0	-14	14	11	20
50	80	0	-16	16	12	25
80	120	0	-18	18	14	35
120	150	0	-20	20	15	40
150	180	0	-25	25	19	45
180	250	0	-30	30	23	50
250	315	0	-35	35	26	60
315	400	0	-40	40	30	70
400	500	0	-45	45	34	80
500	630	0	-50	50	38	100

Tolerances in μm

Note: the limit tolerance of the outer diameter D1 of a flanged bearing is h9

PRECISION CLASS P0 - WITH OF INNER, OUTER RING AND HEIGHT

d mm		$\Delta BS, \Delta CS$		ΔTS		$\Delta T1S$		$\Delta T2S$	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower
10	18	0	-120	+120	0	+100	0	+100	0
18	30	0	-120	+200	0	+100	0	+100	0
30	50	0	-120	+200	0	+100	0	+100	0
50	80	0	-150	+200	0	+100	0	+100	0
80	120	0	-200	+200	-200	+100	-100	+100	-100
120	180	0	-250	+350	-250	+150	-150	+200	-100
180	250	0	-300	+350	-250	+150	-150	+200	-100
250	315	0	-350	+350	-250	+150	-150	+200	-100
315	400	0	-400	+400	-400	+200	-200	+200	-200

Tolerances in μm

PRECISION CLASS P6X

D mm		ΔBs		ΔCs		ΔTs		$\Delta T1s$		$\Delta T2s$	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
10	18	0	-50	0	-100	+100	0	+50	0	+50	0
18	30	0	-50	0	-100	+100	0	+50	0	+50	0
30	50	0	-50	0	-100	+100	0	+50	0	+50	0
50	80	0	-50	0	-100	+100	0	+50	0	+50	0
80	120	0	-50	0	-100	+100	0	+50	0	+50	0
120	180	0	-50	0	-100	+150	0	+50	0	+100	0
180	250	0	-50	0	-100	+150	0	+50	0	+100	0
250	315	0	-50	0	-100	+200	0	+100	0	+100	0
315	400	0	-50	0	-100	+200	0	+100	0	+100	0

Tolerances in μm

The limit tolerances for the diameter and the radial run-out of the outer ring and the inner ring in this precision class are the same with precision class P0.

The limit tolerances for the width and mounting height for the outer and inner ring are those indicated below.

Tolerances

PRECISION CLASS TAPERED ROLLER BEARINGS - METRIC SIZE

PRECISION CLASS P4

PRECISION CLASS P5 - INNER RING

d mm		Δd_{mp}		V_{dp}	VD_{MP}	K_{ia}	S_d	ΔB_s		ΔT_s	
over	up to	upper	lower	max.	max.	max.	max.	upper	lower	upper	lower
10	18	0	-7	5	5	5	7	0	-200	+200	-200
18	30	0	-8	6	5	5	8	0	-200	+200	-200
30	50	0	-10	8	5	6	8	0	-240	+200	-200
50	80	0	-12	9	6	7	8	0	-300	+200	-200
80	120	0	-15	11	8	8	9	0	-400	+200	-200
120	180	0	-18	14	9	11	10	0	-500	+350	-250
180	250	0	-22	17	11	13	11	0	-600	+350	-250

Tolerances in μm

OUTER RING

D mm		ΔD_{mp}		V_{dp}	VD_{MP}	K_{ea}	SD	ΔC_s
over	up to	upper	lower	max.	max.	max.	max.	
18	30	0	-8	6	5	6	8	Identical with ΔB_s of the inner ring of the same bearing
30	50	0	-9	7	5	7	8	
50	80	0	-11	8	6	8	8	
80	120	0	-13	10	7	10	9	
120	150	0	-15	11	8	11	10	
150	180	0	-18	14	9	13	10	
180	250	0	-20	15	10	15	11	
250	315	0	-25	19	13	18	13	
315	400	0	-28	22	14	20	13	

Tolerances in μm

The limit tolerance of the outer diameter D_1 of a flanged bearing is h9.

