



LONG-LIFE SEALED SPHERICAL ROLLER BEARINGS

FOR MINING AND AGGREGATE CONVEYOR PULLEYS



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.

A SEALED-CLEAN COUNTERMEASURE TO CONVEYOR DOWNTIME

The life expectancy of conventional spherical roller bearings for head and tail pulleys on mining and aggregate conveyors is relatively short, often measurable in months. Hard particle and water contamination present a constant challenge to bearing life and consequently to mining plant uptime.

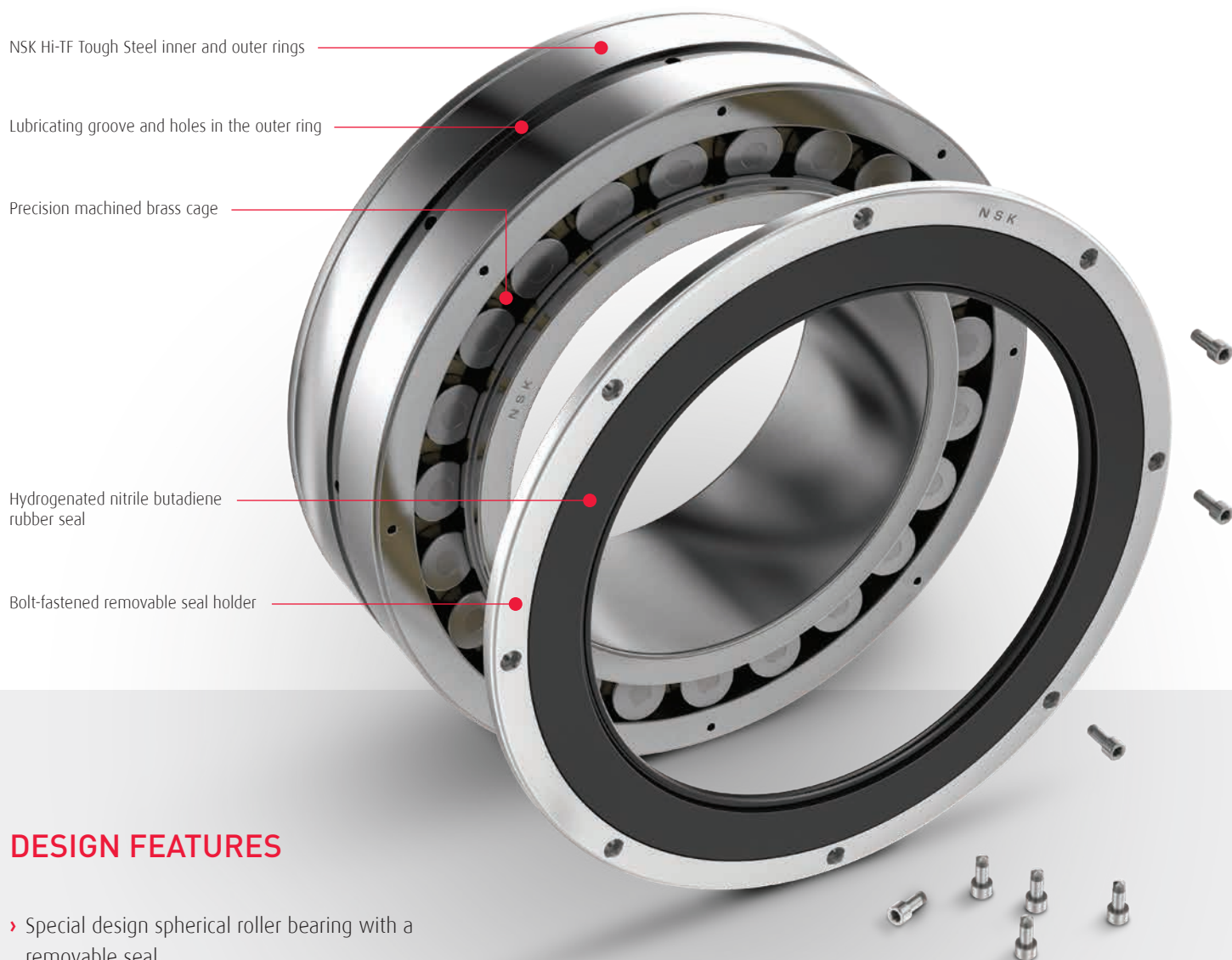
Breaking the cycle of relentless bearing failure requires an advanced approach to the problem. Enter NSK's pioneering spherical roller bearing with removable seal, designed to deliver superior resistance to contaminant ingress while enabling greater accuracy and proficiency with installation.



