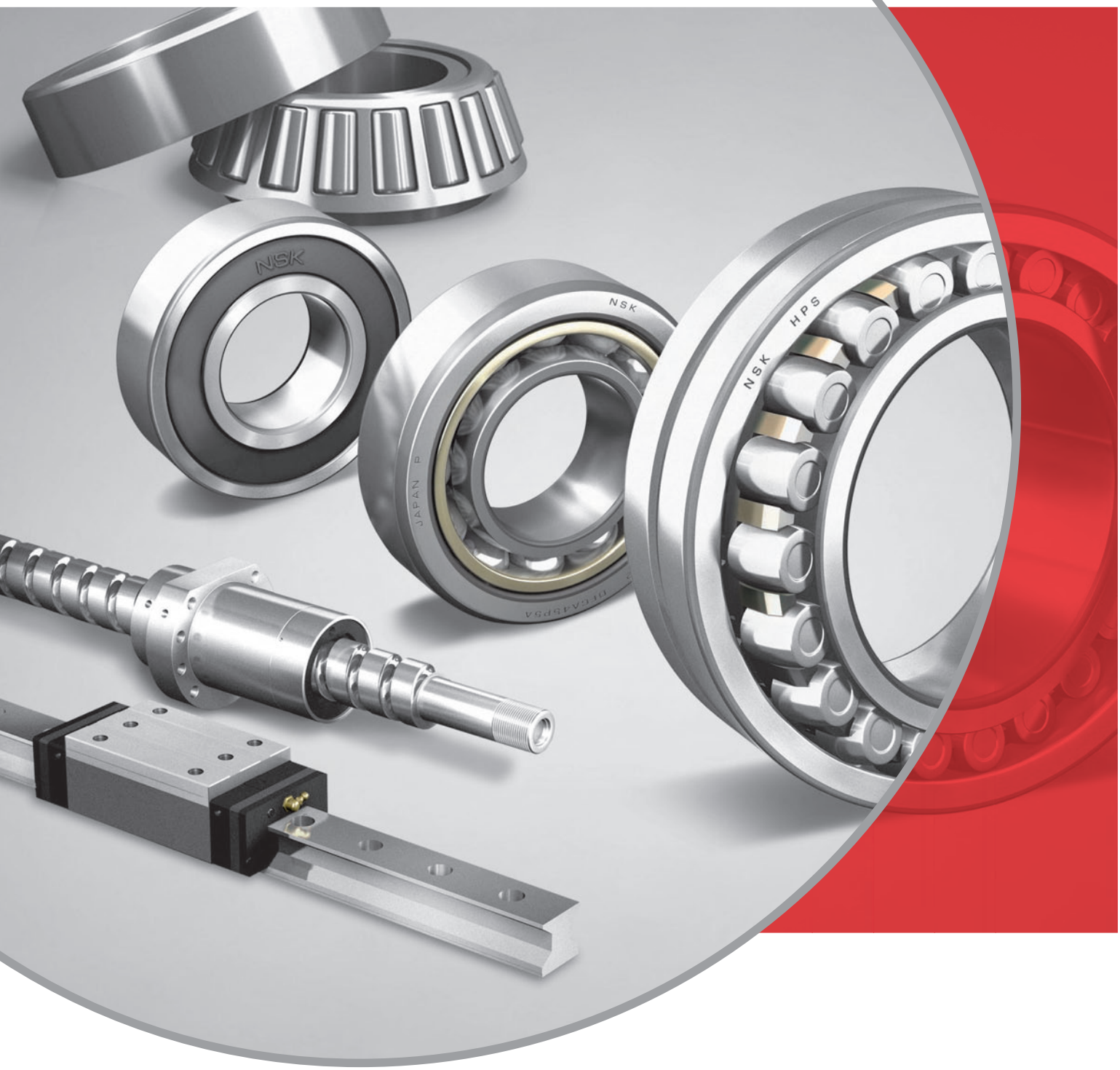
NSK

BEARING AND LINEAR REPLACEMENT GUIDE



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Angular Contact Bearings (cont.)

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The NSK Brand, Recognized Around the World

From home appliances, automobiles, and capital equipment to the aerospace industry – NSK bearings are used in an extensive range of applications. NSK established its global-scale enterprise on technology that has met the exact requirements of global industry. We have also established R&D systems and support services to meet the diverse needs of our customers on every continent.

As a brand recognized around the world, NSK continues to lead industry with its technical expertise.

