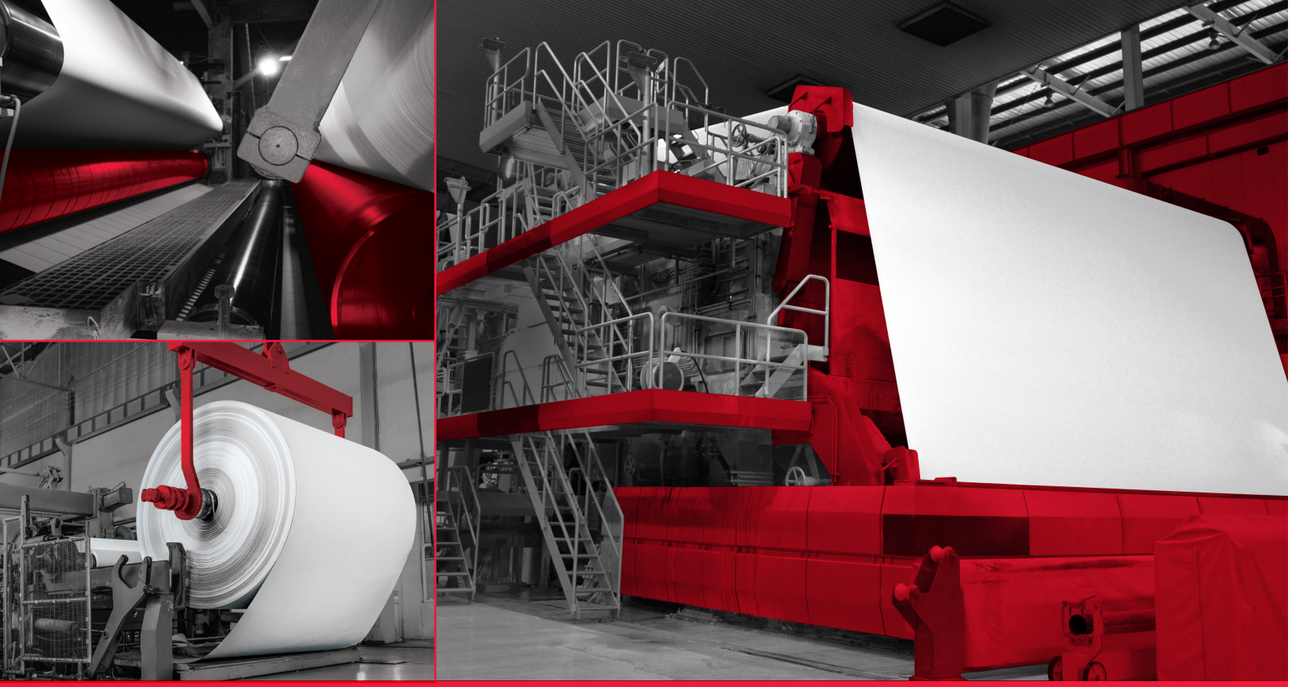
TL SERIES SPHERICAL ROLLER BEARINGS

TOUGH AND LONG LIFE PERFORMANCE IN PAPER MACHINES

STAY IN MOTION. STAY IN CONTROL.



AT HIGH SPEEDS, IN HIGH HEAT

BEARINGS FOR PAPER MAKING MACHINERY

High speeds. Moisture. Intense heat. The forces at work on the bearings used throughout these massive mechanical marvels are extreme. And the stakes are high.

With throughput as great as thousands of feet per minute - hundreds of tons each day - a single bearing failure can bring the paper that flies across a machine's interdependent rolls to an abrupt halt. At a significant cost.

Reliability is paramount.

For NSK, product development and design is focused squarely on withstanding the manifold operating and environmental stresses of these applications with:

- increasing capacities for high loads and high speeds
- advanced materials for durability, wear resistance and longer life
- lubrication and seal technology for smooth and clean running

Our product solutions are designed to optimize the performance of machinery and equipment, to assure predictable reliability and to deliver total cost-efficiency.

NSK

OUTSTANDING DURABILITY. ENGINEERED IN.

NSK engineered our TL - Tough & Long Life - spherical roller bearings to outlast and outperform conventional bearing solutions in the high-heat conditions of dryer and calendar sections of paper making machines, where inner ring fracture and bearing failures resulting from hoop stress are an all-too-common occurrence.

With an innovative and proprietary steel formulation and heat treatment approach - augmented by our optimized bearing design - NSK's TL bearings deliver strength, durability, superior stability and predictably reliable performance - extending maintenance intervals and supporting total machine efficiency.

DESIGN AND OPERATING ADVANTAGES

NSK's TL series spherical roller bearings are ideally designed for paper machine dryer roll applications - and wherever elevated temperatures prevail - optimizing machine uptime and efficiency with superior resistance to inner ring fracture and exceptional dimensional stability at high temperatures.

DESIGN FEATURES

- Optimized, high capacity internal design
- Inner rings manufactured with proprietary TL steel composition and heat-treatment process
- With cylindrical and tapered bore
- With a heavy-duty machined brass cage; pressed steel cages with wear-resistant surface treatment utilized for limited range, or available on request
- Dimensional series 222, 223, 230, 231, 232, and 239 in bore diameters from 60 to 500 mm; additional series /sizes are available on request
- Radial internal clearances from C-normal through C5
- Superior dimensional stability for operating temperatures as high as 200°C