- ➔ **High performance seal design** provides protection against contamination ingress and compensates for bearing misalignment
- ➔ **Easy and accurate installation** with a bolt-fastened removable seal that permits clearance measurement during mounting
- ➔ **Long-life NSK Hi-TF steel** delivers longer service life in highly contaminated operating environments
- ➔ **Dimensionally interchangeable** with standard spherical roller bearings for modification-free upgrade

DESIGN FEATURES AND PERFORMANCE FACTORS

NSK's Hi-TF spherical roller bearings with removable seal are engineered to deliver exponentially longer service life under the highly contaminated environments of mining, aggregate and construction conveyor applications. Long-life Tough Steel™ technology and a heavy-duty machined brass cage achieve wear-resistant durability while an innovative removable seal design keeps contaminants out, clean lubricant in, and ensures easy and accurate installation.



DESIGN FEATURES

- › Special design spherical roller bearing with a removable seal
- › Manufactured with Hi-TF long-life steel
- › Removable seal locates on the bearing inner ring with easy, bolt-fastened installation to bearing outer ring
- › Equipped with a heavy-duty precision machined one-piece brass cage
- › Tapered bore standard — for cylindrical bore, contact NSK
- › With outer ring lubrication groove and holes
- › Dimensionally equivalent to spherical roller bearing series 222 and 231
- › For shaft diameters ranging from 120 to 480 mm



Fig. 1: Seal lips contact the bearing inner ring when installed



Fig. 2: Integral garter springs deliver high sealing performance

HIGH-PERFORMANCE FACTOR: ADVANCED REMOVABLE SEAL

NSK spherical roller bearings with removable seal are engineered to deliver substantially longer bearing life in contaminant-laden mining, aggregate and construction applications. The advanced, easy-to-install seal design provides optimal protection against particle and water ingress with considerable operating and handling advantages:

- ➔ **Seal lips contact the inner ring** with easy, bolt fastened installation (Figure 1)
- ➔ **Integral garter springs deliver high sealing performance** with compensation for misalignment (Figure 2)
- ➔ Hydrogenated nitrile butadiene rubber seal material is **stable at operating temperatures up to 100°C**

Bearings are supplied without packed grease; selection and fill occurs at the time of installation.

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

1	Catalog life
0.2	General carburized steel
1.4	Hi-TF steel

MODIFICATION-FREE ASSEMBLY UPGRADE

EASY AND ACCURATE BEARING INSTALLATION

NSK spherical roller bearings with removable seal are interchangeable with standard ISO dimension spherical roller bearings, with no need for modifications to existing bearing housings or surrounding structures. They're available for bearing upgrade only, or for complete assembly contamination resistance with NSK's heavy-duty SAF / SDAF housings and special design OLB seals.

Unlike bearings with integral seals, the removable seal design delivers considerable advantages for installation accuracy, lubrication and ongoing maintenance:

- ➔ **Appropriate internal clearance can be set during mounting (Figure 3)**, eliminating the risk of bearing wear from vibration (too loose) or heat generation (too tight)
- ➔ Bearings are supplied without packed lubrication – **grease selection and fill amount appropriate to the application** and user preference occurs at the time of installation. While the bearings are conventionally lubricated via outer ring lubrication holes, the removable seal allows for initial grease fill from sides of the bearing if necessary (Figure 4)
- ➔ The removable seal ring **allows for inspection, grease purging and relubrication** under appropriate conditions

Once the bearing is mounted and lubricated, the removable seal is easily re-installed, locating with contact on the bearing inner ring and bolt-fastening to the outer ring (Figure 5).

