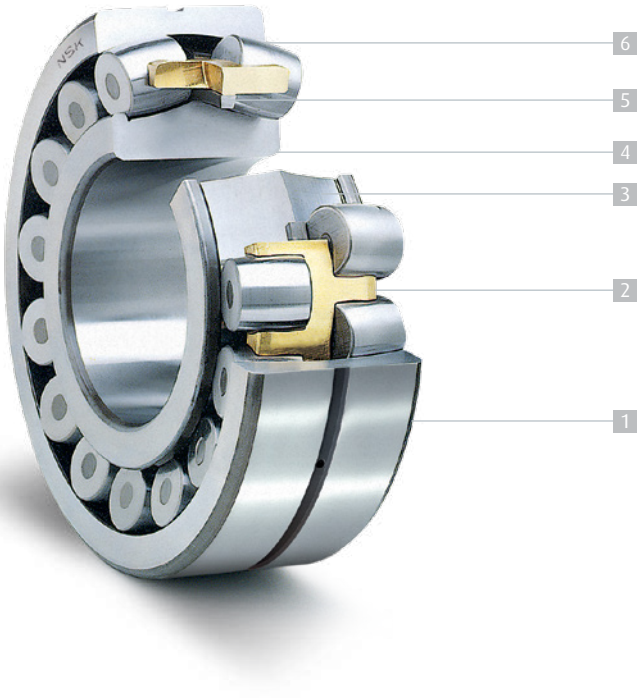
LONG-LIFE SPHERICAL ROLLER BEARINGS FOR VIBRATING EQUIPMENT

Featuring NSKHPS™ High Performance
Standard in Operational Reliability

EXTREME CONDITIONS. EXTREME PERFORMANCE.

NSK's Long-Life Spherical Roller Bearings for vibrating equipment are engineered specifically to contend with high speeds, shock loading, misalignment, marginal lubrication and frequent vibration of equipment used in mining, aggregate, cement and construction industries. High performance NSKHPS™ material engineering and optimized internal bearing design along with tightly controlled internal clearance and dimensional tolerances deliver increased load ratings and extended operating life under the most severe conditions common to these applications.



DESIGN FEATURES

- Manufactured from high-strength, ultra-clean steel for greater fatigue strength
- Heavy duty precision machined one-piece brass cage
- Contoured roller pockets for controlling roller skew and optimizing lubrication flow
- Improved raceway surface finish and geometry promotes reduced operating temperature and improved lubrication
- Self-aligning ability with floating guide ring
- Internal radial clearance set at upper 2/3 of ISO standard bearings for optimal operating clearance and reduced heat generation
- Available with the option NSK Tough Steel for reduced wear and improved seizure resistance in severely contaminated environments
- Availability from 40 mm to 200 mm bore diameter

OPERATING BENEFITS

- As much as twice the service life of conventional bearings
- Reduced maintenance costs
- High dynamic load ratings – increased by 1.25 times
- Highly resistant to heavy or shock loads
- High-speed performance and low operating temperature rise
- Better roller guidance and smooth running – reduced bearing damage from slippage, surface fatigue, flaking
- Greater operational reliability with increased productivity and reduced maintenance costs

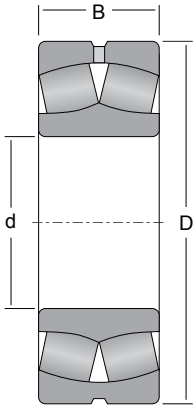
NOMENCLATURE STRUCTURE

223	20	CAM	E4	C4	VE
BEARING TYPE AND DIMENSIONAL SERIES	**BORE REFERENCE NO.** Multiply by five for bearing bore diameter in mm	**CAGE** High capacity one piece machined brass cage	**LUBRICATION FEATURES** E4: Groove and holes, outer ring	**INTERNAL CLEARANCE** C4: Standard C3: Available on request	**VIBRATING EQUIPMENT SPECIFICATIONS** Higher precision tolerances and special radial internal clearance range

BEARING DIMENSIONS AND OPERATING DATA

DESIGN SPECIFICATIONS

1	Ultra-clean steel for increased resistance to material fatigue	4	Improved bore and outer diameter tolerances for reliable mounting
2	Heavy-duty machined brass cage, contoured for better roller control and lubricant flow	5	Inner ring guided to stabilize cage during heavy vibration and prevent roller end wear
3	Improved surface finish and geometry, minimizes sliding contact in high load zones, reduces operating temperature, and facilitates better lubricant film	6	Special clearance for vibrating equipment minimizes heat generation