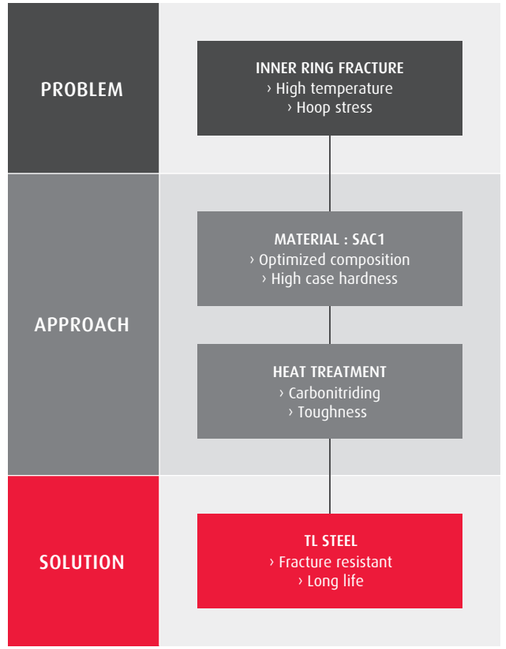
HIGH PERFORMANCE FACTORS

HIGH PERFORMANCE FACTOR: TL TECHNOLOGY

NSK TL series Spherical Roller Bearings are the result of dedicated research efforts to extend bearing life through the utilization of leading-edge bearing material and heat treatment technologies. The outcome is an application-optimized solution that effectively contends with the problem at hand - inner ring fracture caused by rising hoop stress - and is equally resilient to the damaging effects of particle or water contaminated lubrication.

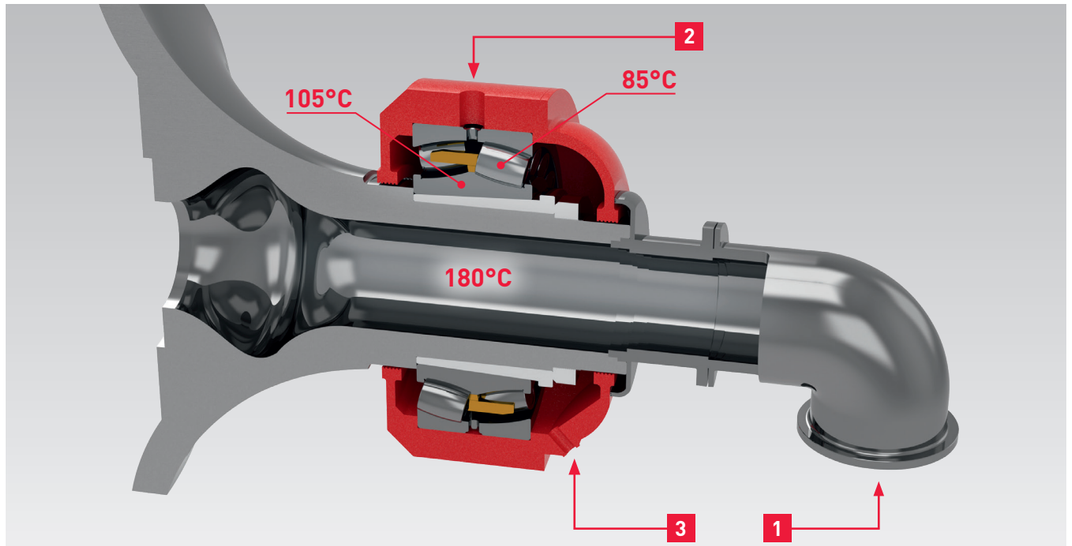
In the case of TL bearings, NSK has developed a proprietary material composition containing appropriate levels of chrome to promote increased hardness. Coupled with an advanced carbonitriding heat treatment process, the result is a case-hardened inner ring with considerable advantages:

- Exceptional ring fracture resistance from high compressive residual stress after heat treatment
- Long life wear resistance due to superior surface hardness values, exceeding conventional through hardened and carburized materials
- High dimensional stability at operating temperatures up to 200°



OPERATING ADVANTAGES

- Service life is more than twice that of conventional bearings operating under contaminated conditions
- High strength resistance to hoop stress and inner ring cracking
- High raceway surface hardness promotes a wear resistant, long service life
- Dramatically reduced incidents of bearing failure translate into extended uptime, reduced maintenance costs and increased machine throughput



Pictured: Example of a dryer cylinder roll structure showing the typical temperatures present. 1) Steam, 2) Lubrication oil, 3) Oil return

FAILURE MECHANISM IN DRYER ROLLS

On a paper or board machine, the drying process occurs when heat is transferred from the dryer roll to the sheet contacting to the roll. The source of this heat is steam, passing through the hollow axis of the roll. Increasingly higher steam temperatures can contribute to higher drying speed and improved machine efficiency, but not without presenting a significant challenge to the bearings that are essential to smooth and trouble-free operation.

On machine start-up in particular, high steam temperature causes the journal to expand more rapidly than the bearing. This increases the tightness of fit between the mating surfaces and causes hoop stress (circumferential force) to be applied to the bearing inner ring. As this thermal stress increases, so too does the risk of crack formation and the inevitably of inner ring fracture.

TL STEEL TECHNOLOGY - NO COMPROMISE

Conventional measures such as adopting a slow start-up procedure can prevent such problems – by introducing temperature gradually - but can consume several hours and compromise production. And other approaches to product solutions exist, but with compromised success.

NSK's long life TL steel technology is a proven solution and standard specification - without special order - that consistently outperforms alternative product solutions such as carburized and bainite treated bearings with:

› Higher fracture resistance

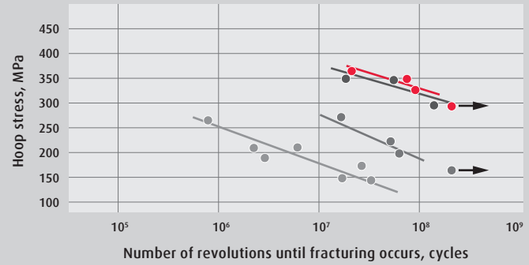
› Longer fatigue life

› Dimensional stability at high temperatures

Higher Fracture Resistance

High inner ring strength delivers high resistance to fracture resulting from increasing hoop stress caused by shaft temperature rise.