NSK is on the Move, Across the Globe

Headquarters

America
Ann Arbor

Asia
Shanghai
Singapore

Europe
Maidenhead

Japan
Tokyo

Technical Offices

America
Ann Arbor

Asia
Kunshan

Europe
Kielce
Newark
Ratingen

Japan
Fujisawa
Maebashi

Plants

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Ann Arbor
Bennington
Clarinda
Franklin
Liberty

America (South)
Suzano

Asia
Anshun
Balakong
Chachoengsao
Changshu
Changwon
Chennai
Chonburi
Dongguan
Jakarta
Kunshan
Suzhou
Zhangjiagang

Europe
Kielce
Munderkingen
Newark
Peterlee
Torino

Japan
Fujisawa
Hanyu
Haruna
Konan
Otsu
Maebashi
Takasaki
Tanakura
Ukiha

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Johannesburg

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Bennington
Chicago
Indianapolis
Los Angeles
Miami
Montreal
San Jose
Toronto
Vancouver

America (South)
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Buenos Aires
Joinville
Mexico City
Porto Alegre
Recife
São Paulo

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Beijing
Chengdu
Chennai
Guangzhou
Hongkong
Jakarta
Johor Bahru
Kota Kinabalu
Kuala Lumpur
Manila
Prai
Seoul
Shanghai
Singapore
Taichung
Tainan
Taipei

Europe
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Düsseldorf
Istanbul
Leipzig
Maidenhead
Milano
Newark
Paris
Stuttgart
Tilburg
Warsaw

Japan
Nagoya
Tokyo

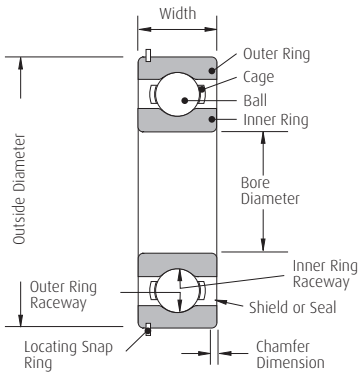
Australia
Adelaide
Auckland
Brisbane
Melbourne
Perth
Sydney

Terminology

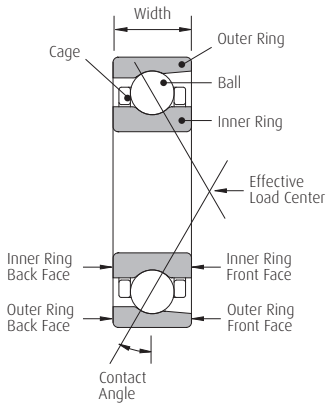
Design and Classification

Rolling bearings use balls or other rolling elements, located between bearing rings, to minimize friction. The rolling elements are separated and held in position by "cages" or other retaining devices.

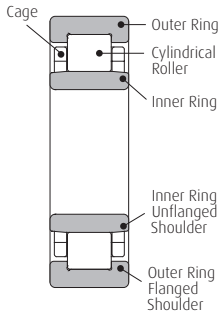
The construction of six of the most common rolling element bearings are illustrated here for identification of nomenclature. Specific dimensions and details for these bearings are given in the dimensional tables in the following sections of this catalog.



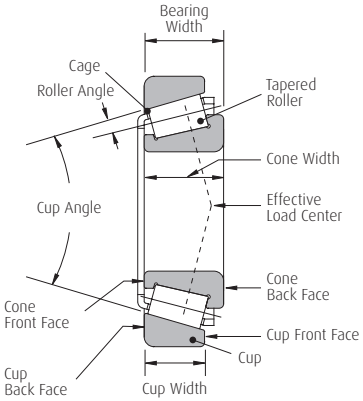
Single Row Deep Groove Ball Bearing



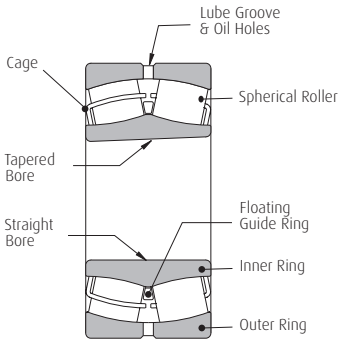
Single Row Angular Contact Ball Bearing



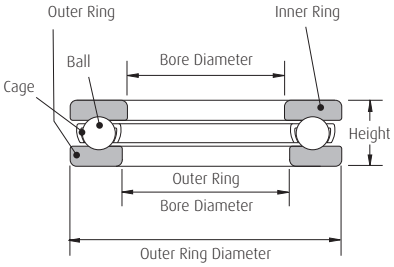
Cylindrical Roller Bearing (NU Style)