PRECISION CLASS P4 - INNER RING

d mm		$\Delta d_{mp}, ds$		V_{dp}	VD_{MP}	K_{ia}	Sd	Sia	ΔBs		ΔTs	
over	up to	upper	lower	max.	max.	max.	max.	max.	upper	lower	upper	lower
10	18	0	-5	4	4	3	3	3	0	-200	+200	-200
18	30	0	-6	5	4	3	4	4	0	-200	+200	-200
30	50	0	-8	6	5	4	4	4	0	-240	+200	-200
50	80	0	-9	7	5	4	4	4	0	-300	+200	-200
80	120	0	-10	8	5	5	5	5	0	-400	+200	-200
120	180	0	-13	10	7	6	7	7	0	-500	+350	-250
180	250	0	-15	11	8	8	8	8	0	-600	+350	-250

Tolerances in μm

OUTER RING

D mm		$\Delta D_{mp}, \Delta Ds$		V_{dp}	VD_{MP}	K_{ea}	SD	Sea	ΔCs
over	up to	upper	lower	max.	max.	max.	mas.	max.	Upper / lower
18	30	0	-6	5	4	4	4	5	Identical with ΔBs of the inner ring of the same bearing
30	50	0	-7	5	5	5	4	5	
50	80	0	-9	7	5	5	4	5	
80	120	0	-10	8	5	6	5	6	
120	150	0	-11	8	6	7	5	7	
150	180	0	-13	10	7	8	5	8	
180	250	0	-15	11	8	10	7	10	
250	315	0	-18	14	9	11	8	10	
315	400	0	-20	15	10	13	10	13	

Tolerances in μm

Tolerances

PRECISION CLASS TAPERED ROLLER BEARINGS - INCH SIZE – PRECISION

ACCORDING AFBMA STANDARD

INNER RING

d mm		Precision classes									
		4		2		3		0		00	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
-	76.2	+13	0	+13	0	+13	0	+13	0	+8	0
76.2	304.2	+25	0	+25	0	+13	0	+13	0	+8	0
304.2	609.6	+51	0	+51	0	+25	0	-	-	-	-
609.6	914.4	+76	0	-	-	+38	0	-	-	-	-
914.4	1219.2	+102	0	-	-	+51	0	-	-	-	-
1219.2	-	+127	0	-	-	+76	0	-	-	-	-

Tolerances in μm

OUTER RING

D mm		Precision classes									
		4		2		3		0		00	
over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
-	304.8	+25	0	+25	0	+13	0	+13	0	+8	0
304.8	609.6	+51	0	+51	0	+25	0	-	-	-	-
609.6	912.4	+76	0	+76	0	+38	0	-	-	-	-
914.4	1219.2	+102	0	-	-	+51	0				
1219.2	-	+127	0	-	-	+76	0	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Tolerances in μm

TOLERANCES FOR THE MOUNTING HEIGHT ON THE INNER RING ROLLER SUB-ASSEMBLY WITH OUTER RING ($\Delta T1S$)

d mm		D mm		Precision classes									
				4		2		3		0		00	
over	up to	over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
-	101.6			+102	0	+102	0	+102	-102	+102	-102	+102	-102
101.6	304.8			+152	-152	+102	0	+102	-102	+102	-102	+102	-102
304.8	609.6		508.0	+178	-178	+178	-178	+102	-102	-	-	-	-
304.8	609.6	508.0	-	+178	-178	+178	-178	+178	-178	-	-	-	-
609.6	-			+178	-178	-	-	+178	-178	-	-	-	-

Tolerances in μm

RADIAL RUN-OUT OF AN ASSEMBLED BEARINGS

d mm		Precision classes				
		4	2	3	0	00
over	up to	max.	max.	max.	max.	max.
-	304.8	51	38	8	4	2
304.8	609.6	51	38	18	-	-
609.6	914.4	76	51	51	-	-
914.4	-	76	-	76	-	-

