

NSK Solutions for the Wind Power Industry



The Wind Power Industry



Efficient power generation demands top performance from every component – especially bearings. NSK bearings are designed to deliver outstanding efficiency and reliability in every application. Choose from a wide range including ball, tapered, cylindrical and spherical bearings.

NSK bearings have built a global reputation on dependability, resistance to heat and seizure, exceptionally long life and environmentally sound design – yet are priced no higher than bearings with lesser performance.

In an ever-changing world with ever-increasing standards, NSK maintains its leadership in bearing design and production through the industry's most exhaustive research and development programs.



Ball Bearings

The secret of their performance is in the NSK system – a system of specially formulated steel to extend bearing life ... advanced lubricants for minimal friction ... super-finished raceways for smoother operation ... and patented seals to lock out contaminants.



Tapers

Designed to absorb combined heavy radial loads and heavy radial thrust loads while operating at moderate speeds, NSK tapers are available in both metric and imperial measurements. Patented NSK HR High Capacity tapers add additional capacity within the same boundary dimensions as standard metric units; both are completely interchangeable depending upon requirements.

Note: Optimal performance depends upon using cups and cones from the same manufacturer. Interchanging parts from different sources may lead to impaired performance due to slight variations in design. Please contact NSK for detailed information.



Cylindricals

Higher load-carrying capacity, lower noise and stronger cages are just the beginning of NSK cylindrical bearing advantages. EM/EW designs are standardized for easy interchangeability and upgraded performance.

EM Series features:

- Roller-guided cage means trouble-free packing of grease, quieter operation and improved oil flow
- High load rating permits a greater number of larger rollers
- One-piece, roller-guided cage delivers maximum rigidity and lower running temperatures
- Stronger balanced design resists wear; large pocket corner radii relieve stress concentrations on cage



EW Series features:

- Roller guide face prevents misalignment
- High load rating permits a greater number of larger rollers
- Higher limiting speed improves productivity potential
- Maximum rigidity delivers low noise
- Optimum well-balanced design for smoother performance and longer life



Sphericals

A difference you can't afford to ignore: NSK HPS™ (High Performance Series) bearings deliver 12 percent higher load-carrying capacity than competitive products, plus a remarkable 50 percent average longer life. In addition, HPS bearings operate at higher limiting speeds, reducing maintenance and raising productivity.

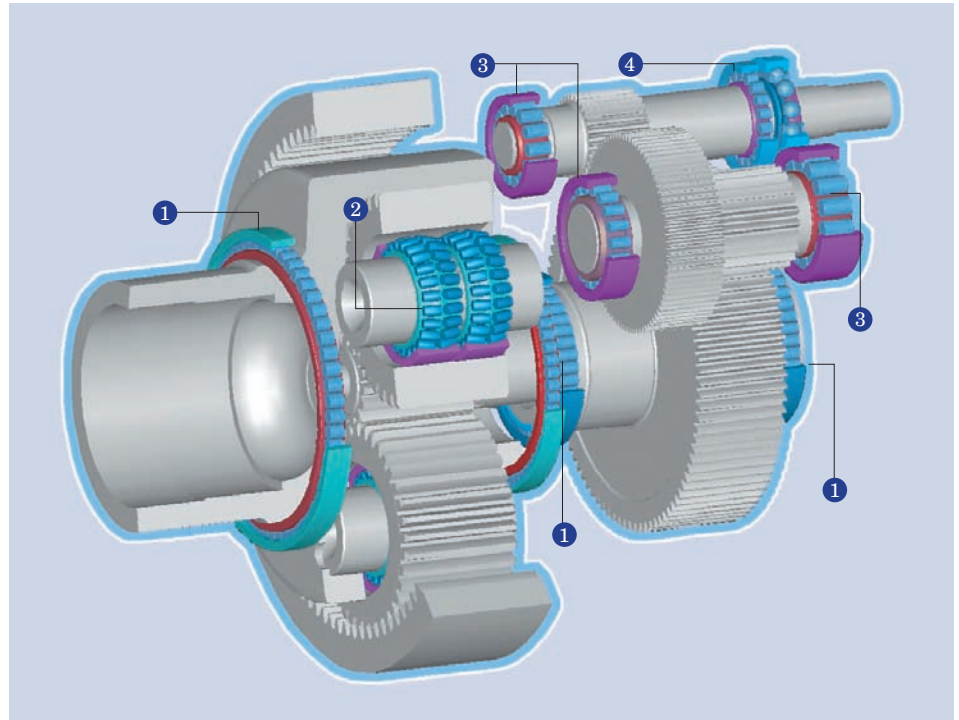
The advanced design of HPS bearings replaces a guide ring with an internal roller guide, making it easier to fit larger additional rollers for increased load capacity. Thanks to special surface treatments, HPS cages are stronger and generate less wear, heat and friction for improved high-speed tolerance.