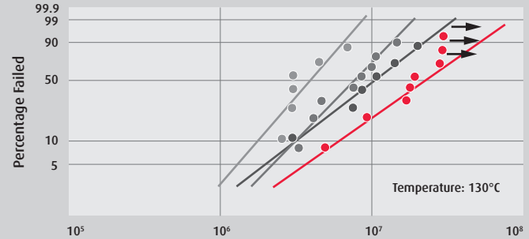
- TL specification steel
- Carburized steel
- Bearing steel with bainite treatment
- Bearing steel with standard heat treatment



Longer Fatigue Life

Increased raceway surface hardness delivers longer life, particularly when foreign debris is present.

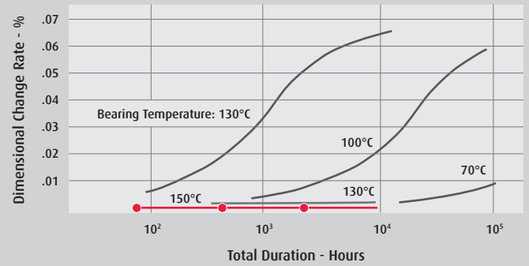
- TL specification steel
- Carburized steel with dimensional stabilizing treatment
- Bearing steel with bainite treatment
- Bearing steel with dimensional stabilizing treatment



Dimensional Stability

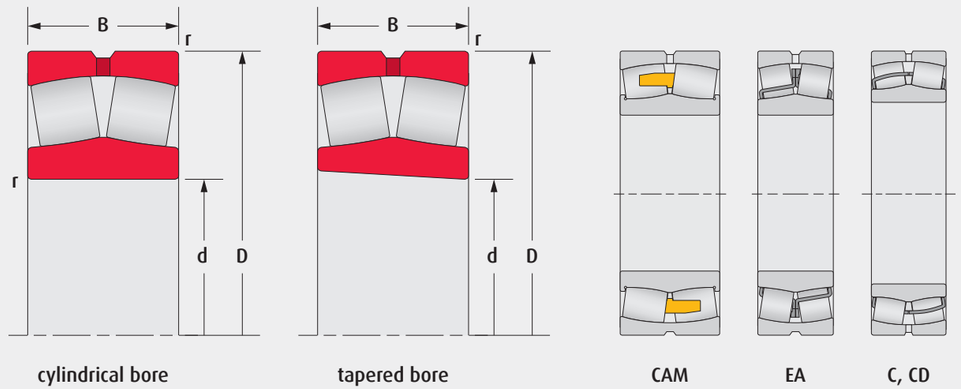
Dimensional stability at high temperatures - up to 200°C - is equal to or greater than traditional stabilizing approaches.

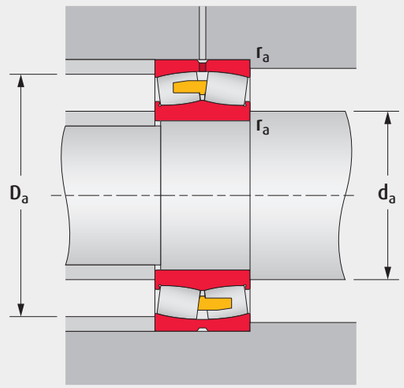
- TL specification steel
- Bearing steel with standard heat treatment
- Bearing steel with dimensional stabilizing treatment



NSK's TL series spherical roller bearings are ideally designed to deliver Tough and Long Life performance wherever elevated temperatures prevail in the paper making process - in dryer rolls, canvas rolls, PV rolls and calendar rolls.

When total machine efficiency and output hangs in the balance, NSK TL spherical roller bearings provide an advanced solution with a predictably reliable outcome.





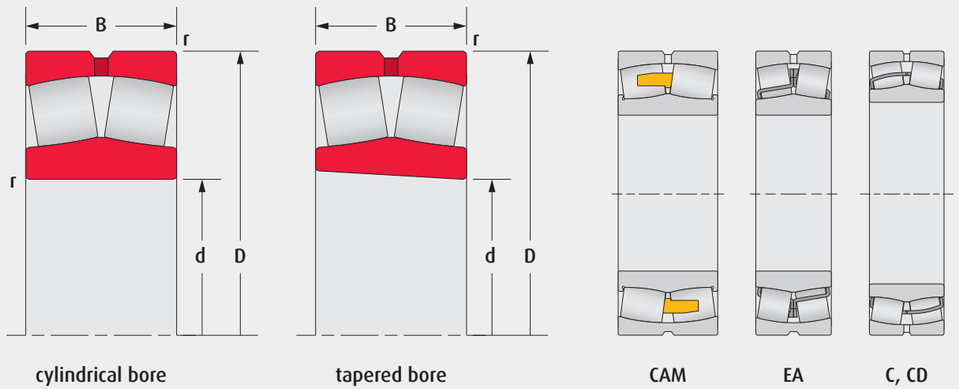
Dynamic equivalent load: $P = XF_r + YF_a$

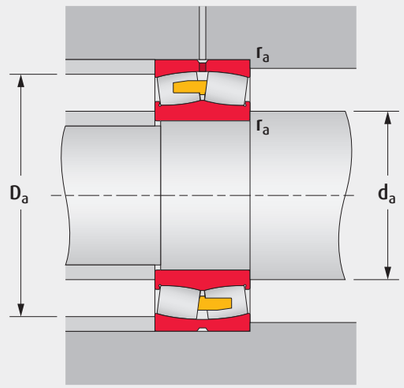
$F_a/F_r \leq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static equivalent load: $P_0 = F_r + Y_0F_a$