Tolerances in μm

TOLERANCES FOR MOUNTING HEIGHT ΔT_s

d mm		D mm		Precision classes									
				4		2		3		0		00	
over	up to	over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
-	101.6			+203	0	+203	0	+203	-203	+203	-203	+203	-203
101.6	304.8			+356	-254	+203	0	+203	-203	+203	-203	+203	-203
304.8	609.6	-	508.0	+318	-381	+381	-381	+203	-203	-	-	-	-
304.8	609.6	508.0		+318	-381	+318	-381	+381	-381	-	-	-	-
609.6	-			+318	-381	-	-	+381	-381	-	-	-	-

Tolerances in μm

TOLERANCES FOR THE MOUNTING HEIGHT ON THE INNER RING ROLLER SUB-ASSEMBLY WITH OUTER RING (ΔT_{2S})

d mm		D mm		Precision classes									
				4		2		3		0		00	
over	up to	over	up to	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower
-	101.6			+102	0	+102	0	+102	-102	+102	-102	+102	-102
101.6	304.8			+203	-102	+102	0	+102	-102	+102	-102	+102	-102
304.8	609.6		508.0	+203	-203	+203	-203	+102	-102	-	-	-	-
304.8	609.6	508.0	-	+203	-203	+203	-203	+203	-203	-	-	-	-
609.6	-			+203	-203	-	-	+203	-203	-	-	-	-

Tolerances in μm

Tolerances

PRECISION CLASS THRUST BEARING

SINGLE ACTING THRUST BEARING (SINGLE ROW)

SHAFT WASHER

d mm		P0; P6 ; P5			P4; P2		
		Δd_{mp} Δd_{2mp}		V_{dp} VD_{2P}	Δd_{mp} Δd_{2mp}		V_{dp} VD_{2P}
over	up to	upper	lower	max.	upper	lower	max.
-	18	0	-8	6	0	-7	5
18	30	0	-10	8	0	-8	6
30	50	0	-12	9	0	-10	8
50	80	0	-15	11	0	-12	9
80	120	0	-20	15	0	-15	11
120	180	0	-25	19	0	-18	14
180	250	0	-30	23	0	-22	17
250	315	0	-35	26	0	-25	19
315	400	0	-40	30	0	-30	23
400	500	0	-45	34	0	-35	26
500	630	0	-50	38	0	-40	30
630	800	0	-75	-	0	-50	-
800	1000	0	-100	-	-	-	-
1000	1250	0	-125	-	-	-	-

Tolerances in μm

HOUSING WASHER

d mm		P0; P6 ; P5			P4; P2		
		VD_{MP}		V_{dp}	Δd_{mp}		V_{dp}
over	up to	upper	lower	max.	upper	lower	max.
10	18	0	-11	8	0	-7	5
18	30	0	-13	10	0	-8	6
30	50	0	-16	12	0	-9	7
50	80	0	-19	14	0	-11	8
80	120	0	-22	17	0	-13	10
120	180	0	-25	19	0	-15	11
180	250	0	-30	23	0	-20	15
250	315	0	-35	26	0	-25	19
315	400	0	-40	30	0	-28	21
400	500	0	-45	34	0	-33	25
500	630	0	-50	38	0	-38	29
630	800	0	-75	55	0	-45	34
800	1000	0	-100	75	0	-	-
1000	1250	0	-125	-	0	-	-
1250	1600	0	-160	-	0	-	-

Tolerances in μm

DOUBLE ACTING THRUST BEARING (DOUBLE ROW)

PRECISION CLASS P5 AND P6 - INNER RING

d mm		P5					P6			P5 and P6			
		Δd_{mp}		Δd_s		S_{ia}	Δd_s		S_{ia}	H_s		C_s	
over	up to	upper	lower	upper	lower	max.	upper	lower	max.	upper	lower	upper	lower
16	18	0	-7	+1	-8	3	0	-5	1.5	+50	-80	0	-30
18	30	0	-8	+1	-9	3	0	-6	1.5	+50	-80	0	-30
30	50	0	-10	+1	-11	3	0	-8	1.5	+60	-100	0	-30
50	80	0	-12	+2	-14	4	0	-9	2	+70	-120	0	-30
80	120	0	-15	+3	-18	4	0	-10	2	+85	-140	0	-30
120	180	0	-18	+3	-21	5	0	-13	3	+95	-160	0	-30
180	250	0	-22	+4	-26	5	0	-15	3	+120	-200	0	-30