NSK

Selecting Bearings by Design

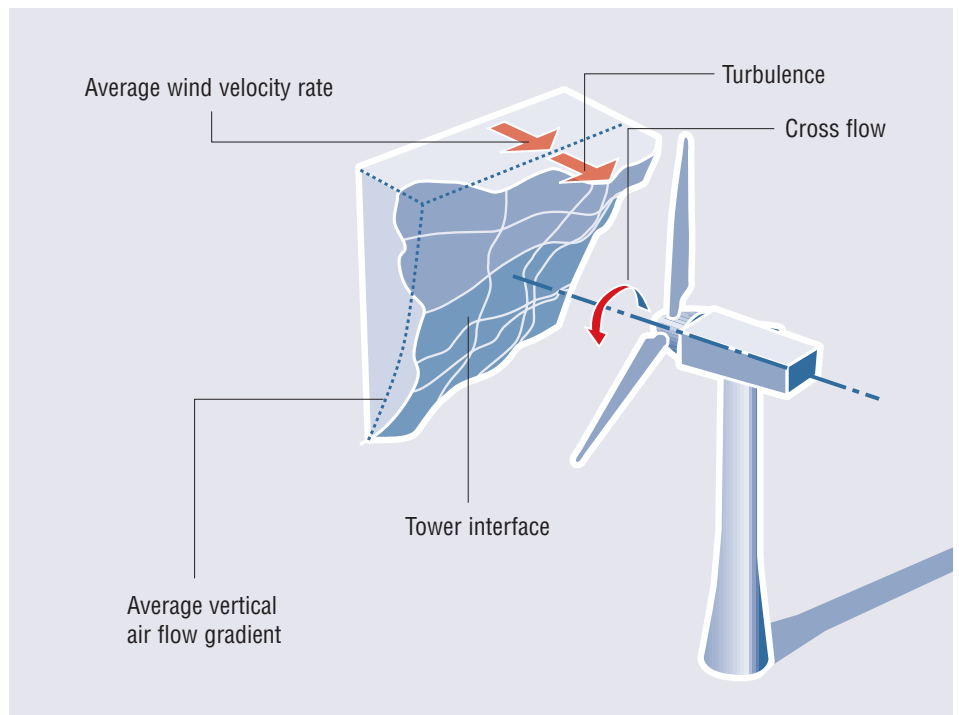
When selecting a suitable bearing type, the special operating conditions at the respective bearing seat are taken into consideration.

- ① Cageless cylindrical roller bearing for low speed and high radial loads.
- ② Spherical roller bearing for ultra-high loads and components in oblique arrangement.
- ③ Cylindrical roller bearings for high speed and high loads, functioning as a floating bearing.
- ④ Four-point bearing, acting as the locating bearing for high speed stage, while the cylindrical roller bearing takes the radial load.



Air Flow Profile of a Wind Generator Plant

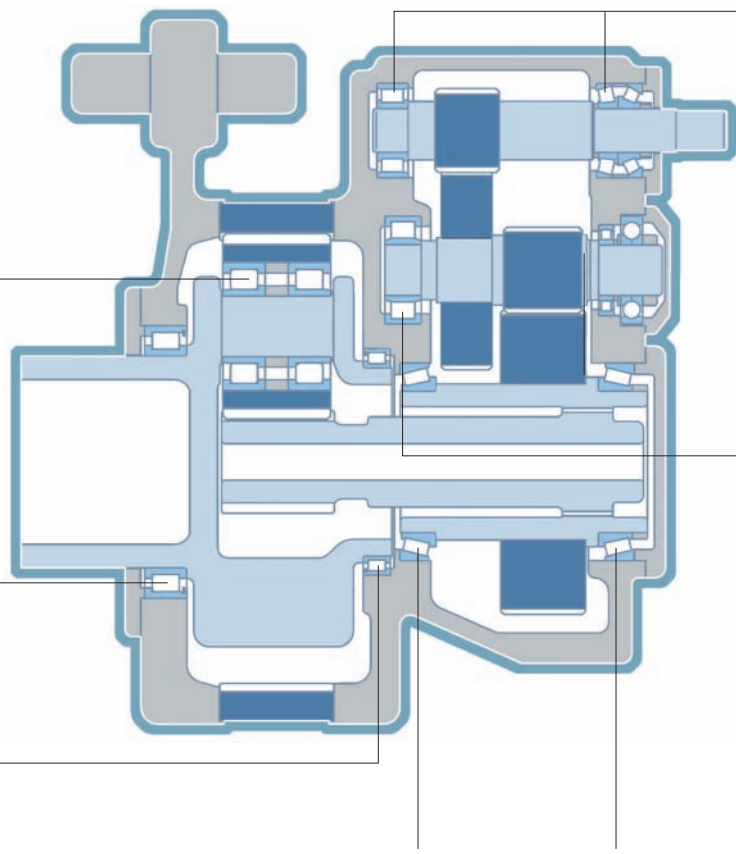
Partial wind velocity depends on rate, place and time, and results in considerable dynamic load impacts affecting the plant as well as subassemblies, including the rolling bearings.





Cylindrical Planet Gears in Different Bearing Arrangements

Floating bearing support with two cylindrical roller bearings NJ type. The two cylindrical roller bearings accommodate radial load and are arranged in radial pairs for uniform and balanced load distribution. To ensure sufficient axial clearance, axial adjustment is performed by means of spaces.










Combination of thrust bearing and floating bearing arrangement with a cylindrical roller bearing and a tapered roller bearing arranged in asymmetric pairs, suitable for high radial loads and high axial loads evolving from one direction.

Bearing with two cylindrical roller bearings and one four-point bearing. The two cylindrical roller bearings accommodate the radial loads while the four-point bearing accommodates axial loads and is released on the radial side.