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

BASIC BEARING NO.		BEARING DIMENSIONS				BASIC LOAD RATINGS				LIMITING SPEEDS		ABUTMENT AND FILLET DIMENSIONS					CONSTANT	AXIAL LOAD FACTORS			MASS ~
		mm				kN		lbf		rpm		d_a		D_a		r_a					
cylindrical bore	tapered bore	d	D	B	r (min)	dynamic	static	dynamic	static	grease	oil	min	max	max	min	max	e	Y_2	Y_3	Y_0	kg
TL22308CAME4	**TL22308CAMKE4**	40	90	33	1.5	122	129	27 500	29 000	5 300	6 700	49	-	81	77	1.5	0.38	2.6	1.8	1.7	1.0
TL22311CAME4	**TL22311CAMKE4**	55	120	43	2.0	209	241	47 000	54 000	3 800	4 800	65	-	110	103	2.0	0.36	2.8	1.9	1.8	2.3
TL22312CAME4	**TL22312CAMKE4**	60	130	46	2.1	246	288	55 500	64 500	3 600	4 500	72	-	118	111	2.0	0.36	2.8	1.9	1.9	2.9
TL22313EAE4	**TL22313EAKE4**	65	140	48	2.1	375	380	84 500	85 500	3 200	4 000	77	84	128	119	2.0	0.33	3.0	2.0	2.0	3.5
TL22314EAE4	**TL22314EAKE4**	70	150	51	2.1	425	435	95 500	98 000	3 000	3 800	82	91	138	129	2.0	0.33	3.0	2.0	2.0	4.3
TL22315CAME4	**TL22315CAMKE4**	75	130	31	2.1	340	415	76 500	93 500	2 800	3 600	87	-	148	134	2.0	0.35	2.9	2.0	1.9	3.6
TL22316CAME4	**TL22316CAMKE4**	80	170	58	2.1	390	480	87 500	108 000	2 600	3 400	92	-	158	145	2.0	0.35	2.9	2.0	1.9	6.2
TL22318EAE4	**TL22318EAKE4**	90	190	64	3.0	665	705	149 500	158 500	2 400	3 000	104	115	176	163	2.5	0.33	3.1	2.1	2.0	8.6
TL22319CAME4	**TL22319CAMKE4**	95	200	67	3.0	525	675	118 000	151 500	2 200	2 800	109	-	186	172	2.5	0.35	2.9	1.9	1.9	9.9
TL22320EAE4	**TL22320EAKE4**	100	215	73	3.0	860	930	193 500	209 000	2 000	2 600	114	130	201	184	2.5	0.33	3.0	2.0	2.0	12.7
TL23022CDE4	**TL23022CDKE4**		170	45	2.0	293	465	66 000	104 500	2 000	2 400	120	124	160	153	2.0	0.24	4.2	2.8	2.8	3.8
TL23222CE4	**TL23222CKE4**	110	200	70	2.1	515	760	116 000	171 000	1 500	1 900	122	130	188	170	2.0	0.34	3.0	2.0	1.9	9.5
TL22322EAE4	**TL22322EAKE4**		240	80	3.0	1 030	1 120	231 500	252 000	1 700	2 200	124	145	226	206	2.5	0.30	3.1	2.1	2.0	17.6
TL22324EAE4	**TL22324EAKE4**	120	260	86	3.0	1 190	1 320	267 500	296 500	1 600	2 000	134	157	246	222	2.5	0.32	3.1	2.1	2.0	22.2
TL22326CAME4	**TL22326CAMKE4**	130	280	93	4.0	995	1 350	223 500	303 500	1 300	1 600	148	-	262	236	3.0	0.34	2.9	2.0	1.9	27.8
TL23028CDE4	**TL23028CDKE4**		210	53	2.0	420	715	94 500	160 500	1 600	1 900	150	157	200	190	2.0	0.22	4.5	3.0	2.9	6.5
TL22228CDE4	**TL22228CDKE4**	140	250	68	3.0	645	930	145 000	209 000	1 400	1 700	154	167	236	219	2.5	0.25	4.0	2.7	2.6	14.5
TL23228CE4	**TL23228CKE4**		250	88	3.0	835	1 300	187 500	292 500	1 100	1 500	154	163	236	213	2.5	0.25	2.9	1.9	1.9	18.8





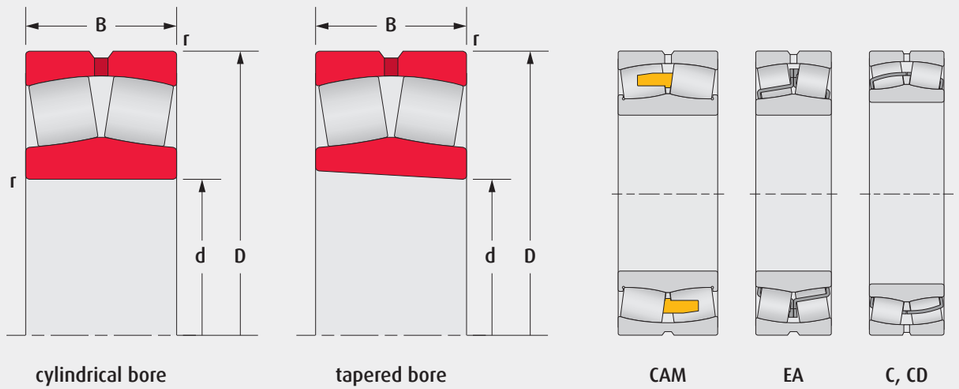
Dynamic equivalent load: $P = XF_r + YF_a$

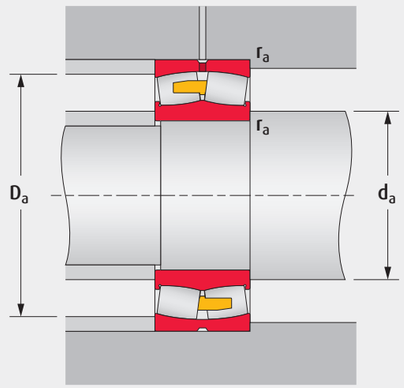
$F_a/F_r \leq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static equivalent load: $P_0 = F_r + Y_0F_a$