PRECISION CLASS P5 AND P6 - OUTER RING

D mm		SP and UP		
		ΔD_S	S_{ea}	
over	up to	upper	lower	max.
30	50	-20	-27	Identical with the inner ring of the same bearing
50	80	-24	-33	
80	120	-28	-38	
120	150	-33	-44	
150	180	-33	-46	
180	250	-37	-52	
250	315	-41	-59	

SINGLE & DOUBLE ACTING THRUST BEARING

d mm		Si					Se
		P0;	P6;	P5;	P4;	P2	P0; P6; P5; P4; P2
over	up to	max.	max.	max.	max.	max.	max.
-	18	10	5	3	2	1	Identical with S1 of the shaft washer
18	30	10	5	3	2	1.2	
30	50	10	6	3	2	1.5	
50	80	10	7	4	3	2	
80	120	15	8	4	3	2	
120	180	15	9	5	4	3	
180	250	20	10	5	4	3	
250	315	25	13	7	5	4	
315	400	30	15	7	5	4	
400	500	30	18	9	6	-	
500	630	35	21	11	7	-	
630	800	40	25	13	8	-	
800	1000	45	30	15	-	-	
1000	1250	50	35	18	-	-	

Tolerances in μm

GENERAL GUIDELINES, ROLLING BEARING LUBRICATION

The main duties of introducing lubricants into ball and roller bearings, apart from protecting the finely finished surfaces when rotating at high speeds, is to reduce friction between the rolling elements, the separator or cage, and the races at any point where true rolling is absent. Lubrication also assists in dissipating heat, and sealing the bearing against the entry of contaminants such as dust and moisture.

Rolling bearings may be lubricated with oil or grease. The choice of lubricant is usually decided by temperature, speed, load, and operating conditions along with bearing design. We summarize as follows:

1. SIZE OF BEARING

The size of bearing governs the viscosity of the lubricant – the larger the bearing the higher should be the viscosity. Regarding size, rolling bearings can be divided into four sizes depending on the outside diameter:

- Very small bearings $D \leq 22 \text{ mm}$
- Small bearings $D \leq 62 \text{ mm}$
- Medium bearings $62 \leq D \leq 240 \text{ mm}$
- Large bearings $D \geq 240 \text{ mm}$

2. SPEED

Speed has an influence upon the viscosity of the lubricant because the resisting force, opposed to the moving parts by the lubricant, depends on its viscosity. The higher the revolution speed, the lower the viscosity of the lubricant should be.

The revolution speed may be:

- Normal $n \leq 75\%$ of the limit speed specified in the tables
- High $75\% \leq 100\%$ of the limit speed specified in the tables
- Very high $n \geq 100\%$ of the limit speed specified in the tables. For very high revolution speeds, oil lubrication is required to transfer frictional heat or other sources of heat away from the bearing.

3. LOAD

Equivalent loading capacity, $P = XFr + YFa$, conditions the viscosity grade of the lubricant, due to specific pressure which appears between the contact surfaces. The higher this is, the greater the resistance of the lubricant film should be, and the respective viscosity. Loads may vary as follows:

- normal loads where
 - $P/Cr \leq 0.1$ for bearings within diameter ranges 1, 2 and 3.
 - $P/Cr \leq 0.15$ for bearings within diameter range 4.
- high loads where
 - $P/Cr \geq 0.1$ for bearings within diameter ranges 1, 2 and 3.
 - $P/Cr \geq 0.15$ for bearings within diameter range 4.
- P = equivalent dynamic load [kN]
- Cr = basic dynamic load [kN]

4. TEMPERATURE

The operating temperature affects selection of lubricants, as it is an influence upon viscosity. Therefore, each lubricant is used only within the limits of certain clearly defined temperature ranges.