Floating bearing support with two cageless cylindrical roller bearings, suitable for high radial and average axial loads.

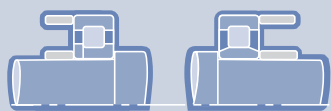
Bearing with two tapered roller bearings in X-Arrangement, suitable for high radial and axial loads.

Preview of Bearing Arrangements

		Comments
Bearing arrangement - adjusted or floating		Floating bearing support for average radial loads. Outer rings are frequently adjusted by means of springs.
		Floating bearing support for high radial loads. Force fit for inner and outer ring feasible. Mutual strain on the inner ring rib needs to be avoided.
		Standard bearing for high loads. Suitable for short distance between the bearings because the distance between the bearings increases due to O-Arrangement. Adjusting internal clearance is feasible during assembly.
		X-Arrangement is selected if force fit for inner ring is required. Easy handling of assembly and positioning. X-Arrangement reduces bearing support clearance. Adjusting bearing clearance is required on assembly.
		Suitable for high speed and average radial and axial loads. If certain design versions are employed, preload (e.g. by means of spring support) is possible. Adjustment of bearing clearance and preload is required on assembly.
Combination of thrust bearing and floating bearing arrangement		This bearing type is frequently employed if load on the bearing seats is uniform and balanced. Lower axial loads. To reduce noise thrust, bearing is often adjusted by means of springs.
		This arrangement is frequently employed. Loads on the bearing seats vary. Lower axial loads.



Comments



Intended for higher radial loads and lower axial loads. Due to the disassembly feature of the cylindrical roller bearings, these are well suited for assembly requiring a force fit of the inner ring and outer ring.



Intended for high radial loads of both bearing seats with average axial loads. Not sensitive to misalignment.



Intended for high radial and average axial loads at high speed. (To avoid radial load of the deep groove ball bearing, which is employed for the function of an axial bearing, the housing above the deep groove ball bearing needs to be released.)



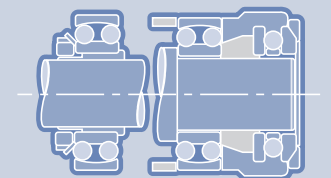
Intended for high radial and average axial loads.



Intended for high radial and axial loads. X-Arrangement of the tapered roller bearing allows misalignment to a slightly higher extent than does O-Arrangement.



Intended for average axial loads. The angular contact ball bearings need to be employed in universal combination (BG) or mated design. Often a cylindrical roller bearing is employed for the function of the radial bearing.

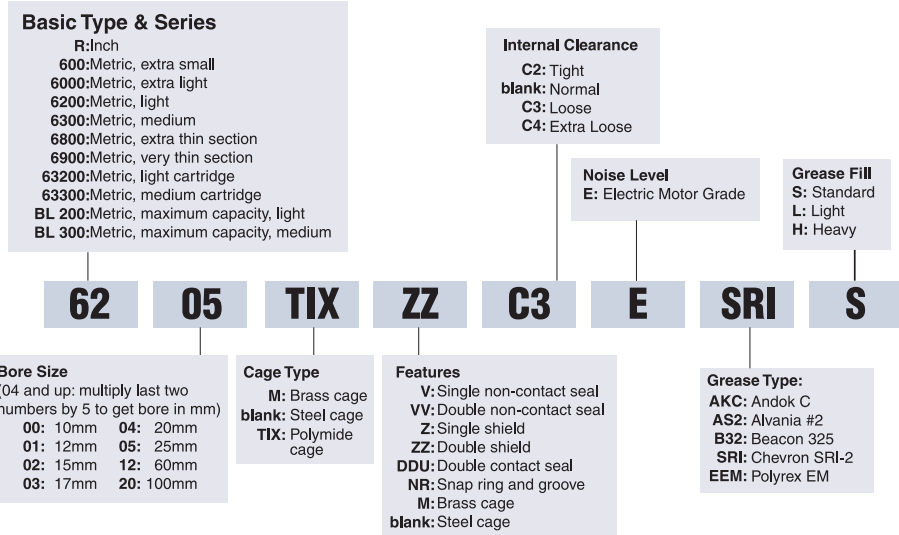


Bearing employed in the event of misalignment and high axial loads in one direction. The combination of spherical roller bearings and thrust spherical roller bearings is also often employed. It needs to be observed that the centers of the thrust bearing are in conformity. Axial minimum load is to be observed. Also suitable for vertical assembly (post cranes).