Tapered Roller Bearing

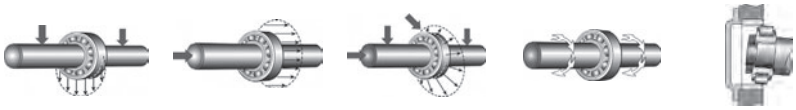


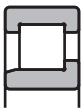
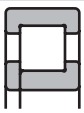
Spherical Roller Bearing



Single Direction Thrust Ball Bearing

Bearing Types and Performance



	Bearing Type	Series	Radial Loads	Axial Loads	Combined Loads	High Speeds	Angular Misalignment
	Deep Groove Ball Bearing	600-6000-6200-6300-16000-16100-6800-6900-BL	Good	Fair 2 directions	Good	Excellent	Good
	Double Row Deep Groove Ball Bearing	4200-4300	Good	Fair 2 directions	Fair	Fair	Poor
	Angular Contact Ball Bearing	7200-7300	Good	Good 1 direction only	Good	Excellent	Poor
	Double Row Angular Contact Ball Bearing	3200-3300-5200-5300	Good	Good 2 directions	Good	Fair	Poor
	Four-Point Contact Ball Bearing	QJ200-QJ300	Poor	Good 2 directions	Fair	Good	Poor
	Self-Aligning Ball Bearing	1200-1300-2200-2300	Fair	Poor 2 directions	Poor	Good	Excellent
	Cylindrical Roller Bearing	NU-N200-300-400-1000-2200-2300	Good	None	None	Excellent	Fair
	Cylindrical Roller Bearing	NJ-NF200-300-400-1000-2200-2300	Good	Fair 1 direction only	Fair	Good	Fair
	Cylindrical Roller Bearing	NUP200-300-400-1000-2200-2300	Good	Fair 2 directions	Fair	Good	Fair
	Tapered Roller Bearing	HR30200-30300-30300DJ-32000-32200-32300-33000-33100-33200	Good	Good 1 direction only	Good	Fair	Fair
	Spherical Roller Bearing	21300-22200-22300-23000-23100-23200-23900-24000-24100	Excellent	Fair 2 directions	Good	Fair	Excellent
	Thrust Ball Bearing	51100-51200-51300-51400-52200-52300-52400	None	Good 1 direction only	None	Poor	None

Precision Class

Bearing Tolerance Standards

The dimensional and running accuracies of rolling bearings are standardized by ISO with regard to the following items:

- Tolerances for bore diameter, outer diameter, individual ring width, and overall width
- Tolerances for absolution dimensions of inscribed circle diameter and circumscribed circle diameter
- Tolerances for chamfer dimension
- Tolerances for width variations
- Tolerances for taper angle and taper bore diameters
- Tolerances for radial runout of inner ring and outer rings
- Tolerances for axial runout of inner and outer rings
- Tolerances for side or face runout of inner ring
- Tolerances for side or face runout of outer ring

Precision Standards

Equivalent Standards (reference)	JIS [1] / DIN [2]	Class 0 / P0	Class 6 / P6	Class 5 / P5	Class 4 / P4	Class 3 / P3	Class 2 / P2
ANSI/ABWA[3]	Ball Bearings	ABEC 1	ABEC 3	ABEC 5 (CLASS 5P)	ABEC 7 (CLASS 7P)	ABEC 7/9	ABEC 9 (CLASS 9P)
	Roller Bearings	RBEC 1	RBEC 3	RBEC 5			
	Tapered Roller Bearings	CLASS 4	CLASS 2	CLASS 3	CLASS 0		CLASS 00

[1] JIS: Standards for Japanese Industry, [2] DIN: German Institute for Standards, [3] ABMA: American Bearing Manufacturers Association.

Standard Bearings Precision **Standard for Precision Bearings**

Bearing Identification

Bearing Number Formulation

Bearings are identified by numbers and letters which designate bearing type, boundary dimensions, tolerance class, internal clearance and other specifications. The numbers used for standard bearings conform to ISO 15, Designation of Rolling Bearings. Boundary dimensions for the most commonly used bearings are based on the ISO Boundary Dimensions Tables.

In order to establish certain standards in addition to those specified in ISO, NSK also uses various symbols of its own.

