LONG-LIFE VE SERIES SPHERICAL ROLLER BEARINGS

FOR VIBRATING MACHINERY AND EQUIPMENT

STAY IN MOTION. STAY IN CONTROL.






RELENTLESS GRIT:

BEARINGS FOR MINING AND CONSTRUCTION

Punishing Loads. Misalignment. Mechanical shock. Grit and contamination and marginal lubrication. A day in a life for bearings used in mining, aggregate and construction industries.

For the machinery and equipment used to extract, transport and process — interdependent in their purpose — access can be remote or restricted. The unexpected failure of a single component can bring an entire site to a standstill — at a significant cost.

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

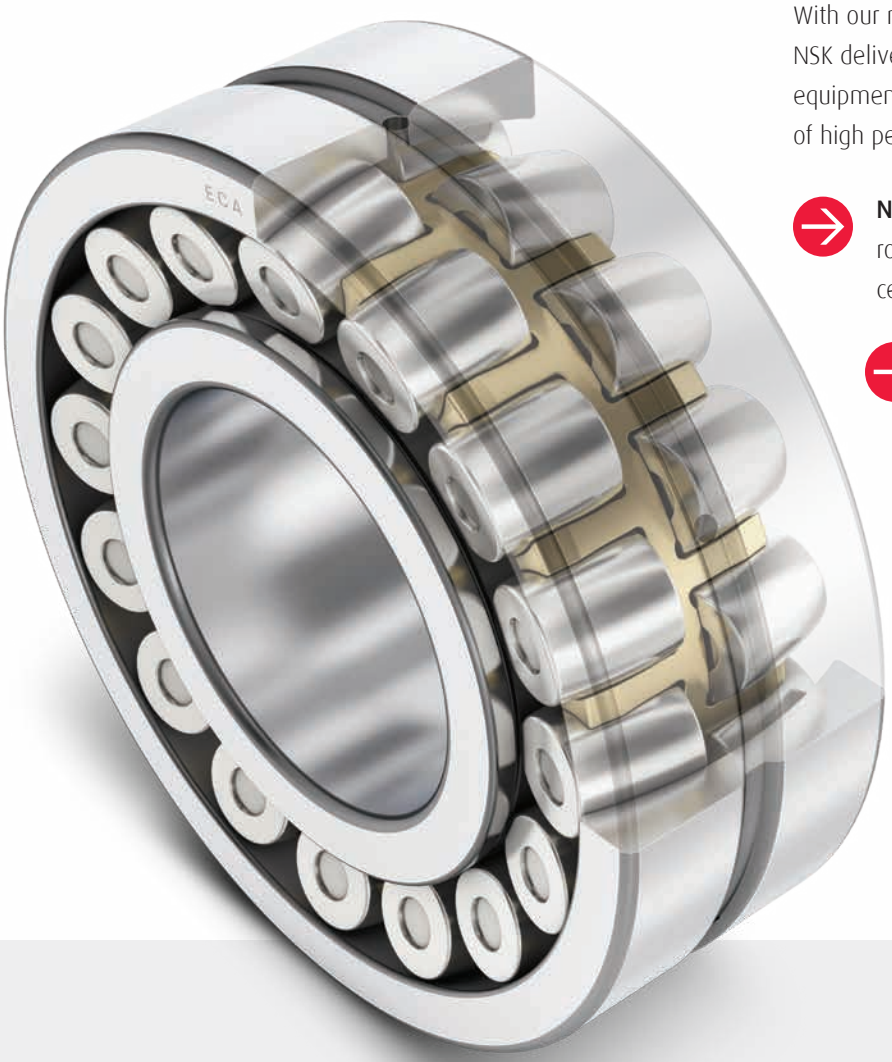
Our product solutions are designed to optimize the performance of machinery and equipment, to assure predictable reliability and to deliver total cost-efficiency.