Combination of thrust bearing and floating bearing arrangement

Single Row Deep Groove Ball Bearings

Nomenclature



Interchange

DESCRIPTION		INTERCHANGE					
		NSK	SKF	TORR/FAF	FAG	MRC	NTN
Part Number	INCH	Rxx	Rxx	SxxK	Rxx	Rxx	Rxx
	EXTRA SMALL	6xx	6xx	3xK	6xx	3x	6xx
	EXTRA LIGHT	60xx	60xx	91xxK	60xx	1xxK	60xx
	LIGHT	62xx	62xx	2xxK	62xx	2xxS	62xx
	MEDIUM	63xx	63xx	3xxK	63xx	3xxS	63xx
	EXTRA THIN SECTION	68xx	618xx	–	618xx	18xxS	–
	VERY THIN SECTION	69xx	619xx	93xxK	619xx	19xxS	69xx
	THIN SECTION	16xxx	16xxx	–	16xxx	–	–
	MAXIMUM CAPACITY, LIGHT	BL2xx	2xx	2xxW	2xx	2xxM	BL2xx
	MAXIMUM CAPACITY, MEDIUM	BL3xx	3xx	3xxW	3xx	3xxM	BL3xx
	CARTRIDGE TYPE	633xx	4622xx	W3xx	S35xx	3xxC	633xx
		632xx	4623xx	W2xx	S36xx	2xxC	632xx
Part Number Suffix	TWO SEALS (NON CONTACT)	VV	2RZ	–	–	–	LLB
	TWO SEALS (CONTACT)	DDU	2RS	PP	2RSR	ZZ	LLU
	ONE SEAL (CONTACT)	DU	RS	P	RSR	Z	LU
	TWO SHIELDS	ZZ	2Z	DD	2ZR	FF	ZZ
	ONE SHIELD	Z	Z	D	ZR	F	Z
	SNAP RING	NR	NR	G	NR	G	NR
	STEEL CAGE	blank	J/blank	blank	blank	blank	blank
	POLYIMIDE CAGE	TIX	–	–	–	–	–
	BRASS CAGE	M	M	MBR	M	BRZ	L1
	HEAT STABILIZED 200C	X28	S1	–	S1	–	PREFIX TS3
	TIGHT CLEARANCE	C2	C2	H	C2	Tight	C2
	NORMAL CLEARANCE	blank	blank	R	blank	Normal	blank
	LOOSE CLEARANCE	C3	EM=C3E	P	C3	Loose	C3
	EXTRA LOOSE CLEARANCE	C4	C4	J	C4	Extra Loose	C4
	RADIAL CLEARANCE IN UM	C6xx	RLxx	–	Rxx	–	C5xx
	ELECTRIC MOTOR GRADE	E	QE6	–	–	–	–

The competitive manufacturers are provided for a convenient source of unit substitution. They can be considered interchangeable in most instances but for special applications, please consult NSK Engineering. NSK assumes no liability with respect to errors or omissions.

Inch Tapered Roller Bearings

Nomenclature



Prefix

- EH:** Extra heavy
- EL:** Extra light
- H:** Heavy
- HH:** Heavier than heavy
- HM:** Heavy medium
- J:** Metric designed
- L:** Light
- LL:** Lighter than light
- LM:** Light medium
- M:** Medium

Code Included Cup Angle

- | Code | Included Cup Angle |
|------|-----------------------------|
| 1 | 0° to 23°59'59.99" |
| 2 | 24° to 25°29'59.99" |
| 3 | 25°30' to 26°59'59.99" |
| 4 | 27° to 28°29'59.99" |
| 5 | 28°30' to 30°29'59.99" |
| 6 | 30°30' to 32°29'59.99" |
| 7 | 32°30' to 35°59'59.99" |
| 8 | 36° to 44°59'59.99" |
| 9 | 45° up, but not thrust only |

Design Number

2 digits which identify the cup or cone

LM

1

19

49

R

Basic Series

1-3 digit number that identifies maximum bore range

Additional Features*

R: Conforms to AFBMA standard
G: Case carburized cups & cone
 *NSK uses these two standard suffixes. Either one-or two-letter suffixes may appear.

Please refer to the bearing tables for exact part number options.