	Bearing Series	Bearing Type	Dimension Series	
			Width* Series	Diameter Series
Single Row Deep Groove Ball Bearing	68	6	(1)	8
	69	6	(1)	9
	60	6	(1)	0
	62	6	(0)	2
	63	6	(0)	3
	64	6	(0)	4
Single Row Angular Contact Ball Bearing	70	7	(1)	0
	72	7	(0)	2
	73	7	(0)	3
	74	7	(0)	4
Self-Aligning Ball Bearing	12	1	(0)	2
	13	1	(0)	3
	22	2	(2)	2
	23	2	(2)	3
Single Row Cylindrical Roller Bearing	NU10	NU	1	0
	NU2	NU	(0)	2
	NU22	NU	2	2
	NU3	NU	(0)	3
	NU23	NU	2	3
	NU4	NU	(0)	4
	NJ2	NJ	(0)	2
	NJ22	NJ	2	2
	NJ3	NJ	(0)	3
	NJ23	NJ	2	3
	NJ4	NJ	(0)	4
	N2	N	(0)	2
	N3	N	(0)	3
	N4	N	(0)	4
	NF2	NF	(0)	2
	NF3	NF	(0)	3
	NF4	NF	(0)	4
Double Row Cylindrical Roller Bearing	NNU49	NNU	4	9
	NN30	NN	2	0
Metric Tapered Roller Bearing	320	3	2	0
	302	3	(0)	2
	322	3	2	2
	303	3	0	3
	323	3	2	3
Spherical Roller Bearing	230	2	3	0
	231	2	3	1
	222	2	2	2
	232	2	3	2
	213**	2	0	3
	223	2	2	3
Thrust Ball Bearing with Flat Seat	511	5	1	1
	512	5	1	2
	513	5	1	3
	514	5	1	4
	522	5	2	2
	523	5	2	3
	524	5	2	4
Spherical Roller Thrust Bearing	292	2	9	2
	293	2	9	3
	294	2	9	4

*The width series numbers shown in parentheses are usually omitted.
**213 is customary usage since this series would be 203 according to standard practice.

Bearing Number Formulation (cont.)

Bearing series numbers indicate bearing types and dimension series. They constitute the basic number structure for bearing designations. These are shown on page A-7. Supplementary symbols and meanings of typical numbers and symbols are shown on page A-8.

Typical examples of bearing designations are illustrated below:

6 3 08 ZZ C3
- C3: Radial clearance (C3)
- ZZ: Shields on Both Sides
- 08: Bearing Bore (40mm)
- 3: Diameter Series 3
- 6: Single Row Deep Groove Ball Bearing

1 2 06 K + H206
- H206: Adapter with 25mm Bore
- K: Tapered Bore (1:12 Taper)
- 06: Bearing Bore (30mm)
- 2: Diameter Series 2
- 1: Self-Aligning Ball Bearing

NU 3 18 M ( )
- ( ): Radial Clearance (Blank is CN)
- M: Machined Brass Cage
- 18: Bearing Bore (90mm)
- 3: Diameter Series 3
- NU: Cylindrical Roller Bearing (NU Type)

NN 3 0 17 K CC1 P4
- P4: Tolerance to ISO Class 4
- CC1: Radial Clearance for Matched Cylindrical Roller Bearings
- K: Tapered Bore (1:12 Taper)
- 17: Bearing Bore (85mm)
- 0: Diameter Series 0
- 3: Width Series 3
- NN: Cylindrical Roller Bearing (NN Type)

7 2 20 A DB C3
- C3: Axial Clearance (C3)
- DB: Back-to-Back Arrangement
- A: Contact Angle (30°)
- 20: Bearing Bore (100mm)
- 2: Diameter Series 2
- 7: Single Row Angular Contact Ball Bearing

HR 3 0 2 07 J
- J: Small Diameter of Outer Ring Raceway and Contact Angle Conform to ISO Standard
- 07: Bearing Bore (35mm)
- 2: Diameter Series 2
- 0: Width Series 0
- 3: Tapered Roller Bearing
- HR: High Capacity Bearing

2 4 0 /1000 M K30 E4 C3
- C3: Radial Clearance (C3)
- E4: Outer Ring with Lubrication Groove and Holes
- K30: Tapered Bore (1:30 Taper)
- M: Machined Brass Cage
- /1000: Bearing Bore (1,000mm)
- 0: Diameter Series 0
- 4: Width Series 4
- 2: Spherical Roller Bearing

5 1 2 15
- 15: Bearing Bore (75mm)
- 2: Diameter Series 2
- 1: Height Series 1
- 5: Thrust Ball Bearing

Bearing Identification (cont.)