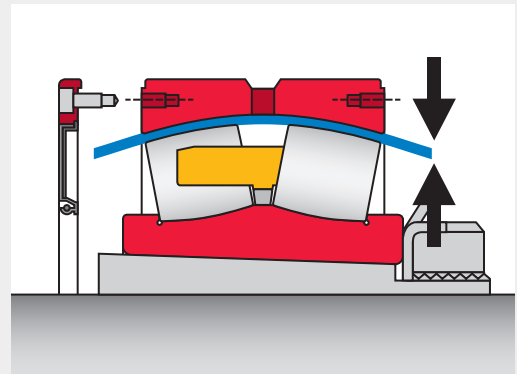


Fig. 3: Appropriate clearance can be set during mounting

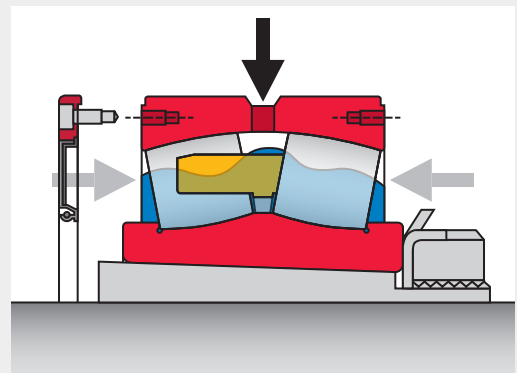


Fig. 4: Grease selection and fill are specific to the application

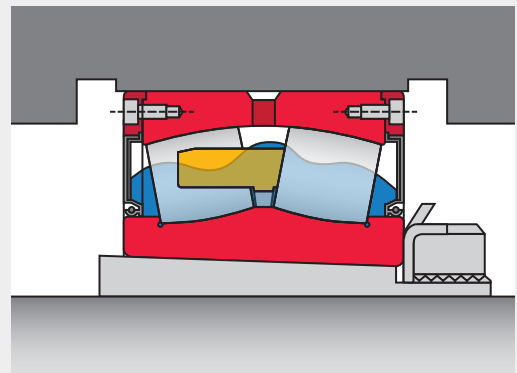


Fig. 5: Mounted and lubricated with removable seals

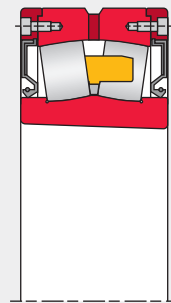
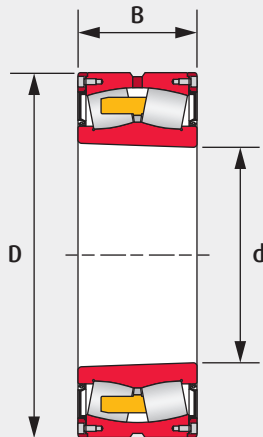


MAXIMUM PROTECTION: SEALED-CLEAN ASSEMBLIES

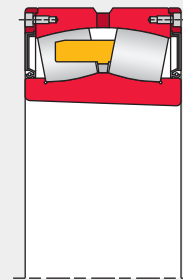
For complete assembly rebuild or replacement, NSK's sealed spherical roller bearings and heavy duty SAF / SDAF split pillow block housings equipped with contaminant-resistant seals keep conveyors moving under the most severe operating conditions.

Above: NSK spherical roller bearing with removable seal mounted in an SAF housing equipped with contaminant-resistant OLB seals

BEARING DIMENSIONS AND OPERATING VALUES



Series 222



Series 231

BOUNDARY DIMENSIONS			BEARING PART NO.	BASIC LOAD RATINGS		LIM. SPEED	LUBRICATION		
mm				kN		Grease	Init. Fill	Replenishment	
d	D	B		Dynamic	Static	rpm	g	hrs	g
120	215	58	22224CAMKDD2E4C3TF	480	525	1 050	80	10 000	19
130	230	64	22226CAMKDD2E4C3TF	565	635	970	100	9 700	22
140	250	68	22228CAMKDD2E4C3TF	680	765	890	130	9 100	26
150	270	73	22230CAMKDD2E4C3TF	780	895	820	160	8 600	30
160	290	80	22232CAMKDD2E4C3TF	900	1 050	780	210	8 200	35
170	280	88	23134CAMKDD2E4C3TF	915	1 230	770	165	7 700	37
180	300	96	23136CAMKDD2E4C3TF	1 060	1 400	720	220	7 400	43
190	320	104	23138CAMKDD2E4C3TF	1 190	1 540	670	340	7 000	50
200	340	112	23140CAMKDD2E4C3TF	1 360	1 790	630	390	6 700	57
220	370	120	23144CAMKDD2E4C3TF	1 570	2 140	580	480	6 100	67
240	400	128	23148CAMKDD2E4C3TF	1 830	2 470	540	650	5 700	77
260	440	144	23152CAMKDD2E4C3TF	2 210	2 980	490	850	5 200	95
280	460	146	23156CAMKDD2E4C3TF	2 330	3 300	460	850	4 900	100