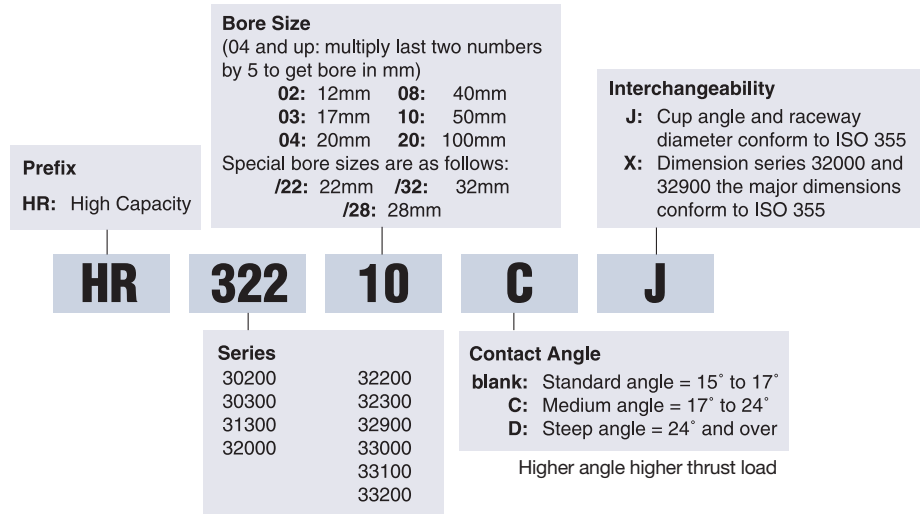
Interchange

DESCRIPTION		INTERCHANGE			
		NSK	SKF	Timken	FAG
Prefix	EXTRA HEAVY	EH	EH	EH	KEH
	HEAVIER THAN HEAVY	HH	HH	HH	KHH
	HEAVY	H	H	H	KH
	HEAVY MEDIUM	HM	HM	HM	KHM
	MEDIUM	M	M	M	KM
	LIGHT MEDIUM	LM	LM	LM	KLM
	LIGHT	L	L	L	KL
	LIGHTER THAN LIGHT	LL	LL	LL	KLL
	EXTRA LIGHT	EL	EL	EL	KEL
	Cup Angle	0° to 23°59'59.99"	1xxxx	1xxxx	1xxxx
24° to 25°29'59.99"		2xxxx	2xxxx	2xxxx	2xxxx
25°30' to 26°59'59.99"		3xxxx	3xxxx	3xxxx	3xxxx
27° to 28°29'59.99"		4xxxx	4xxxx	4xxxx	4xxxx
28°30' to 30°29'59.99"		5xxxx	5xxxx	5xxxx	5xxxx
30°30' to 32°29'59.99"		6xxxx	6xxxx	6xxxx	6xxxx
32°30' to 35°59'59.99"		7xxxx	7xxxx	7xxxx	7xxxx
36° to 44°59'59.99"		8xxxx	8xxxx	8xxxx	8xxxx
45° up, but not thrust only		9xxxx	9xxxx	9xxxx	9xxxx
CONFORMS TO AFBMA STANDARD		R	—	blank	—
CASE CARBURIZED CUP & CONE		G	—	blank	—

The competitive manufacturers are provided for a convenient source of unit substitution. They can be considered interchangeable in most instances but for special applications, please consult NSK Engineering. NSK assumes no liability with respect to errors or omissions.

Metric Tapered Roller Bearings

Nomenclature



Please refer to the bearing tables for exact part number options.

Interchange

DESCRIPTION		INTERCHANGE			
		NSK	SKF	Timken	FAG
Part Number	HIGH CAPACITY DESIGN	HR	—	—	—
	LIGHT	HR302xx	302xx	302xx	302xx
	MEDIUM	HR303xx	303xx	303xx	303xx
	MEDIUM, STEEP ANGLE	HR313xx*	313xx	313xx	313xx
	EXTRA LIGHT, WIDE	HR329xx	329xx	329xx	329xx
	VERY LIGHT, WIDE	HR320xx	320xx	320xx	320xx
	LIGHT, WIDE	HR322xx	322xx	322xx	322xx
	MEDIUM, WIDE	HR323xx	323xx	323xx	323xx
	VERY LIGHT, EXTRA WIDE	HR330xx	330xx	330xx	330xx
	LIGHT, EXTRA WIDE	HR331xx	331xx	331xx	331xx
	MEDIUM, EXTRA WIDE	HR332xx	332xx	332xx	332xx
	Suffix	MEDIUM CONTACT ANGLE	C	B	B
STEEP CONTACT ANGLE		D	—	—	—
MODIFIED INTERNAL DESIGN		X	X	X	X
CONFORMS TO ISO 355		J	—	—	A

* HR313xx is directly equal to an HR303xxD

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Cylindrical Roller Bearings

Nomenclature



Basic Type

N: Single row, no flanges on outer ring
NU: Single row, no flanges on inner ring
NJ: Single row, one flange on inner ring
NUP: Single row, NJ style w/locating ring
NF: Single row, one flange on outer ring
NH: Single row, NJ w/stabilizing ring
NN: Double row, no flanges on outer ring
NNU: Double row, no flanges on inner ring

Other Features

blank: Standard design
E: High capacity design

Internal Clearance

C2: Tight
blank: Normal
C3: Loose
C4: Extra Loose

E: Electric Motor Quality

NJ

3

20

E

M

C3

E

Series

2: light
3: medium

Bore Size

(04 and up: multiply last two numbers by 5 to get bore in mm)

00: 10mm **04:** 20mm
01: 12mm **05:** 25mm
02: 15mm **12:** 60mm
03: 17mm **20:** 100mm

Cage Style

T: Glass-fiber reinforced polyamide (only available with type "E" high capacity bearings)
M: Machined brass
W: Pressed steel cage
WS: Pressed steel for type "E" high capacity bearings

Please refer to the bearing tables for exact part number options.

Interchange

DESCRIPTION		INTERCHANGE		
		NSK	SKF	FAG
Part Number Prefix	SINGLE ROW, NO FLANGES ON OUTER RING	N	N	N
	SINGLE ROW, NO FLANGES ON INNER RING	NU	NU	NU
	SINGLE ROW, 1 FLANGE INNER	NJ	NJ	NJ
	SINGLE ROW, 1 FLANGE OUTER	NF	NF	—
	SINGLE ROW, 1 FLANGE INNER, WITH RETAINING RING	NUP	NUP	NUP
	SINGLE ROW, 1 FLANGE INNER w/STABILIZING RING	NH	NH	NH
	STABILIZING RING	HJ	HJ	HJ
	DOUBLE ROW, FLANGES OUTER/FLANGES INNER	NNU/NN	NNU/NN	NNU/NN
Part Number	LIGHT	2xx	2xx	2xx
	MEDIUM	3xx	3xx	3xx
	HEAVY	4xx	4xx	4xx
	EXTRA LIGHT	10xx	10xx	10xx
	LIGHT, WIDE	22xx	22xx	22xx
	MEDIUM, WIDE	23xx	23xx	23xx
Part Number Suffix	POLYAMIDE CAGE	T	P	TVP2
	COMPOSITE HIGH TEMP CAGE	T7	—	—
	MACHINED BRASS CAGE	M	M	M, M1
	PRESSED STEEL CAGE	W,WS	J	JP1
	HIGH CAPACITY DESIGN	E	EC	E
	FULL COMPLEMENT (NO CAGE)	V	V	V
	TIGHT CLEARANCE	C2	C2	C2
	NORMAL CLEARANCE	blank	blank	blank
	LOOSE CLEARANCE	C3	C3	C3
	EXTRA LOOSE CLEARANCE	C4	C4	C4