Basic Bearing	Bearing Dimensions						Basic Load Ratings				Limiting Speeds	
	d		D		B		(lbf)		(N)		(RPM)	
No.	mm	inch	mm	inch	mm	inch	Dynamic	Static	Dynamic	Static	Grease	Oil
SERIES 223												
22308	40	1.5748	90	3.5433	33	1.2992	34 000	29 000	152 000	129 000	4 300	5 300
22309	45	1.7717	100	3.9370	36	1.4173	42 000	38 000	185 000	167 000	3 800	4 800
22310	50	1.9685	110	4.3307	40	1.5748	52 000	47 000	232 000	211 000	3 600	4 300
22311	55	2.1654	120	4.7244	43	1.6929	59 000	54 000	261 000	241 000	3 200	4 000
22312	60	2.3622	130	5.1181	46	1.8110	69 000	65 000	305 000	288 000	3 000	3 600
22313	65	2.5591	140	5.5118	48	1.8898	74 000	71 000	330 000	315 000	2 800	3 400
22314	70	2.7559	150	5.9055	51	2.0079	85 000	106 000	380 000	470 000	2 600	3 200
22315	75	2.9528	160	6.2992	55	2.1654	96 000	93 000	425 000	415 000	2 400	3 000
22316	80	3.1496	170	6.6929	58	2.2835	109 000	108 000	485 000	480 000	2 200	2 800
22317	85	3.3465	180	7.0866	60	2.3622	117 000	115 000	520 000	510 000	2 000	2 600
22318	90	3.5433	190	7.4803	64	2.5197	136 000	134 000	605 000	595 000	2 000	2 400
22319	95	3.7402	200	7.8740	67	2.6378	147 000	152 000	655 000	675 000	1 900	2 400
22320	100	3.9370	215	8.4646	73	2.8740	169 000	176 000	750 000	785 000	1 700	2 200
22322	110	4.3307	240	9.4488	80	3.1496	208 000	220 000	925 000	980 000	1 600	1 900
22324	120	4.7244	260	10.2362	86	3.3858	238 000	252 000	1 060 000	1 120 000	1 400	1 800
22326	130	5.1181	280	11.0236	93	3.6614	279 000	304 000	1 240 000	1 350 000	1 300	1 600
22328	140	5.5118	300	11.8110	102	4.0157	326 000	357 000	1 450 000	1 590 000	1 200	1 500
22330	150	5.9055	320	12.5984	108	4.2520	344 000	380 000	1 530 000	1 690 000	1 100	1 400
22332	160	6.2992	340	13.3858	114	4.4882	382 000	427 000	1 700 000	1 900 000	1 100	1 300
22334	170	6.6929	360	14.1732	120	4.7244	443 000	474 000	1 970 000	2 110 000	1 000	1 200
22336	180	7.0866	380	14.9606	126	4.9606	488 000	526 000	2 170 000	2 340 000	950	1 200
22338	190	7.4803	400	15.7480	132	5.1969	533 000	582 000	2 370 000	2 590 000	900	1 100
SERIES 233												
23322	110	4.3307	240	9.4488	92	3.6220	175 000	236 000	778 000	1 050 000	1 700	2 200
23324	120	4.7244	260	10.2362	106	4.1732	216 000	295 000	961 000	1 310 000	1 500	1 900
23326	130	5.1181	280	11.0236	112	4.4094	234 000	321 000	1 040 000	1 430 000	1 400	1 800
23328	140	5.5118	300	11.8110	118	4.6457	279 000	400 000	1 240 000	1 780 000	1 300	1 700
23330	150	5.9055	320	12.5984	128	5.0394	315 000	450 000	1 400 000	2 000 000	1 200	1 500
23332	160	6.2992	340	13.3858	136	5.3543	349 000	510 000	1 550 000	2 270 000	1 100	1 400
23338	190	7.4803	400	15.7480	155	6.1024	468 000	697 000	2 080 000	3 100 000	950	1 200
23340	200	7.8740	420	16.5354	165	6.4961	526 000	798 000	2 340 000	3 550 000	900	1 100
23344	220	8.6614	460	18.1102	180	7.0866	629 000	967 000	2 800 000	4 300 000	800	1 000

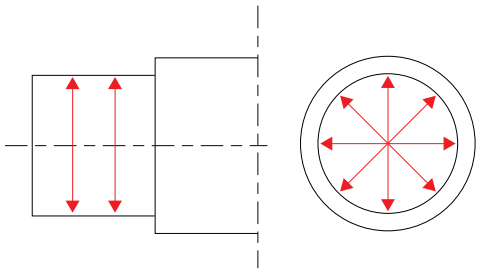
VE Spherical Roller Bearings are available with C4 clearance as standard; C3 clearance is available on request.