Formulation of Bearing Numbers

Basic Bearing

- Bearing Series
- Bore
- Contact Angle
- Internal Design
- Material
- Cage
- External Seals, Shields

External Seals, Shields

Z	Shield on One Side Only
ZZ	Z Shields on Both Sides
DU	Contact Rubber Seal on One Side Only
DDU	DU Seals on Both Sides
V	Non-Contact Rubber Seal on One Side Only
VV	V Seals on Both Sides

Internal Design

A	Modified Internal Design
J	Small Diameter of Outer Ring Raceway and Contact Angle of Tapered Roller Bearings Conform to ISO
(For High Capacity Bearings)	
CA	Spherical Roller Bearings with Machined Cages
CD	Spherical Roller Bearings with Pressed Cages
E	Extra Capacity Design
H	Spherical Radial and Thrust Roller Bearings with Polyamide cage
HR (prefix)	Tapered Roller Bearings High Capacity

Material

g	Case-Hardened Steel Used in Outer Rings, Inner Rings and Rolling Elements
h	Stainless Steel Used in Outer Rings, Inner Rings and Rolling Elements

Cages

M	Machined Brass Cages
W	Pressed Steel Cages
T,TR	Phenolic Resin/Cages (Ball Bearing)
T	Polyamide Cages (Roller Bearing)
TYN, TIX	Polyamide Cages (Ball Bearing)
V	Bearings without Cages (Cageless Ball and Rolling Bearings

Bore

1 thru 9	Bore in mm
00	10mm
01	12mm
02	15mm
03	17mm
/22	22mm
/28	28mm
/32	32mm
04 thru 96	Multiply by 5 for Bore in mm (ex. 04=20mm)
/500 thru /2500	Bore in mm

Contact Angle Angular Contact Ball Bearings

A	30°
A5	25°
B	40°
C	15°

Contact Angle Tapered Roller Bearings

(none)	Contact Angle less than 17°
C	Contact Angle Approx. 20°
D	Contact Angle Approx. 28°

Bearing Series

68	Single Row Deep Groove Ball Bearings
69	
60	
...	
70	Single Row Angular Contact Ball Bearings
72	
73	
...	
12	Self-Aligning Ball Bearings
13	
22	
...	
NJ 2	Cylindrical Roller Bearings
N 3	
NN 30	
...	
320	Tapered Roller Bearings
322	
323	
...	
230	Spherical Roller Bearings
222	
223	
...	
511	Thrust Ball Bearings with Flat Seats
512	
513	
...	
292	Spherical Roller Thrust Bearings
293	
294	
...	

Formulation of Bearing Numbers (continued) - Supplementary Symbols

Supplementary Features

- Features
- Arrangement
- Radial Internal Clearance
- Tolerance Class
- Special Specifications
- Spacer or Sleeve
- Lubrication

Lubrication

AKC	Exxon Andok C
AS2	Shell Alvania No. 2
B32	Exxon Beacon 325
SRI	Chevron SRI-2
SDR	Shell Dolium R

Spacer or Sleeve

+K	Bearings with Outer Ring Spacer
+L	Bearings with Inner Ring Spacer
+KL	Bearings with Both Outer and Inner Ring Spacers
+H	Adapter Designation
+AH	Withdrawal Sleeve Designation
HJ	Angle Ring Designation

Tolerance Class

(None)	ISO Class 0 (ABEC 1)
P6	ISO Class 6 (ABEC 3)
P5	ISO Class 5 (ABEC 5)
P4	ISO Class 4 (ABEC 7)

Special Specifications

X28	Inner and Outer Rings Heat Stabilized for Maximum Working Temperature of 200°C
S11	Spherical Bearings Heat Stabilized to 200°C
P55	High Running Accuracy of Inner and Outer Rings

Feature Designs of Outer and Inner Ring

K	Tapered Bore (Taper 1:12)
K30	Tapered Bore (Taper 1:30)
E4	Lubrication Groove and Holes in Outer Ring
N	Snap Ring Groove in Outer Ring
NR	Snap Ring Groove with Snap Ring in Outer Ring

Arrangement

DB	Back to Back Duplex Arrangement
DF	Face to Face Duplex Arrangement
DT	Tandem Duplex
SU	Arrangement Single Universal - Bearings with front and back face standout adjusted to be equal
DU	Duplex Universal (SU sold as pair)