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

BASIC BEARING NO.		BEARING DIMENSIONS				BASIC LOAD RATINGS				LIMITING SPEEDS		ABUTMENT AND FILLET DIMENSIONS					CONSTANT	AXIAL LOAD FACTORS			MASS ~
		mm				kN		lbf		rpm		d_a		D_a		r_a					
cylindrical bore	tapered bore	d	D	B	r (min)	dynamic	static	dynamic	static	grease	oil	min	max	max	min	max	e	Y_2	Y_3	Y_0	kg
TL23030CAME4	TL23030CAMKE4	150	225	56	2.1	470	815	105 500	183 000	1 400	1 800	162	-	213	203	2.0	0.22	4.6	3.1	3.0	7.9
TL23130CAME4	TL23130CAMKE4		250	80	2.1	725	1 180	163 000	265 500	1 100	1 400	162	-	238	218	2.0	0.30	3.4	2.3	2.2	15.8
TL22230CDE4	TL22230CDKE4		270	73	3.0	765	1 120	172 000	252 000	1 300	1 600	164	179	256	236	2.5	0.26	3.9	2.6	2.5	18.4
TL22330CAME4	TL22330CAMKE4		320	108	4.0	1 220	1 690	274 500	380 000	1 100	1 400	168	-	302	270	3.0	0.35	2.9	1.9	1.9	41.5
TL23032CDE4	TL23032CDKE4	160	240	60	2.1	540	955	121 500	214 500	1 300	1 700	172	179	228	216	2.0	0.22	4.5	3.0	2.9	9.7
TL22232CDE4	TL22232CDKE4		290	80	3.0	910	1 320	204 500	296 500	1 200	1 500	174	190	276	255	2.5	0.26	3.8	2.6	2.5	23.1
TL23232CE4	TL23232CKE4		290	104	3.0	1 100	1 770	247 500	398 000	1 000	1 300	174	189	276	245	2.5	0.34	2.9	2.0	1.9	30.5
TL23934BCAME4	TL23934BCAMKE4	170	230	45	2.0	350	660	78 500	148 500	1 400	1 800	180	-	220	213	2.0	0.17	5.8	3.9	3.8	5.4
TL23034CDE4	TL23034CDKE4		260	67	2.1	640	1 090	144 000	245 000	1 200	1 600	182	191	248	233	2.0	0.23	4.3	2.9	2.9	13.0
TL23134CAME4	TL23134CAMKE4		280	88	2.1	940	1 570	211 500	353 000	1 000	1 300	182	-	268	245	2.0	0.29	3.5	2.3	2.3	21.0
TL22334CAME4	TL22334CAMKE4		360	120	4.0	1 580	2 110	355 000	474 500	1 000	1 200	188	-	342	304	3.0	0.35	2.9	1.9	1.9	57.9
TL23036CDE4	TL23036CDKE4	180	280	74	2.1	750	1 270	168 500	285 500	1 200	1 400	192	202	268	249	2.0	0.24	4.2	2.8	2.8	17.1
TL23236CAME4	TL23236CAMKE4		320	112	4.0	1 300	2 110	292 500	474 500	850	1 100	198	-	302	274	3.0	0.35	2.9	1.9	1.9	38.5
TL23038CAME4	TL23038CAMKE4	190	290	75	2.1	775	1 350	174 000	303 500	1 100	1 400	202	-	278	261	2.0	0.24	4.2	2.8	2.8	17.6
TL23138CAME4	TL23138CAMKE4		320	104	3.0	1 190	2 020	267 500	454 000	850	1 100	204	-	306	276	3.5	0.31	3.2	2.2	2.1	34.0
TL22238CAME4	TL22238CAMKE4		340	92	4.0	1 140	1 730	256 500	389 000	1 000	1 200	208	-	322	296	3.0	0.26	3.8	2.6	2.5	35.5
TL23238CAME4	TL23238CAMKE4		340	120	4.0	1 440	2 350	323 500	528 500	800	1 100	208	-	322	288	3.0	0.35	2.9	1.9	1.9	46.5
TL22338CAME4	TL22338CAMKE4		400	132	5.0	1 890	2 590	425 000	582 500	900	1 100	212	-	378	338	4.0	0.34	2.9	2.0	1.9	77.6





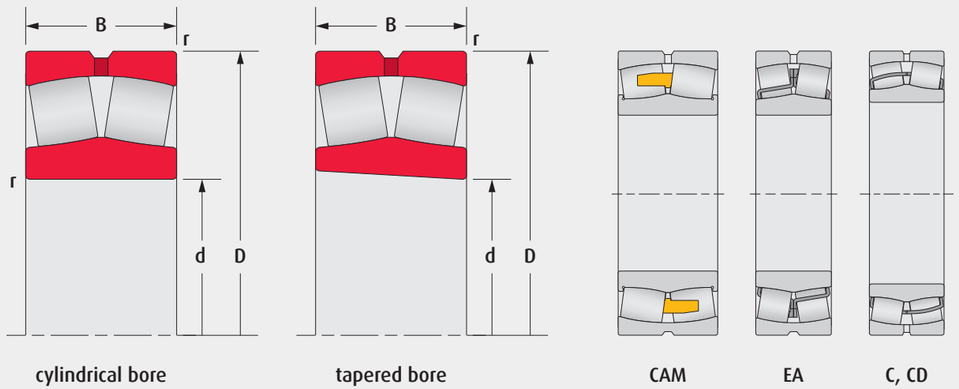
Dynamic equivalent load: $P = XF_r + YF_a$

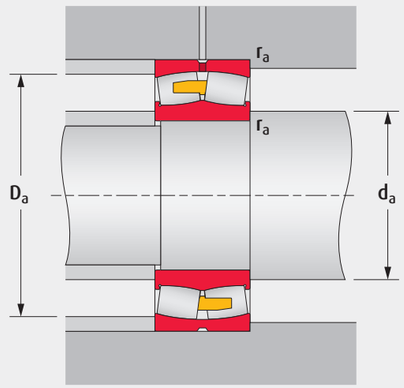
$F_a/F_r \leq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static equivalent load: $P_0 = F_r + Y_0F_a$