RECOMMENDED FITS AND CLEARANCES

IMPORTANCE OF FITS

Proper fits are imperative for optimizing the operating life of spherical roller bearings in vibrating equipment. By ensuring appropriate interference between mating surfaces – inner ring to shaft, outer ring to housing – the risk of circumferential displacement during operation is minimized and so to the possibility of premature bearing failure (creep) due to slippage of the bearing rings.

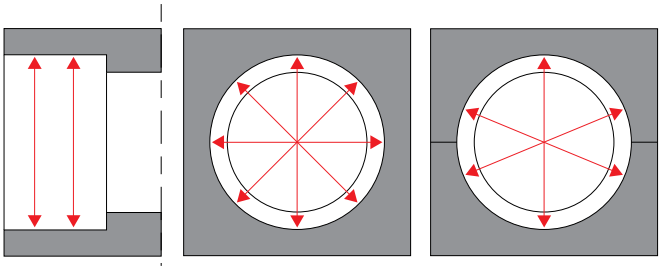
In order to ensure reliable bearing mounting, it is recommended to inspect fits prior to installation: measure and record shaft and housing dimensions (see illustrations) and review the values with the recommendations in the table below. For additional verification or consultation, contact NSK.



ASSEMBLY SHAFT

Basic Bearing	Bearing Dimensions						Fit Recommendations - Shaft					
	d		D		B		Shaft Diameter (mm)			Shaft Diameter (inch)		
No.	mm	inch	mm	inch	mm	inch	min	max	fit	min	max	fit
SERIES 223												
22308	40	1.5748	90	3.5433	33	1.2992	39.975	39.991	.002L - .025L	1.5738	1.5744	.0001L - .0010L
22309	45	1.7717	100	3.9370	36	1.4173	44.975	44.991	.002L - .025L	1.7707	1.7713	.0001L - .0010L
22310	50	1.9685	110	4.3307	40	1.5748	49.975	49.991	.002L - .025L	1.9675	1.9681	.0001L - .0010L
22311	55	2.1654	120	4.7244	43	1.6929	54.971	54.990	.001L - .029L	2.1642	2.1650	.0000L - .0011L
22312	60	2.3622	130	5.1181	46	1.8110	59.971	59.990	.001L - .029L	2.3611	2.3618	.0000L - .0011L
22313	65	2.5591	140	5.5118	48	1.8898	64.971	64.990	.001L - .029L	2.5579	2.5587	.0000L - .0011L
22314	70	2.7559	150	5.9055	51	2.0079	69.971	69.990	.001L - .029L	2.7548	2.7555	.0000L - .0011L
22315	75	2.9528	160	6.2992	55	2.1654	74.971	74.990	.001L - .029L	2.9516	2.9524	.0000L - .0011L
22316	80	3.1496	170	6.6929	58	2.2835	79.971	79.990	.001L - .029L	3.1485	3.1492	.0000L - .0011L
22317	85	3.3465	180	7.0866	60	2.3622	84.966	84.988	.000L - .034L	3.3451	3.3460	.0000L - .0013L
22318	90	3.5433	190	7.4803	64	2.5197	89.966	89.988	.000L - .034L	3.5420	3.5428	.0000L - .0013L
22319	95	3.7402	200	7.8740	67	2.6378	94.966	94.988	.000L - .034L	3.7388	3.7397	.0000L - .0013L
22320	100	3.9370	215	8.4646	73	2.8740	99.966	99.988	.000L - .034L	3.9357	3.9365	.0000L - .0013L
22322	110	4.3307	240	9.4488	80	3.1496	109.966	109.988	.000L - .034L	4.3294	4.3302	.0000L - .0013L
22324	120	4.7244	260	10.2362	86	3.3858	119.966	119.988	.000L - .034L	4.7231	4.7239	.0000L - .0013L
22326	130	5.1181	280	11.0236	93	3.6614	129.932	129.957	.028L - .068L	5.1154	5.1164	.0011L - .0027L
22328	140	5.5118	300	11.8110	102	4.0157	139.932	139.957	.028L - .068L	5.5091	5.5101	.0011L - .0027L
22330	150	5.9055	320	12.5984	108	4.2520	149.932	149.957	.028L - .068L	5.9028	5.9038	.0011L - .0027L
22332	160	6.2992	340	13.3858	114	4.4882	159.932	159.957	.028L - .068L	6.2965	6.2975	.0011L - .0027L
22334	170	6.6929	360	14.1732	120	4.7244	169.932	169.957	.028L - .068L	6.6902	6.6912	.0011L - .0027L
22336	180	7.0866	380	14.9606	126	4.9606	179.932	179.957	.028L - .068L	7.0839	7.0849	.0011L - .0027L
22338	190	7.4803	400	15.7480	132	5.1969	189.921	189.950	.032L - .079L	7.4772	7.4783	.0013L - .0031L
SERIES 233												
23322	110	4.3307	240	9.4488	92	3.6220	109.966	109.988	.000L - .034L	4.3294	4.3302	.0000L - .0013L
23324	120	4.7244	260	10.2362	106	4.1732	119.966	119.988	.000L - .034L	4.7231	4.7239	.0000L - .0013L
23326	130	5.1181	280	11.0236	112	4.4094	129.932	129.957	.028L - .068L	5.1154	5.1164	.0011L - .0027L
23328	140	5.5118	300	11.8110	118	4.6457	139.932	139.957	.028L - .068L	5.5091	5.5101	.0011L - .0027L
23330	150	5.9055	320	12.5984	128	5.0394	149.932	149.957	.028L - .068L	5.9028	5.9038	.0011L - .0027L
23332	160	6.2992	340	13.3858	136	5.3543	159.932	159.957	.028L - .068L	6.2965	6.2975	.0011L - .0027L
23338	190	7.4803	400	15.7480	155	6.1024	189.921	189.950	.032L - .079L	7.4772	7.4783	.0013L - .0031L
23340	200	7.8740	420	16.5354	165	6.4961	199.921	199.950	.032L - .079L	7.8709	7.8720	.0013L - .0031L
23344	220	8.6614	460	18.1102	180	7.0866	219.921	219.950	.032L - .079L	8.6583	8.6594	.0013L - .0031L