Radial Internal Clearance

C2	For All Radial Ball Bearings	Clearance Less Than Normal
CO		Normal Clearance
C3		Clearance Greater Than Normal
C4		Clearance Greater Than C3
CC1	For Matched Cylindrical Roller Bearings	Clearance Less Than C
CC2		Clearance Less Than Normal
CC		Normal Clearance
CC3		Clearance Greater Than Normal
CC4		Clearance Greater Than CC3
CC5		Clearance Greater Than CC4
MC2	For Extra Small Ball Bearings and Miniature Bearings	Clearance Less Than MC3
MC3		Normal Clearance
MC4		Clearance Greater Than MC3
MC5		Clearance Greater Than MC4

How to Order Replacement Bearings

Ordering the correct replacement bearing is a critical task – but one that is not difficult if you take time to gather the right information. Just follow these steps:

1. Identify – the type of bearing you need to replace.
- Ball Bearing – Single Row, Double Row, Angular Contact
- Roller Bearing – Cylindrical, Spherical, Tapered
- Thrust Bearing – Ball or Roller
- Split Pillow Block – Pillow Blocks
- Super Precision – Angular Contact Ball, Cylindrical Roller, Ball Screw Support
- Linear Motion – Linear Guides, Ball Screws, Monocarriers

2. Locate – the identification number on the bearing.
Bearing identification numbers are usually located on the inner ring face, outer ring face or bearing O.D. Mounted units are identified by a number tag fastened to the unit or by a housing number cast into the housing cap.

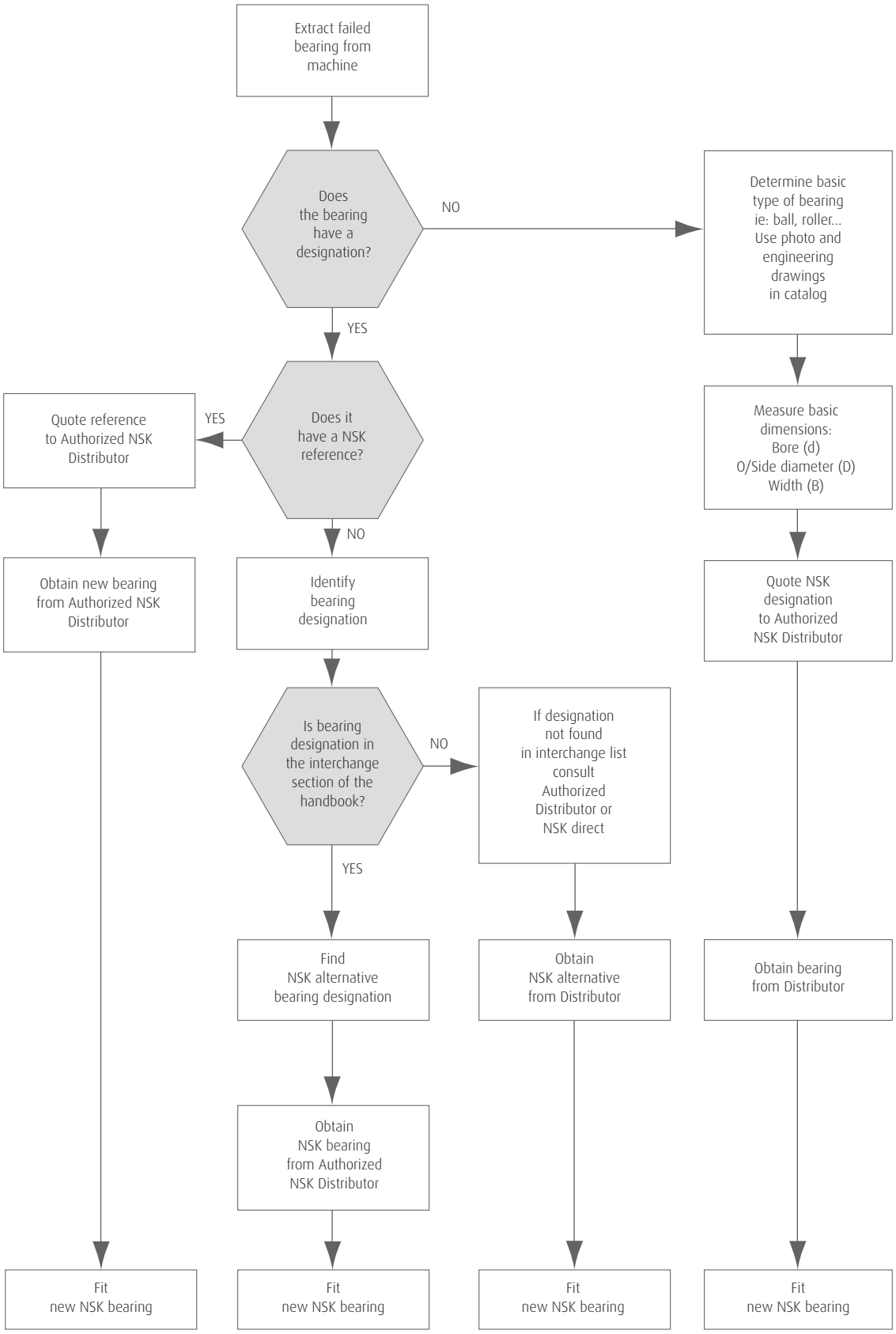
3. Measure – if you need to.
If a bearing identification number is not legible, you will need to determine the following:
1. Inner ring bore (inside diameter)
2. Outer ring outside diameter
3. Inner width and outer width (these may be different)
4. Shape of the bore and/or outside diameter of bearing – spherical, tapered or cylindrical