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Spherical Roller Bearings

Nomenclature



Basic Type

22200:Spherical roller, medium
22300:Spherical roller, heavy
23000:Spherical roller, very light
23100:Spherical roller, light
23200:Spherical roller, medium, wide
23900:Spherical roller, extra light
24000:Spherical roller, very light, wide
24100:Spherical roller, light, wide

Lubrication Features

E3: Holes only,outer
E4: Groove & holes,outer
E7: Groove & holes,outer & inner
E8: Outer ring with tapped holes in both faces for lifting
blank: No re-lubrication feature

Bore Type

blank: Cylindrical bore
K: 1:12 Tapered bore
K30: 1:30 Tapered bore

Other Features

P52: Outer ring accuracy
P53: Inner ring accuracy
P55: Both ring accuracy
U22: Special inspection measure
S11: Inner and outer ring Heat stabilized to 200°C

231

72

CAM

K

E4

C3

P53S11

Bore Size (multiply last two numbers by 5 to get bore in mm)

20: 100mm **48:** 240mm

32: 160mm **96:** 480mm

500 millimeters and larger written as :

/500: 500mm **/710:** 710mm

/630: 630mm **/1000:** 1000mm

Cage Options

CAM: One piece brass cage, guide ring
C,CD: Two piece steel cage guide ring
EA: High capacity steel cage
H: Two piece polyamide cage
M: Two piece brass cage, integral guide flange

Internal Clearance

C2: Tight
blank: Normal
C3: Loose
C4: Extra Loose

Interchange

Please refer to the bearing tables for exact part number options.

DESCRIPTION		INTERCHANGE			
		NSK	SKF	Timkin	FAG
Part Number	VERY LIGHT	239xx	239xx	239xx	239xx
	LIGHT	230xx	230xx	230xx	230xx
	LIGHT, WIDE	240xx	240xx	240xx	240xx
	MEDIUM	231xx	231xx	231xx	231xx
	MEDIUM, WIDE	241xx	241xx	241xx	241xx
	HEAVY	222xx (HPS)	222xx	222xx	222xx
	HEAVY, WIDE	232xx	232xx	232xx	232xx
	EXTRA HEAVY	213xx (HPS)	213xx	213xx	213xx
	EXTRA HEAVY, WIDE	223xx (HPS)	223xx	223xx	223xx
	Part Number Suffix	BRONZE CAGE, ONE PIECE, GUIDE RING	CAM,AM	CA,CACM	YM
BRONZE CAGE, TWO PIECE, GUIDE FLANGE		M	MC	BR	MB
STEEL CAGE, TWO PIECE, GUIDE RING		C,CD	CJ,CC	CJ,VJ	blank
HIGH CAPACITY STEEL CAGE		EA	-	-	-
POLYAMIDE CAGE, TWO PIECE		H	-	VCF	TVPB
TAPERED BORE 1:12		K	K	K	K
TAPERED BORE 1:30		K30	K30	K	K30
CARBURIZED STEEL, COMPLETE BEARING		g	ECD	W40	W209
CARBURIZED STEEL, INNER RING ONLY		g3	ECB	W40I	W209B
LUBE GROOVE & HOLES OUTER RING		E4	W33	W33	S
LUBE GROOVE & HOLES OUTER RING AND INNER RING		E7	W513	W33W94	SH40AB
OUTER RING, TAPPED HOLES ONE FACE FOR LIFTING		-	W56	W45A	-
OUTER RING, TAPPED HOLES BOTH FACES FOR LIFTING + E4 FEATURE		E8	-	-	-
HOLES ONLY OUTER RING		E3	W20	W20	SY
INNER RING LUBE GROOVE AND HOLES		E5	W26	W94	H40AB
NO RELUBE FEATURES		blank	blank	blank	-
PLUGS PROVIDED FOR OUTER RING HOLES (SEND E46 PLUGS)		E42	W77	W84	H40
COMBINATION W33, W4, W31		W507	W507	W33W4W31	-
COMBINATION W33, W31		E4U22	W506	W33W31	-
COMBINATION W33, W26, W31		W509	W509	W33W94W31	SH40A
OUTER RING WITH EXTRA CLOSE RUNNING ACCURACY		P52	C04	C04	T52BN
INNER RING WITH EXTRA CLOSE RUNNING ACCURACY		P53	C02	C02	T52BE
INNER AND OUTER RING W/EXTRA CLOSE RUNNING ACCURACY		P55	C08	C08	T52BW
SPECIAL INSPECTION MEASURES		W31	W31	W31	-
INNER RING AND OUTER RING HEAT STABILIZED TO 200°C		S11	S1	-	-
TIGHT CLEARANCE		C2	C2	C2	C2
NORMAL CLEARANCE		blank	blank	blank	blank
LOOSE CLEARANCE	C3	C3	C3	C3	
EXTRA LOOSE CLEARANCE	C4	C4	C4	C4	

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Bearing Maintenance and Inspection

Maintenance

Bearings and operating conditions must be periodically inspected and maintained to maximize bearing life to prevent mechanical failure, ensure reliable operation, raise productivity and enhance cost performance.