Lubrication

GREASE & OIL LUBRICATION

Although oil is the better lubricant, grease is often preferred because of the following natural advantages:

- Grease helps to form an effective closure between the shaft and housing, thus preventing the ingress of dirt, moisture and other corrosive agents.
- Grease protects the finely finished working surfaces of a bearing by clinging to them, particularly when the bearing is not in motion. Oil tends to drain away, leaving the surfaces open to attack.
- Grease is easier to retain within the housing than oil. This is of great help in the food, printing, textile, chemical and other industries where contamination or staining can ruin the product.
- Grease is convenient to handle, and re-lubrication of bearings is quick and clean. Planned lubrication cycles are often possible, resulting in smaller labour costs.
- Whatever type of grease is used, it should have no tendency to separate under operating conditions. When separation occurs, the oil runs out of the bearing and leaves behind dry soap, which hardens and cakes. This interferes with the movement of the rolling element, which may result in overheating and mechanical failure. Excessive softening is also undesirable, because the grease might then leak out of the bearing and leave working surfaces unprotected.

The quantity of grease used for the lubrication of a rolling bearing should not be too great, as a tightly packed bearing is liable to overheat if operated at high speed. Relubrication intervals depend on the bearing type, inner diameter and revolution speed for filling with fresh grease. The quantity required is given in the following equation:

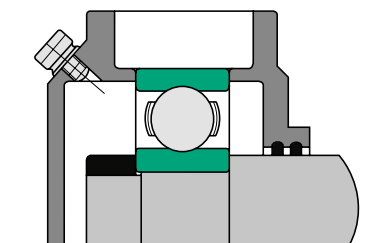
$$G = 0.005 \text{ DB grams}$$

where:

D = outer diameter (m/m)

B = width (m/m)

After a certain number of refills, it is necessary to remove old grease completely using a suitable solvent. Never mix two grades of grease.



Typical Grease Lubrication

OIL LUBRICATION

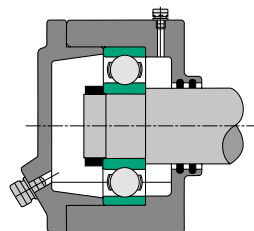
Oil is sometimes more convenient to use than grease, and there are circumstances when it is definitely preferred. These are as follows:

- When frictional resistance in light machinery and instruments must be kept low.
- Where either the speed or the temperature is too high for grease lubrication.
- Where high temperature and heavy load occur together, with or without high speed.
- Where the bearings are enclosed in a casing that contains other components lubricated by oil, e.g. a gearbox.

A good quality mineral oil should be used of a viscosity to suit the operating conditions involved. Vegetable or animal oils are not recommended as these can become rancid under certain conditions and cause corrosion problems. A small supply of oil is required to lubricate the bearings; a more copious supply should be used if the bearing must be kept cool, when it is often advantageous to use a synthetic oil to cope with the temperature conditions. Limiting temperature for mineral oil is about 150°C (302°F) and for synthetic oils about 220°C (428°F).

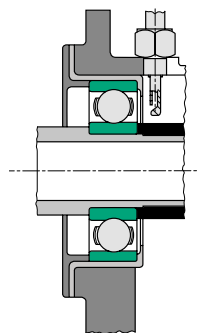
OIL BATH

This method is suitable for horizontal shaft applications. The oil should reach the center of the bottom ball or roller in the bearing; a greater depth than this could cause overheating due to churning of the oil. The surface area and volume of the oil in the bath should be sufficiently large to maintain an adequate depth of oil for the cage to dip into when running. Sight oil level indicators can be used. Alternatively, a tapped and plugged hole can be provided at the correct level; when replenishing the oil, the plug is removed and oil added until it starts to escape through the hole. The plug should, of course, be replaced before the machine is started!