4. Record – additional relevant information.
The more information available, the easier it will be to identify the replacement bearing needed. Record:
1. Unique features such as lubrication holes, snap ring grooves, machined shoulders, etc.
2. Application/equipment data

5. Look – in the appropriate section of the catalog.
1. Ball Bearings
2. Cylindrical Roller Bearings
3. Spherical Roller Bearings
4. Tapered Roller Bearings
5. Thrust Bearings
6. Split Pillow Blocks
7. Super Precision Bearings
8. Linear Motion
9. Engineering

If you are still unable to identify the bearing you need, call your NSK Distributor.

Steps for Ordering Replacement Bearings



Notes

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Single Row Deep Groove Ball Bearings

Basic Type & Series

R: Inch
600: Metric, Extra Small
6000: Metric, Extra Light
6200: Metric, Light
6300: Metric, Medium
6800: Metric, Extra Thin Section
6900: Metric, Very Thin Section
63200: Metric, Light Cartridge
63300: Metric, Medium Cartridge
BL 200: Metric, Maximum Capacity, Light
BL 300: Metric, Maximum Capacity, Medium

Cage Type

M: Brass
Blank: Steel
T1X: Polyamide

Internal Clearance

C2: Tight
Blank: Normal
C3: Greater than Normal
C4: Greater than C3

Grease Type

NS7: NS Hi-Tube
AS2: Alvania #2
B32: Beacon 325
SRI: Chevron SRI-2
EEM: Polyrex EM

62	05	T1X	ZZ	C3	E	SRI	S

Bore Size

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

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

Features

V: Single Non-Contact Seal
VV: Double Non-Contact Seal
Z: Single Shield
ZZ: Double Shield
D/DD: Single Contact Seal
DD/DDU: Double Contact Seal
NR: Snap Ring and Groove
M: Brass Cage
Blank: Steel Cage

Noise Level

E: Electric Motor Grade

Grease Fill

S: Standard
L: Light
H: Heavy

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

Interchange

Description		Interchange					
		NSK	SKF	FAF/TIMKEN	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
	ExtraThin 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	632xx	4622xx	W2xx	335xx	2xxC	632xx
		633xx	4623xx	W3xx	336xx	3xxC	633xx
Part Number Suffix	Two Seals (Non Contact)	VV	--	--	2RSD	--	LLB
	Two Seals (Contact)	DDU	2RS	PP	2RSR	ZZ	LLU
	One Seals (Contact)	DU	RS	P	RSR	Z	LU
	Two Shield	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 or BLANK	BLANK	J	BLANK or STL	BLANK
	Polyamide Cage	T1X	TN9	PRB	TNH or TVH	TN9	T2
	Brass Cage	M	M	MBR	Y	BRS	L1
	Heat Stabilized 200C	X28	S1	--	S1	HT	PREFIX TS3
	Tight Clearance	C2	C2	H	C2	C2	C2
	Normal Clearance	BLANK	BLANK	R	BLANK	C0	BLANK
	Greater than Normal Clearance	C3	(C3)	P	C3	C3	C3
	Greater than C3 Clearance	C4	C4	J	C4	C4	C4
	Radial Clearance in Microns	CGXX	RLXX	--	RXX	--	--
	Electric Motor Grade	E	EM (C3)	--	--	EMQ	--

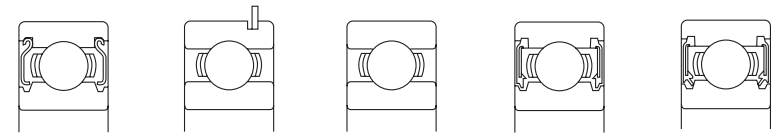
The competitive manufacturers are provided for a convenient source of unit substitution. They can be considered interchangeable in most instances, but for special applications, please contact NSK. NSK assumes no liability with respect to errors or omissions.