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

BASIC BEARING NO.		BEARING DIMENSIONS				BASIC LOAD RATINGS				LIMITING SPEEDS		ABUTMENT AND FILLET DIMENSIONS					CONSTANT	AXIAL LOAD FACTORS			MASS ~
		mm				kN		lbf		rpm		d_a		D_a		r_a					
cylindrical bore	tapered bore	d	D	B	r (min)	dynamic	static	dynamic	static	grease	oil	min	max	max	min	max	e	Y_2	Y_3	Y_0	kg
TL23040CAME4	TL23040CAMKE4	200	310	82	2.1	940	1 700	211 500	382 000	1 000	1 300	212	-	298	279	2.0	0.25	4.0	2.7	2.6	22.6
TL23140CAME4	TL23140CAMKE4		340	112	3.0	1 360	2 330	305 500	524 000	800	2 000	214	-	326	293	2.5	0.32	3.2	2.1	2.1	41.5
TL22240CAME4	TL22240CAMKE4		360	98	4.0	1 300	2 010	292 500	452 000	950	1 200	218	-	342	315	3.0	0.26	3.8	2.6	2.5	42.6
TL23240CAME4	TL23240CAMKE4		360	128	4.0	1 660	2 750	373 000	618 000	750	1 000	218	-	342	307	3.0	0.35	2.9	1.9	1.9	57.0
TL23044CAME4	TL23044CAMKE4	220	340	90	3.0	1 090	1 980	245 000	445 000	950	1 200	234	-	326	302	2.5	0.24	4.1	2.8	2.7	29.7
TL23144CAME4	TL23144CAMKE4		370	120	4.0	1 570	2 710	353 000	609 000	710	950	238	-	352	320	3.0	0.31	3.2	2.2	2.1	52.0
TL22244CAME4	TL22244CAMKE4		400	108	4.0	1 570	2 430	353 000	546 500	850	1 000	238	-	382	348	3.0	0.27	3.7	2.5	2.4	59.0
TL23244CAME4	TL23244CAMKE4		400	144	4.0	2 520	3 400	566 500	764 500	670	900	238	-	382	337	3.0	0.36	2.8	1.9	1.8	79.5
TL22344CAME4	TL22344CAMKE4		460	145	5.0	2 350	3 400	528 500	764 500	750	950	242	-	438	391	4.0	0.33	3.0	2.0	2.0	116.0
TL23948CAME4	TL23948CAMKE4	240	320	60	2.1	635	1 300	143 000	292 500	950	1 200	252	-	308	298	2.0	0.17	6.0	4.0	3.9	13.3
TL23048CAME4	TL23048CAMKE4		360	92	3.0	1 160	2 140	261 000	481 000	850	1 100	254	-	346	324	2.5	0.24	4.2	2.8	2.7	32.6
TL23148CAME4	TL23148CAMKE4		400	128	4.0	1 790	3 100	402 500	697 000	670	850	258	-	382	347	3.0	0.31	3.3	2.2	2.2	64.5
TL22348CAME4	TL22348CAMKE4		500	155	5.0	2 600	3 800	584 500	854 500	670	850	262	-	478	423	4.0	0.32	3.2	2.1	2.1	147.0
TLI-112618CAME4	TLI-112618CAMKE4	250	410	128	4.0	1 780	3 150	400 000	708 000	640	840	268	-	392	357	3.0	0.30	3.4	2.2	2.2	65.2
TL23952CAME4	TL23952CAMKE4	260	360	75	2.1	930	1 870	209 000	420 500	850	1 000	272	-	348	333	2.0	0.19	5.4	3.6	3.5	23.0
TL23052CAME4	TL23052CAMKE4		400	104	4.0	1 430	2 580	321 500	580 000	800	950	278	-	382	356	3.0	0.25	4.1	2.7	2.7	46.6
TL23152CAME4	TL23152CAMKE4		440	144	4.0	2 160	3 750	485 500	843 000	600	800	278	-	422	380	3.0	0.32	3.2	2.1	2.1	88.2





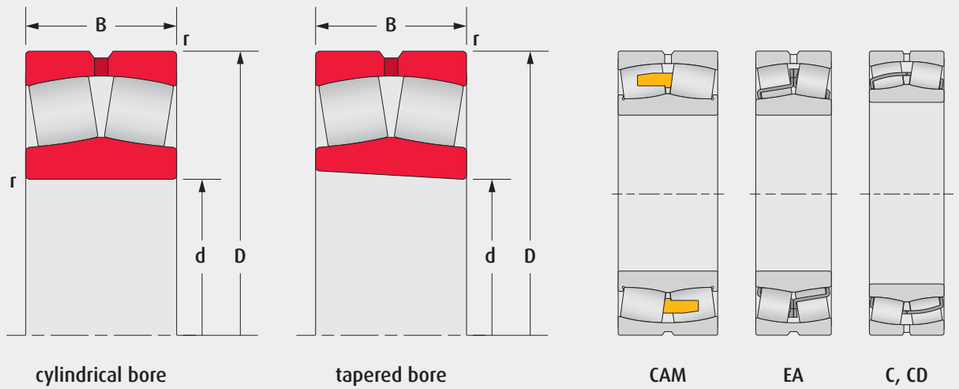
Dynamic equivalent load: $P = XF_r + YF_a$

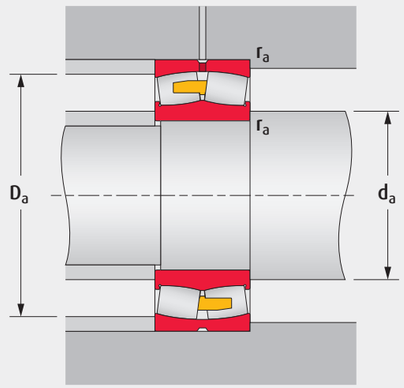
$F_a/F_r \leq e$		$F_a/F_r > e$	
X	Y	X	Y
1	Y_3	0.67	Y_2