Maintenance should be performed regularly according to work standards that may vary according to machine operating conditions. Operating conditions should be monitored, lubricant replenished or changed, and the machine periodically disassembled and overhauled.

1. Inspection under operating conditions

Review lubricant properties, check operating temperatures and inspect for any vibrations and bearing noise to determine bearing replacement periods and replenishment intervals of the lubricant.

2. Inspection of the bearing

Be sure to thoroughly examine the bearings during periodic machine inspections and part replacement. Check the raceway for any damage and confirm if the bearing can be reused or should be replaced.

Table 1 – Bearing Irregularity Causes and Countermeasures

IRREGULARITIES		POSSIBLE CAUSES	COUNTERMEASURES
Noise	Loud metallic sound	Abnormal load	Improve the fit, internal clearance, preload or position of housing shoulder.
		Incorrect mounting	Improve machining accuracy, alignment accuracy or mounting accuracy of shaft and housing, or use the correct mounting method.
		Insufficient or improper lubricant	Replenish the lubricant or select another lubricant.
		Contact of rotating parts	Modify the labyrinth seal.
	Loud regular sound	Flaws, corrosion or scratches on raceways caused by foreign particles	Replace or clean the bearing, improve sealing conditions or use clean lubricant.
		Brinelling	Replace the bearing and use care when handling.
		Flaking on raceway	Replace the bearing.
	Irregular sound	Excessive clearance	Improve the fit, clearance, or preload.
		Contamination by foreign particles	Replace or clean the bearing, improve the seals and use clean lubricant.
Flaws or flaking on balls		Replace the bearing.	
Abnormal temperature rise	Excessively small clearance	Improve the fit, clearance or preload.	
	Excessive amount of lubricant	Reduce amount of lubricant and select stiffer grease.	
	Insufficient or improper lubricant	Replenish lubricant or select a proper one.	
	Abnormal load	Improve the fit, internal clearance, preload, or position of housing shoulder.	
	Incorrect mounting	Improve machining accuracy, alignment accuracy or mounting accuracy of shaft and housing, or use the correct mounting method.	
	Creep on fitted surface, or excessive seal friction	Correct the seals, replace the bearing, and correct the fitting or mounting.	
Vibration (Axial runout)	Brinelling	Replace the bearing, and use care when handling bearings.	
	Flaking	Replace the bearing.	
	Incorrect mounting	Correct the squareness between the shaft and housing shoulder or side of spacer.	
	Penetration of foreign particles	Replace or clean the bearing components and improve sealing.	
Leakage or discoloration of lubricant	Too much lubricant, or contamination by foreign particles or wear debris	Reduce the amount of lubricant. Select a stiffer grease. Replace the bearing or lubricant. Clean the housing and adjacent parts.	

Running Traces and Applied Loads



As the bearing rotates, the raceways of the inner ring and the outer ring make contact with the rolling elements. This results in a darkening of both the rolling elements and raceways. It is normal for the running trace to be marked on the raceway, and the extent and shape of this running trace provides a useful indication of loading conditions.

It is possible to determine from careful observation of the running traces whether the bearing is carrying a radial load, a large axial load or a moment load, or if there are extreme rigidity variations of the housing. Unexpected load applied to the bearing, excessive mounting error, or others can also be determined, providing a clue to the investigation of causes for bearing failure.

Typical running traces of deep groove ball bearings are shown in Fig. 1, and representative running traces of roller bearings are shown in Fig. 2.