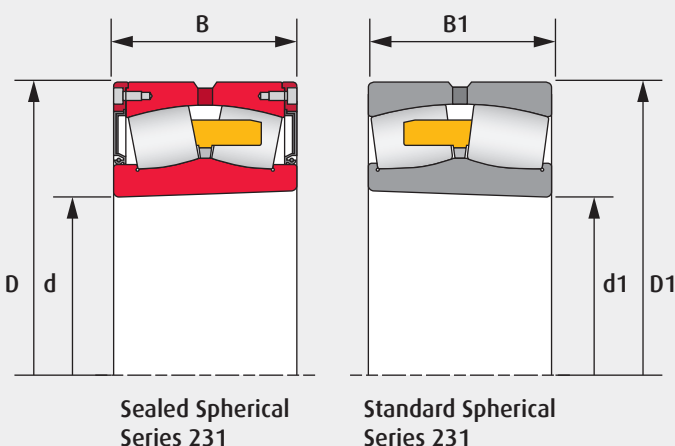
Dimensional Interchangeability

Easy adoption with conformity to standard ISO spherical roller bearings.

No modifications to housings or the surrounding structures are required.

At right: boundary dimensions for NSK sealed spherical v. standard type:

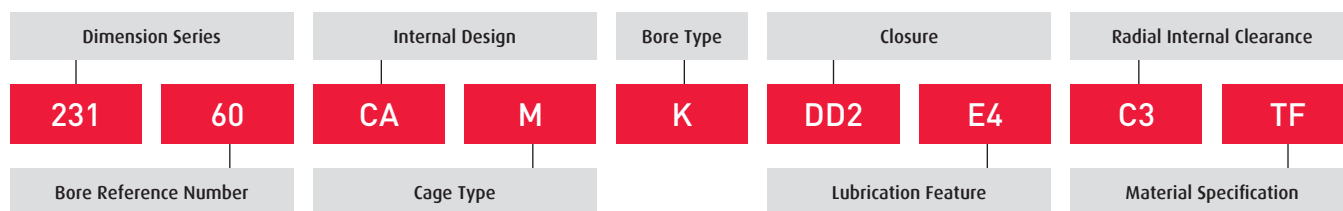
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BOUNDARY DIMENSIONS			BEARING PART NO.	BASIC LOAD RATINGS		LIM. SPEED	LUBRICATION		
mm				kN		Grease	Init. Fill	Replenishment	
d	D	B		Dynamic	Static	rpm	g	hrs	g
300	500	160	23160CAMKDD2E4C3TF	2 770	4 000	430	1 100	4 500	120
320	540	176	23164CAMKDD2E4C3TF	3 400	4 850	400	1 450	4 200	140
340	580	190	23168CAMKDD2E4C3TF	3 850	5 450	370	1 800	4 000	170
360	600	192	23172CAMKDD2E4C3TF	3 900	5 600	360	2 400	3 700	170
380	620	194	23176CAMKDD2E4C3TF	4 000	5 850	350	2 600	3 500	180
400	650	200	23180CAMKDD2E4C3TF	4 200	6 300	330	2 850	3 300	200
420	700	224	23184CAMKDD2E4C3TF	5 250	7 700	310	3 900	3 100	240
440	720	226	23188CAMKDD2E4C3TF	5 450	8 200	300	4 000	2 900	240
460	760	240	23192CAMKDD2E4C3TF	6 050	9 150	280	4 600	2 700	270
480	790	248	23196CAMKDD2E4C3TF	6 550	10 100	270	5 050	2 600	290

DESIGNATION SYSTEM AFTERMARKET

SPHERICAL ROLLER BEARINGS WITH REMOVABLE SEAL



DESIGNATION		ATTRIBUTE
Dimension series	222	medium duty type
	231	light duty type
Bore reference number		multiply x 5 for bearing bore diameter in millimeters
Internal design	CA	high-capacity internal design
Cage type	M	one-piece machined brass cage
Bore type	K	1:12 tapered bore

DESIGNATION		ATTRIBUTE
Closure	DD2	special design bolt-fastened removable seal
Lubrication feature	E4	lubrication groove and holes in the outer ring
Radial internal clearance	C3	lubrication groove and holes in the outer ring
Material specification	TF	long-life Hi-TF / Super-TF steel



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