Static equivalent load: $P_0 = F_r + Y_0F_a$

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

BASIC BEARING NO.		BEARING DIMENSIONS				BASIC LOAD RATINGS				LIMITING SPEEDS		ABUTMENT AND FILLET DIMENSIONS					CONSTANT	AXIAL LOAD FACTORS			MASS ~
		mm				kN		lbf		rpm		d_a		D_a		r_a					
cylindrical bore	tapered bore	d	D	B	r (min)	dynamic	static	dynamic	static	grease	oil	min	max	max	min	max	e	Y_2	Y_3	Y_0	kg
TL23956CAME4	TL23956CAMKE4	280	380	75	2.1	925	1 950	208 000	438 500	800	950	292	-	368	351	2.0	0.18	5.7	3.9	3.8	24.5
TL23056CAME4	TL23056CAMKE4		420	106	4.0	1 540	2 950	346 000	663 000	710	900	298	-	402	377	3.0	0.24	4.2	2.8	2.7	50.5
TL23156CAME4	TL23156CAMKE4		460	146	5.0	2 230	4 000	501 500	899 000	560	750	302	-	438	400	4.0	0.30	3.3	2.2	2.2	94.3
TL23256CAME4	TL23256CAMKE4		500	176	5.0	2 880	4 900	647 500	1 101 500	530	670	302	-	478	425	4.0	0.35	2.9	1.9	1.9	147.0
TL23960CAME4	TL23960CAMKE4	300	420	90	3.0	1 230	2 490	276 500	560 000	710	900	314	-	406	386	2.5	0.19	5.2	3.5	3.4	38.2
TL23060CAME4	TL23060CAMKE4		460	118	4.0	1 920	3 700	431 500	832 000	670	850	318	-	442	413	3.0	0.24	4.2	2.8	2.7	70.5
TL23160CAME4	TL23160CAMKE4		500	160	5.0	2 670	4 800	600 000	1 079 000	500	670	322	-	478	433	4.0	0.31	3.3	2.2	2.2	125.0
TL23260CAME4	TL23260CAMKE4		540	192	5.0	3 400	5 900	764 500	1 326 500	480	630	322	-	518	458	4.0	0.35	2.9	1.9	1.9	189.0
TL23164CAME4	TL23164CAMKE4	320	540	176	5.0	3 050	5 500	685 500	1 236 500	480	600	342	-	518	466	4.0	0.31	3.2	2.1	2.1	162.0
TL23068CAME4	TL23068CAMKE4	340	520	133	5.0	2 280	4 400	512 500	989 000	560	710	362	-	458	465	4.0	0.24	4.2	2.8	2.8	101.0
TL23168CAME4	TL23168CAMKE4		580	190	5.0	3 600	6 600	809 500	1 483 500	430	560	362	-	558	499	4.0	0.31	3.2	2.1	2.1	206.0
TL23072CAME4	TL23072CAMKE4	360	540	134	5.0	2 390	4 700	537 500	1 056 500	530	670	382	-	518	485	4.0	0.24	4.2	2.8	2.8	106.0
TL23976CAME4	TL23976CAMKE4	380	520	106	4.0	1 870	4 100	420 500	921 500	530	670	398	-	502	482	3.0	0.18	5.5	3.7	3.6	65.4
TL23080CAME4	TL23080CAMKE4	400	600	148	5.0	2 970	5 900	667 500	1 326 500	480	600	422	-	578	540	4.0	0.23	4.4	3.0	2.9	146.0
TL23984CAME4	TL23984CAMKE4	420	560	106	4.0	1 870	4 250	420 500	955 500	500	600	438	-	542	521	3.0	0.17	6.0	4.0	3.9	71.6
TL23088CAME4	TL23088CAMKE4	440	650	157	6.0	3 150	6 350	708 000	1 427 500	430	530	468	-	622	587	5.0	0.23	4.3	2.9	2.8	173.0
TL23992CAME4	TL23992CAMKE4	460	620	118	4.0	2 220	4 950	499 000	1 113 000	430	530	478	-	602	573	3.0	0.17	5.9	4.0	3.9	100.0