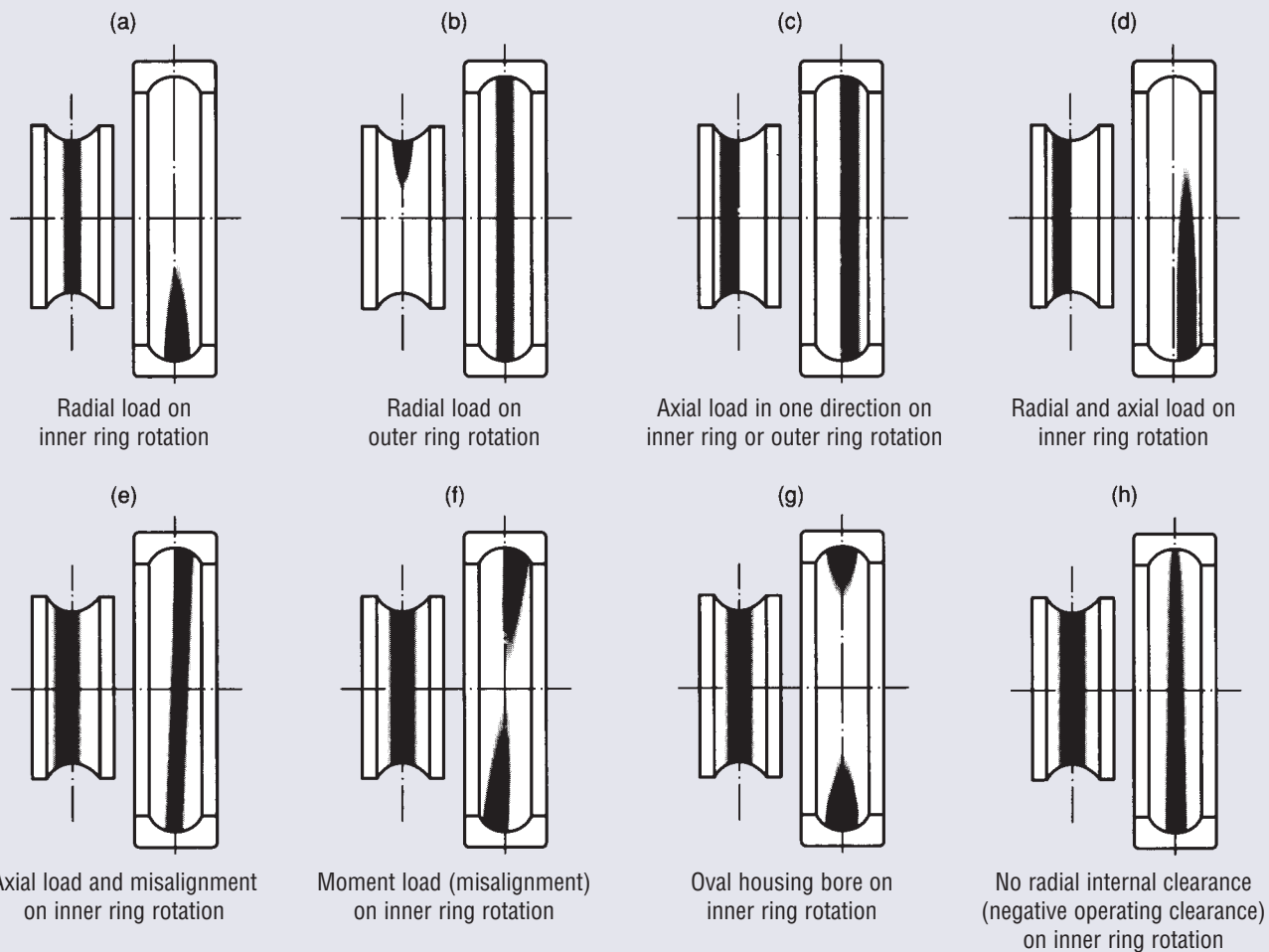


Fig. 1 – Typical running traces of deep groove ball bearings

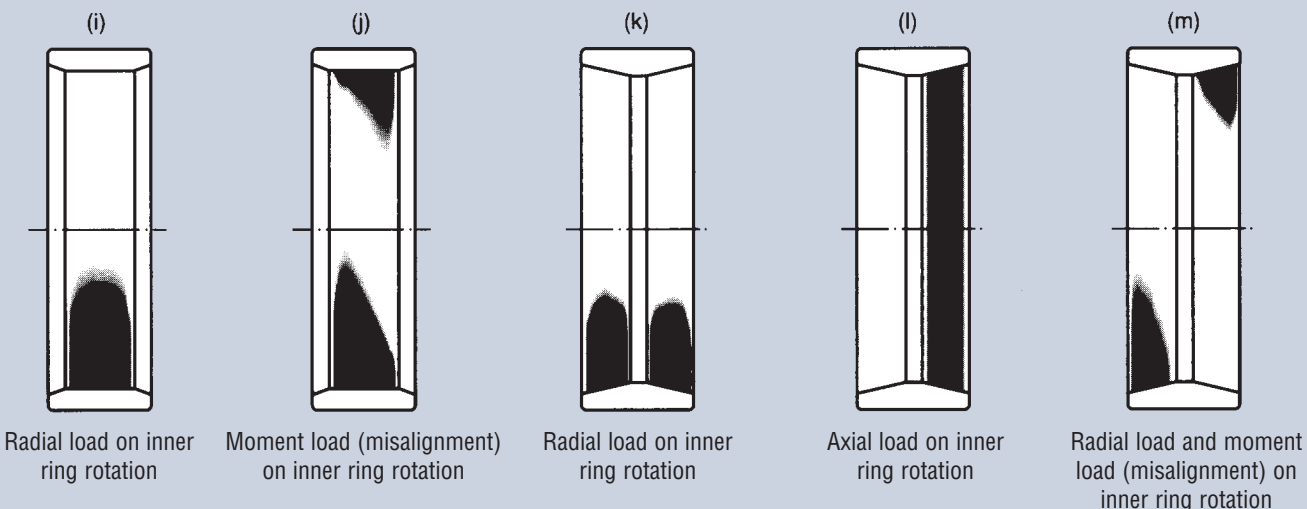


Fig. 2 – Typical running traces of roller bearings



Worldwide Sales Offices

NSK Ltd.-Headquarters, Tokyo, Japan	www.nsk.com				
ASIA BUSINESS STRATEGIC DIVISION-HEADQUARTERS	tel: 03-3779-7145				
INDUSTRIAL MACHINERY BEARINGS DIVISION-HEADQUARTERS	tel: 03-3779-7227				
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