UNSHAKABLE PERFORMANCE IN VIBRATING SCREENS

Punishing loads. Radial acceleration. Relentless vibration and mechanical shock. NSK's VE series spherical roller bearings are engineered specifically to contend with the severity of vibrating machinery and equipment applications with stabilized load distribution and robust performance, delivering long-life operating benefits that include:

- **As much as twice the service life** as that of conventional bearings in applications subject to frequent vibration
- **Superior resistance** to heavy loads and shock loads
- **Smooth running** with superior roller guidance and controlled roller skew
- **Optimized lubricant distribution** to rolling contact surfaces facilitated by precision-machined cage pocket geometry
- **High-speed performance** with low operating temperature rise
- **Reduced bearing damage** from slippage, surface fatigue and flaking
- **Higher operational reliability** with reduced incidents and maintenance costs

A NEW STANDARD IN HIGH-CAPACITY PERFORMANCE

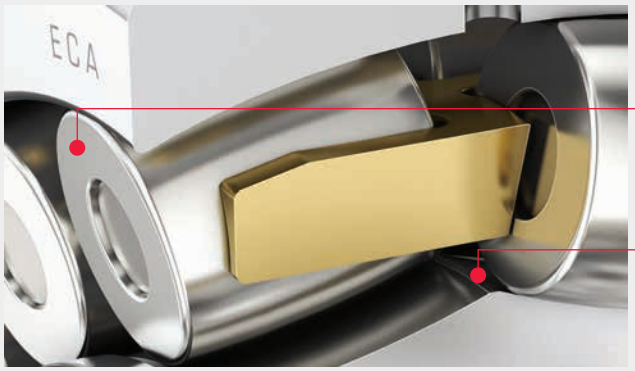


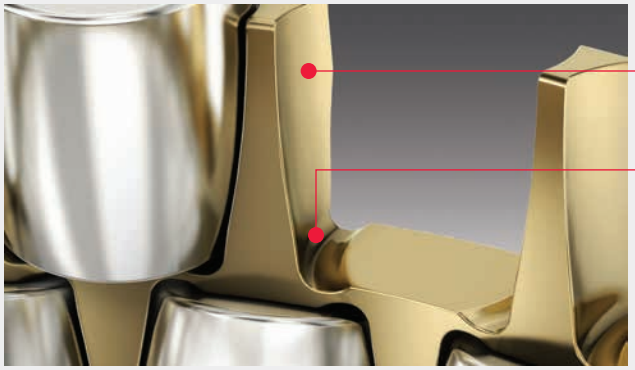
With our new extra-capacity ECA spherical roller bearings, NSK delivers unrivalled reliability to vibrating machinery and equipment applications, achieving an unprecedented level of high performance standard with:

- **Newly optimized internal design** with an advanced roller-guided cage that eliminates the need for a center guide ring
- **Higher load ratings** derived from a larger complement of larger-sized rollers
- **Higher limiting speeds** are achievable, even greater than comparable steel cage designs

DESIGN FEATURES

- Manufactured from ultra-clean steel for optimal fatigue strength and longer life
- Optimized, high-capacity (CA) internal designs
- Guide ring-free ECA type with next-generation roller-guided machined brass cage packs in more rollers of larger size for higher loads and longer fatigue life
- Advanced raceway surface finish for improved lubrication characteristics and wear resistance
- With outer ring lubricating groove and holes
- High temperature dimensional stability in working temperatures up to 200°C
- Special dimensional tolerances — set at 1/2 relative to the normal — to minimize vibration during operation
- Special internal clearance — set at upper 2/3 relative to the standard — for optimal operating clearance and reduced heat generation
- Available in dimension series 223 and 233 for shaft diameters ranging from 40 to 220 mm
- Available with Hi-TF material option for severe operating environments





ECA DESIGN OPTIMIZATIONS

Significantly higher load capacity
with increased size and quantity of rollers packed into each roller row

Optimized cage geometry
eliminates the need for a center guide ring and reduces sliding friction and wear

Controlled roller motion
with precision "roller hugging" cage pocket contour

Reduced cage stress
with a design that balances form fitting shape with uncompromised cage bar strength in maximum stress zones

HIGH-PERFORMANCE FACTOR: LONG-LIFE TOUGH STEEL

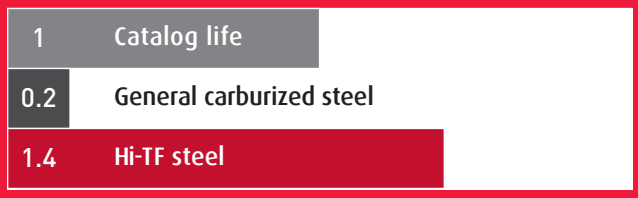
NSK has adopted our Hi-TF steel, engineered specifically to mitigate the catastrophic impact of bearing lubricant contamination. Through advanced material composition and carbonitriding heat treatment, this resilient steel exudes greater hardness and higher toughness, extending bearing life in severe operating conditions with:

Superior wear resistance: less than 1/3 the rate of wear of standard bearing steel

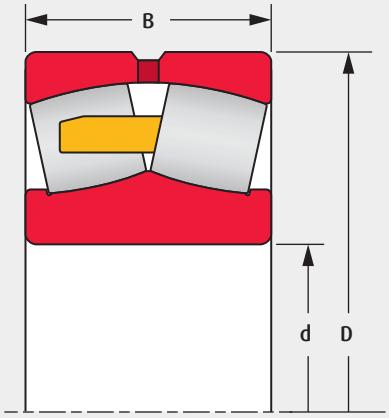
Greater seizure resistance: as much as a 20% improvement

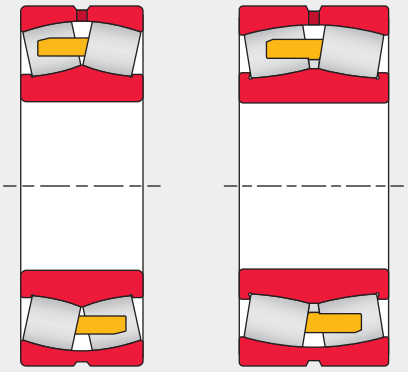
Under contaminated lubrication conditions that instigate progressive bearing damage and failure, **NSK Hi-TF bearings deliver as much as 7 times longer life** when compared with general carburized alternatives.

Life test: Result under foreign contamination



BEARING DIMENSIONS AND OPERATING VALUES



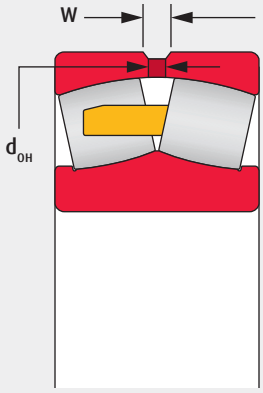


series 223 series 233

BOUNDARY DIMENSIONS			BASIC BEARING PART NO.	BASIC LOAD RATINGS		LIMITING SPEEDS	
mm				kN		rpm	
d	D	B		dynamic	static	grease	oil
40	90	33	**22308 ECA**	161	142	5 300	6 300
45	100	36	**22309 ECA**	197	182	4 500	5 600
50	110	40	**22310 ECA**	233	219	4 300	5 300
55	120	43	**22311 ECA**	278	274	3 800	4 800
60	130	46	**22312 ECA**	320	320	3 600	4 500
65	140	48	**22313 ECA**	375	380	3 200	4 000
70	150	51	**22314 ECA**	425	435	3 000	3 800
75	160	55	**22315 ECA**	485	505	2 800	3 600
80	170	58	**22316 ECA**	540	565	2 600	3 400
85	180	60	**22317 ECA**	600	630	2 400	3 200
90	190	64	**22318 ECA**	665	705	2 400	3 000
95	200	67	**22319 ECA**	735	780	2 200	2 800
100	215	73	**22320 ECA**	860	930	2 000	2 400
110	240	80	**22322 ECA**	1 030	1 120	1 900	2 200
	240	92	**23322 CA**	975	1 050	1 300	1 700
120	260	86	**22324 ECA**	1 190	1 320	1 700	2 200
	260	106	**23324 CA**	1 200	1 310	1 200	1 500

Dimensions of Oil Grooves and Holes (mm)

NOMINAL BEARING WIDTH B		OIL GROOVE WIDTH	OIL HOLE DIAMETER
over	incl.	W	d_{OH}
30	40	6	3
40	50	7	4
50	65	8	5
65	80	10	6
80	100	12	8
100	120	15	10
120	160	20	12
160	200	25	15



Number of Oil Holes

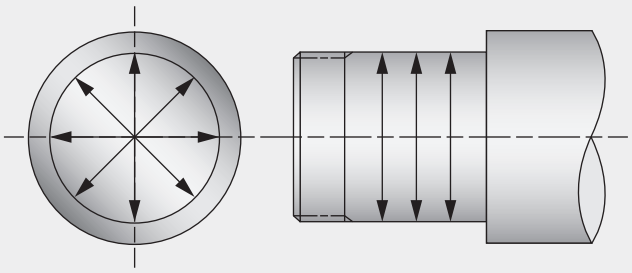
NOMINAL BEARING O.D. D		NUMBER OF HOLES
over	incl.	
—	180	4
180	250	6
250	315	6
315	400	6
400	500	6