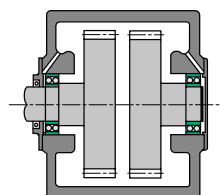
PUMP-FEED LUBRICATION

This is especially suitable for heavily loaded, high-speed bearings, since such conditions can result in bearing temperatures well in excess of 100°C (212°F). Oil is pump-fed to each bearing, being directed by jets on to the outside diameter of the inner ring so that some of it gains access to the internal parts of the bearing. Each bearing may require from 45 to 140 litres of oil per hour, although most of this only flushes the face of the bearing to keep it cool. A reservoir is often provided to lubricate the bearing during starting; alternatively, the pump can be started before the machine is set in motion so that the bearing never runs unlubricated.



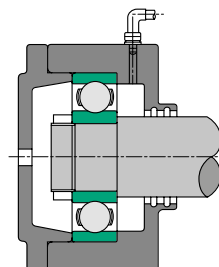
SPLASH LUBRICATION

This is suitable when the bearings are enclosed in a casing, such as a gearbox, and the oil used to lubricate the gears is distributed sufficiently to lubricate the bearings. The oil is either splashed directly on to the bearings or collected in galleries and directed to the bearings. The drawing below illustrates how the oil is made to pass through the bearing before it returns to the gearbox casing.



OIL MIST SYSTEM

One important advantage of this method of lubrication is that only a small quantity of oil is required, carried in a stream of compressed air. The oil mist equipment should be turned on before the machine is set in motion so as to ensure that the bearings are constantly covered by a thin film of oil when rotating. Oil mist is advantageous for applications such as machine tools (where it can also be used to lubricate slideways, gears, chains and other components), since the air escaping from the bearing housing prevents the ingress of foreign matter. The flow of air also keeps the bearing cool. It is important that the compressed air used is absolutely clean and dry.

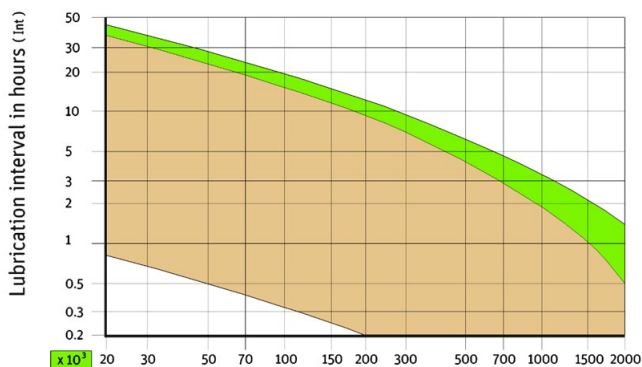


Lubrication

LUBRICATION INTERVAL

The below table gives an estimation of the lubrication interval. Calculate the Kr value using the below formula and place it on the x axis. The crossing point with the upper green zone will indicate the maximum interval in hours. Then based on operating condition K1, K2, K3 & K4 adjust the interval.

$$\text{Lub interval} = \text{Int} \times K1 \times K2 \times K3 \times K4 \quad \text{operating hours}$$



k _r × n × d _m (rpm × mm)											
Type	DGB	ACB1	ACB2	SAB	TB	CRB1	CRB2	CRB FC	TRB	SRB	SRTB
Kr	1	1.5	1.9	1.3	5	1.75	1.9	23	3.5	6	12
Cleanliness & Moisture					LOW	HIGH	VERY HIGH				
K1					0.9	0.65	0.4				
Shocks & Vibrations					LOW	HIGH	VERY HIGH				
K2					0.9	0.65	0.4				
Operating temperature					< 70°	< >	> 90°				
K3					0.9	0.65	0.4				
Loading		P/C			0.10	0.22	0.35				
K4					0.9	0.65	0.4				

Typical: For Crushers: 1 x day – 1 x week For Oscillating movement: reduced interval

Example: DGB: Kr = 1, dm = 120 mm, n = 1000 rpm => Int = 1 x 120 x 1000 = 120000 => 19000 h

Best condition: $0.9 \times 0.9 \times 0.9 \times 0.9 = 0.650 \times \text{Int} = 12350 \text{ h}$ /Worse condition: $0.4 \times 0.4 \times 0.4 \times 0.4 = 0.025 \times \text{Int} = 475 \text{ h}$



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