VE Spherical Roller Bearings are available with C4 clearance as standard; C3 clearance is available on request.

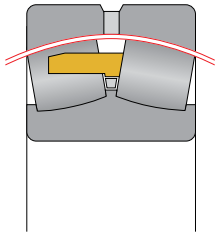


ONE PIECE HOUSING

SPLIT HOUSING

RADIAL CLEARANCE

Internal radial clearance for NSK long-life spherical roller bearings for vibrating equipment are set at the upper 2/3 of ISO standard bearings for optimal operating clearance and reduced heat generation. Refer to the table below for unmounted and mounted clearance ranges.



Fit Recommendations - Housing						Radial Internal Clearance - Min / Max			
Housing Bore Diameter (mm)			Housing Bore Diameter (inch)			C4 Unmounted		C4 Mounted	
min	max	fit	min	max	fit	mm	inch	mm	inch
89.962	89.984	.003T - .033T	3.5418	3.5427	.0001T - .0013T	.065 - .080	.0026 - .0031	.052 - .073	.0021 - .0029
99.962	99.984	.003T - .033T	3.9355	3.9364	.0001T - .0013T	.085 - .100	.0033 - .0039	.072 - .092	.0028 - .0036
109.962	109.984	.003T - .033T	4.3292	4.3301	.0001T - .0013T	.085 - .100	.0033 - .0039	.072 - .093	.0028 - .0036
119.962	119.984	.003T - .033T	4.7229	4.7238	.0001T - .0013T	.100 - .120	.0039 - .0047	.096 - .116	.0038 - .0046
129.955	129.980	.007T - .040T	5.1163	5.1173	.0003T - .0016T	.100 - .120	.0039 - .0047	.085 - .110	.0033 - .0043
139.955	139.980	.007T - .040T	5.5100	5.5110	.0003T - .0016T	.100 - .120	.0039 - .0047	.085 - .111	.0033 - .0044
149.955	149.980	.007T - .040T	5.9037	5.9047	.0003T - .0016T	.120 - .145	.0047 - .0057	.105 - .135	.0041 - .0053
159.939	159.964	.018T - .056T	6.2968	6.2978	.0007T - .0022T	.120 - .145	.0047 - .0057	.098 - .129	.0038 - .0051
169.939	169.964	.018T - .056T	6.6905	6.6915	.0007T - .0022T	.120 - .145	.0047 - .0057	.097 - .129	.0038 - .0051
179.939	179.964	.018T - .056T	7.0842	7.0852	.0007T - .0022T	.150 - .180	.0059 - .0071	.127 - .163	.0050 - .0064
189.930	189.959	.018T - .060T	7.4776	7.4787	.0007T - .0024T	.150 - .180	.0059 - .0071	.125 - .162	.0049 - .0064
199.930	199.959	.018T - .060T	7.8713	7.8724	.0007T - .0024T	.150 - .180	.0059 - .0071	.124 - .162	.0049 - .0064
214.930	214.959	.018T - .060T	8.4618	8.4630	.0007T - .0024T	.150 - .180	.0059 - .0071	.124 - .162	.0049 - .0064
239.930	239.959	.018T - .060T	9.4461	9.4472	.0007T - .0024T	.180 - .210	.0070 - .0083	.154 - .192	.0061 - .0076
259.921	259.953	.024T - .069T	10.2331	10.2344	.0009T - .0027T	.180 - .210	.0070 - .0083	.151 - .190	.0060 - .0075
279.921	279.953	.024T - .069T	11.0205	11.0218	.0009T - .0027T	.205 - .240	.0081 - .0094	.176 - .220	.0069 - .0087
299.921	299.953	.024T - .069T	11.8079	11.8092	.0009T - .0027T	.205 - .240	.0081 - .0094	.176 - .220	.0069 - .0086