BOUNDARY DIMENSIONS mm			BASIC BEARING PART NO.	BASIC LOAD RATINGS kN		LIMITING SPEEDS rpm	
d	D	B		dynamic	static	grease	oil
130	280	93	22326 CA	1 240	1 350	1 300	1 600
	280	112	23326 CA	1 300	1 430	1 100	1 400
140	300	102	22328 CA	1 450	1 590	1 200	1 500
	300	118	23328 CA	1 550	1 780	1 000	1 300
150	320	108	22330 CA	1 530	1 690	1 100	1 400
	320	128	23330 CA	1 750	2 000	950	1 200
160	340	114	22332 CA	1 700	1 900	1 100	1 300
	340	136	23332 CA	1 940	2 270	850	1 100
170	360	120	22334 CA	1 970	2 110	1 000	1 200
180	380	126	22336 CA	2 170	2 340	950	1 200
190	400	132	22338 CA	2 370	2 590	900	1 100
	400	155	23338 CA	2 600	3 100	710	950
200	420	165	23340 CA	2 340	3 550	670	900
220	460	180	23344 CA	2 800	4 300	630	800

RECOMMENDED SHAFT AND HOUSING FITS

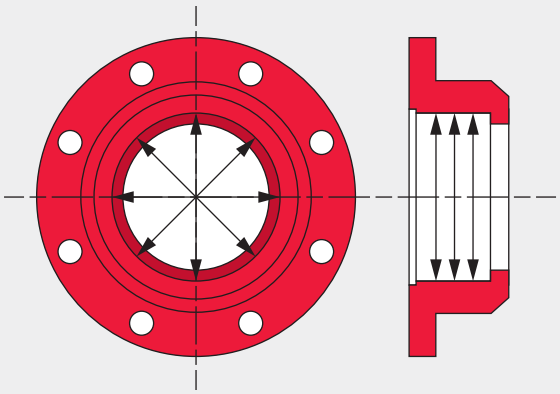
Ensuring appropriate interference between mating surfaces is imperative to optimize the operating life of spherical roller bearings in vibrating equipment.

It is recommended to inspect fits prior to installation: measure and record shaft and housing dimensions and review the values with the recommendations in the tables below.



Checking cylindrical shafts

BASIC BEARING NO.		BEARING BORE DIAMETER DIMENSIONS					RECOMMENDED SHAFT FIT		
		mm	Tolerance µm		inch		inch		Resulting fit
223	233	shaft	max	min	max	min	max	min	
22308	--	40			1.5748	1.5745	1.5744	1.5738	
22309	--	45	**0**	**-7**	1.7717	1.7714	1.7713	1.7707	**10 L / 1 L**
22310	--	50			1.9685	1.9682	1.9681	1.9675	
22311	--	55			2.1654	2.1650	2.1650	2.1642	
22312	--	60			2.3622	2.3619	2.3618	2.3611	
22313	--	65	**0**	**-9**	2.5591	2.5587	2.5587	2.5579	**11 L / 0 L**
22314	--	70			2.7559	2.7556	2.7555	2.7548	
22315	--	75			2.9528	2.9524	2.9524	2.9516	
22316	--	80			3.1496	3.1493	3.1492	3.1485	
22317	--	85			3.3465	3.3460	3.3460	3.3451	
22318	--	90			3.5433	3.5428	3.5428	3.5420	
22319	--	95	**0**	**-12**	3.7402	3.7397	3.7397	3.7388	**13 L / 0 L**
22320	--	100			3.9370	3.9365	3.9365	3.9357	
22322	**23322**	110			4.3307	4.3302	4.3302	4.3294	
22324	**23324**	120			4.7244	4.7239	4.7239	4.7231	
22326	**23326**	130			5.1181	5.1175	5.1164	5.1154	
22328	**23328**	140			5.5118	5.5112	5.5101	5.5091	
22330	**23330**	150	**0**	**-15**	5.9055	5.9049	5.9038	5.9028	**27 L / 11 L**
22332	**23332**	160			6.2992	6.2986	6.2975	6.2965	
22334	--	170			6.6929	6.6923	6.6912	6.6902	
22336	--	180			7.0866	7.0860	7.0849	7.0839	
22338	**23338**	190			7.4803	7.4796	7.4783	7.4772	
--	**23340**	200	**0**	**-18**	7.8740	7.8733	7.8720	7.8709	**31 L / 13 L**
--	**23344**	220			8.6614	8.6607	8.6594	8.6583	