Dynamic equivalent load: $P = XF_r + YF_a$

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

Static equivalent load: $P_0 = F_r + Y_0F_a$

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

BASIC BEARING NO.		BEARING DIMENSIONS				BASIC LOAD RATINGS				LIMITING SPEEDS		ABUTMENT AND FILLET DIMENSIONS					CONSTANT	AXIAL LOAD FACTORS			MASS ~
		mm				kN		lbf		rpm		d_a		D_a		r_a					
cylindrical bore	tapered bore	d	D	B	r (min)	dynamic	static	dynamic	static	grease	oil	min	max	max	min	max	e	Y_2	Y_3	Y_0	kg
TL239/500CAME4	TL239/500CAMKE4	500	670	128	5.0	2 460	5 550	553 000	1 247 500	400	500	522	-	648	622	4.0	0.17	6.0	4.0	3.9	124.0
TL230/500CAME4	TL230/500CAMKE4		720	167	6.0	3 750	8 100	843 000	1 821 000	380	480	528	-	692	655	5.0	0.21	4.8	3.2	3.1	220.0
TL231/500CAME4	TL231/500CAMKE4		830	264	7.5	6 850	13 400	1 540 000	3 012 500	280	360	536	-	794	720	6.0	0.31	3.2	2.2	2.1	567.0
TL232/500CAME4	TL232/500CAMKE4		920	336	7.5	9 000	16 600	2 023 500	3 732 000	260	320	536	-	884	773	6.0	0.38	2.7	1.8	1.8	969.0
TL239/530CAME4	TL239/530CAMKE4	530	710	136	5.0	2 930	6 800	658 500	1 528 500	360	450	552	-	688	659	4.0	0.17	6.0	4.0	3.9	149.0
TL230/530CAME4	TL230/530CAMKE4		780	185	6.0	4 400	9 200	989 000	2 068 000	340	430	558	-	752	706	5.0	0.22	4.6	3.1	3.0	298.0
TL231/530CAME4	TL231/530CAMKE4		870	272	7.5	7 150	14 100	1 607 500	3 170 000	260	340	566	-	834	758	6.0	0.30	3.3	2.2	2.2	628.0
TL232/530CAME4	TL232/530CAMKE4		980	355	9.5	10 100	18 800	2 270 500	4 226 500	240	300	574	-	936	824	8.0	0.38	2.7	1.8	1.7	1 170.0
TL239/560CAME4	TL239/560CAMKE4	560	750	140	5.0	3 100	7 250	697 000	1 630 000	340	430	582	-	728	697	4.0	0.16	6.1	4.1	4.0	172.0
TL230/560CAME4	TL230/560CAMKE4		820	195	6.0	5 000	10 700	1 124 000	2 405 500	320	400	588	-	792	742	5.0	0.22	4.5	3.0	2.9	344.0
TL231/560CAME4	TL231/560CAMKE4		920	280	7.5	7 850	15 500	1 765 000	3 484 500	240	320	596	-	884	804	6.0	0.30	3.4	2.3	2.2	727.0
TL232/560CAME4	TL232/560CAMKE4		1 030	365	9.5	10 900	20 500	2 450 500	4 608 500	220	280	604	-	986	870	8.0	0.36	2.8	1.9	1.8	1 320.0
TL239/600CAME4	TL239/600CAMKE4	600	800	150	5.0	3 450	8 100	775 500	1 821 000	320	400	622	-	778	745	4.0	0.17	5.9	3.9	3.9	205.0
TL230/600CAME4	TL230/600CAMKE4		870	200	6.0	5 450	12 200	1 225 000	2 742 500	300	360	628	-	842	794	5.0	0.21	4.8	3.3	3.2	389.0
TL231/600CAME4	TL231/600CAMKE4		980	300	7.5	8 750	17 500	1 967 000	3 934 000	220	280	636	-	944	856	6.0	0.30	3.4	2.3	2.2	898.0
TL232/600CAME4	TL232/600CAMKE4		1 090	388	9.5	12 700	24 900	2 855 000	5 597 500	200	260	644	-	1 046	923	8.0	0.36	2.8	1.9	1.8	1 590.0
TL239/630CAME4	TL239/630CAMKE4	630	850	165	6.0	4 000	9 350	899 000	2 102 000	300	360	658	-	822	786	5.0	0.18	5.6	3.8	3.7	259.0
TL230/630CAME4	TL230/630CAMKE4		920	212	7.5	5 900	12 700	1 326 500	2 855 000	280	340	666	-	884	835	6.0	0.22	4.7	3.1	3.1	468.0
TL231/630CAME4	TL231/630CAMKE4		1 030	315	7.5	9 600	19 400	2 158 000	4 361 500	200	260	666	-	994	900	6.0	0.30	3.4	2.3	2.2	1 040.0

DESIGNATION SYSTEM - AFTERMARKET

TL SERIES SPHERICAL ROLLER BEARINGS

Dimension Series		Internal Design		Cage Type	Bore Type		Additional Features	
231	52	CA	g3	M	K	C4	W507	TL
Bore Reference Number		Carburization			Radial Internal Clearance		Special Material Designation	

DESIGNATION		ATTRIBUTE
Dimensional Series	222	medium duty type
	223	heavy duty type
	230	very light duty type
	231	light duty type
	232	medium duty type, wide
	239	extra-light duty type
Bore Reference Number		multiply x 5 for bore diameter in mm; 500 mm and greater expressed with a "/" eg. /500 = 500 mm
Internal Design	EA	high capacity design, steel cage
	CA	high capacity design, brass cage
Carburization	g	complete bearing
	g3	inner ring
	g5	inner and outer ring
Cage Type	blank	two piece steel cage
	CD[1]	two piece steel cage with guide ring
	M	machined brass cage with guide ring
Bore Type	blank	cylindrical bore
	K	1:12 tapered bore
Radial Internal Clearance	blank	normal (CN)
	C3	greater than normal
	C4	greater than C3
	C5	greater than C4

DESIGNATION		ATTRIBUTE
Additional Features	P55	extra-close running accuracy, inner and outer ring
	S11	dimensionally stabilized up to 200°C
	W31	special inspection measure of superior raceway finish + upgraded packaging
	W507	W31 + lubrication groove and holes in the outer ring (E4) + S11
	W509	W31 + lubrication groove and holes in the outer and inner ring (E7) + S11
Special Material Designation	TL	Tough and Long Life material technology

Note: 1) When cage type CD is used, it follows the bore reference number in the designation system eg. 23028CDg3KC4W507TL

IMPROVEMENT PAYS

END-TO-END SERVICE DELIVERS CUSTOMER SUCCESS

Improvement never ends. And we never stop looking for better ways to support our customers in a complete, collaborative and continuous way. The focus of NSK isn't simply on a quick fix for immediate gain – it's about incremental and sustainable improvement to deliver long-term benefits.

When NSK is on-site, we're there to understand our customers' challenges and identify problems contributing to frequent bearing replacement, breakdowns caused by poor specification, high energy costs from inefficient product selection and lost production because of downtime. We collaborate with our customers to institute an **Asset Improvement Program (AIP)** that encompasses process and maintenance management, diagnostic and educational support to deliver measurable gains in output and cost-efficiency.

With NSK, our customers embark on a critical path to realizing improvements in equipment, productivity, people and financial performance.

aip
NSK experts

NSK

NSK AMERICAS

United States
NSK Corporation
Ann Arbor MI
1.888.446.5675

Canada
NSK Canada Inc.
Mississauga ON
1.888.603.7667

Mexico
NSK Rodamientos Mexicana,
S.A. de C.V.
Silao Guanajuato MX
52.472.500.9500

Brazil
NSK Brasil Ltda.
Sao Paulo SP
55.11.3269.4700

Argentina
NSK Argentina SRL
Buenos Aires
54.11.4762.6556

Latin America
NSK Latin America Inc.
Miami FL
1.305.477.0605

Website:
www.nskamericas.com
NSK Global: www.nsk.com

Every care has been taken to ensure the accuracy of the data contained in this brochure, but no liability can be accepted for any loss or damage suffered through errors or omissions.

Printed in the USA ©NSK 2021.
The contents of the publication are the copyright of the publishers.

TL / APB / 21