319.913	319.949	.023T - .074T	12.5950	12.5964	.0009T - .0029T	.240 - .280	.0094 - .0110	.209 - .258	.0082 - .0102
339.913	339.949	.023T - .074T	13.3824	13.3838	.0009T - .0029T	.240 - .280	.0094 - .0110	.209 - .258	.0082 - .0102
359.913	359.949	.023T - .074T	14.1698	14.1712	.0009T - .0029T	.265 - .310	.0104 - .0122	.234 - .288	.0092 - .0113
379.913	379.949	.023T - .074T	14.9572	14.9586	.0009T - .0029T	.265 - .310	.0104 - .0122	.234 - .287	.0092 - .0113
399.913	399.949	.023T - .074T	15.7446	15.7460	.0009T - .0029T	.285 - .340	.0113 - .0134	.254 - .317	.0100 - .0125
239.930	239.959	.018T - .060T	9.4461	9.4472	.0007T - .0024T	.180 - .210	.0070 - .0083	.156 - .193	.0061 - .0076
259.921	259.953	.024T - .069T	10.2331	10.2344	.0009T - .0027T	.180 - .210	.0070 - .0083	.153 - .192	.0060 - .0075
279.921	279.953	.024T - .069T	11.0205	11.0218	.0009T - .0027T	.205 - .240	.0081 - .0094	.178 - .221	.0070 - .0087
299.921	299.953	.024T - .069T	11.8079	11.8092	.0009T - .0027T	.205 - .240	.0081 - .0094	.178 - .221	.0070 - .0087
319.913	319.949	.023T - .074T	12.5950	12.5964	.0009T - .0029T	.240 - .280	.0094 - .0110	.211 - .259	.0083 - .0102
339.913	339.949	.023T - .074T	13.3824	13.3838	.0009T - .0029T	.240 - .280	.0094 - .0110	.211 - .259	.0083 - .0102
399.913	399.949	.023T - .074T	15.7446	15.7460	.0009T - .0029T	.285 - .340	.0113 - .0134	.256 - .318	.0101 - .0125
419.905	419.945	.025T - .082T	16.5317	16.5333	.0010T - .0032T	.285 - .340	.0113 - .0134	.254 - .317	.0100 - .0125
459.905	459.945	.025T - .082T	18.1065	18.1081	.0010T - .0032T	.320 - .380	.0126 - .0150	.289 - .357	.0114 - .0140

PERFORMANCE AND ECONOMY WITH TOUGH STEEL

Utilizing advanced material engineering and heat treatment technology, NSK's Tough Steel (TF) design of VE series spherical roller bearings provide improved resistance to wear and seizure in contaminated lubrication conditions.

Compared to bearings made with conventional carburized steel, TF bearings offer:

- Exponentially longer service life with contaminated lubrication, and twice the life where the lubricant is clean
- As low as one-third the normal rate of wear
- Up to 40% improvement to seizure resistance

Tough Steel technology can be applied to a wide range of bearing types including spherical, cylindrical and tapered roller bearings as well as deep groove and angular contact ball bearings as used in mining and aggregate applications subject to similarly severe service conditions.

Think **NSK.**

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