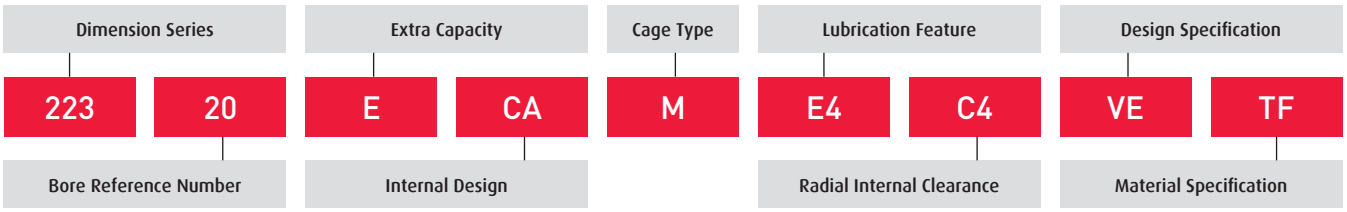


Checking housings, solid type

BASIC BEARING NO.		BEARING OUTER DIAMETER DIMENSIONS					RECOMMENDED HOUSING FIT		
		mm	Tolerance µm		inch		inch		Resulting fit
223	233	OD	max	min	max	min	max	min	
22308	--	90			3.5431	3.5428	3.5427	3.5418	
22309	--	100			3.9368	3.9365	3.9364	3.9355	**13 T / 1 T**
22310	--	110			4.3305	4.3302	4.3301	4.3292	
22311	--	120	**-5**	**-13**	4.7242	4.7239	4.7238	4.7229	
22312	--	130			5.1179	5.1176	5.1173	5.1163	
22313	--	140			5.5116	5.5113	5.5110	5.5100	**16 T / 3 T**
22314	--	150			5.9053	5.9050	5.9047	5.9037	
22315	--	160			6.2990	6.2985	6.2978	6.2968	
22316	--	170	**-5**	**-18**	6.6927	6.6922	6.6915	6.6905	**22 T / 7 T**
22317	--	180			7.0864	7.0859	7.0852	7.0842	
22318	--	190			7.4799	7.4794	7.4787	7.4776	
22319	--	200			7.8736	7.8731	7.8724	7.8713	**24 T / 7 T**
22320	--	215			8.4642	8.4637	8.4630	8.4618	
22322	**23322**	240	**-10**	**-23**	9.4484	9.4479	9.4472	9.4461	
22324	**23324**	260			10.2358	10.2353	10.2344	10.2331	
22326	**23326**	280			11.0232	11.0227	11.0218	11.0205	**27 T / 9 T**
22328	**23328**	300			11.8106	11.8101	11.8092	11.8079	
22330	**23330**	320			12.5979	12.5973	12.5964	12.5950	
22332	**23332**	340			13.3853	13.3847	13.3838	13.3824	
22334	--	360	**-13**	**-28**	14.1727	14.1721	14.1712	14.1698	**29 T / 9 T**
22336	--	380			14.9601	14.95959	14.9586	14.9572	
22338	**23338**	400			15.7475	15.7469	15.7460	15.7446	
--	**23340**	420	**-13**	**-30**	16.5349	16.5343	16.5333	16.5317	**32 T / 10 T**
--	**23344**	460			18.1097	18.1091	18.1081	18.1065	

DESIGNATION SYSTEM AFTERMARKET

SPHERICAL ROLLER BEARINGS FOR VIBRATING EQUIPMENT



DESIGNATION		ATTRIBUTE
Dimension series	223	heavy-duty type
	233	extra heavy-duty type, wide
Bore reference number		multiply x 5 for bearing bore diameter in millimeters
Extra capacity	E	optimized cage and rollers
Internal design	CA	high-capacity internal design
Cage type	M	one-piece machined brass cage

DESIGNATION		ATTRIBUTE
Lubrication feature	DD2	lubrication groove and holes in the outer ring
Radial internal clearance	C4	standard to vibrating equipment
	C3	available upon request
Design specification	VE	higher precision tolerances and special radial internal clearance range
Material specification	TF	long-life Hi-TF / Super-TF steel option

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