Applications

› Transmissions › Electric Motors & Generators › Electrical Appliances › Pumps & Compressors › Blowers & Fans › Speed Changers › Gear Boxes & Drives › Woodworking Machinery › Lawn & Garden Equipment › Turbines › Farm Machinery › Construction Machinery › Oil Field Machinery › Elevators › Conveying Equipment › Hoists & Cranes › Power Hand Tools › Industrial Valves › Rolling Mill Machinery › Textile Machinery › Paper Machinery › Printing Machinery › Food Products Machinery › Packaging Machinery › Medical & Dental Equipment (Extra Small) › Robotics Equipment (Thin) › Industrial Clutches › Slip Joints › Skate Boards (608ZZ) › Inline Skates (608ZZ)

Single Row Deep Groove Ball Bearings

Single-Row Deep Groove Ball Bearings are classified into several types.
The proper amount of good quality grease is packed in shielded and sealed ball bearings. A comparison of the features of each type is shown below.



Shielded Type ZZ | With Snap Ring NR | Open Type | Non-Contact Sealed Type VV | Contact Sealed Type DD–DDU

Features of Sealed Ball Bearings

Type	Shielded Type (ZZ Type)	Non-Contact Rubber Sealed Type (VV Type)	Contact Rubber Sealed Type (DDU Type)
Torque	Low	Low	Higher than ZZ, VV types due to contact seal
Speed Capability	Good	Good	Limited by contact seal
Grease Sealing Effectiveness	Good	Better than ZZ Type	A little better than VV Type
Dust Resistance	Good	Better than ZZ Type (usable in moderately dusty environment)	Best (usable even in very dusty environment)
Water Resistance	Not Suitable	Not Suitable	Good (usable even if fluid is splashed on bearing)
Operating Temperature (1)	-10 to +110°C	-10 to +110°C	-10 to +100°C

Note: (1) The above temperature range applies to standard bearings. By using cold or heat resistant grease and changing the type of rubber, the operating temperature range can be extended. For such applications, please contact NSK.

For deep groove ball bearings, pressed cages are usually used. For big bearings, machined brass cages are used. (Refer to below table.)

Machined cages are also used for high speed applications.

Standard Cages for Deep Groove Ball Bearings

Series	Pressed Steel Cage	Machined Brass Cage
68	6800 - 6838	6840 - 68/800
69	6900 - 6936	6938 - 69/800
160	16001 - 16026	16028 - 16064
60	6000 - 6040	6044 - 60/670
62	6200 - 6240	6244 - 6272
63	6300 - 6332	6334 - 6356

Maximum Type Ball Bearings

Maximum Type Ball Bearings contain a larger number of balls than normal deep groove ball bearings. A filling slot is located in the inner and outer rings. Because of their filling slots, they are not suitable for applications with high axial loads.

BL2 and BL3 types of bearings have boundary dimensions equal to those of single-row deep groove ball bearings of Series 62 and 63 respectively. Besides the open type, ZZ type shielded bearings are also available.

When using these bearings, it is important for the filling slot in the outer ring to be outside of the loaded zone as much as possible.

Their cages are pressed steel.

Single Row Deep Groove Ball Bearings Radial Internal Clearance

Radial Internal Clearance in Single Row Deep Groove Ball Bearings Under No Load

Units: inch

Nominal Bore Diameter d (mm)		Radial Internal Clearance							
		C2		C0		C3		C4	
over	incl.	low	high	low	high	low	high	low	high
(10mm Only)*		+.0000	+.0003	+.0001	+.0005	+.0003	+.0009	+.0006	+.0011
10	18	+.0000	+.0004	+.0001	+.0007	+.0004	+.0010	+.0007	+.0013
18	24	+.0000	+.0004	+.0002	+.0008	+.0005	+.0011	+.0008	+.0014
24	30	+.0000	+.0004	+.0002	+.0008	+.0005	+.0011	+.0009	+.0016
30	40	+.0000	+.0004	+.0002	+.0008	+.0006	+.0013	+.0011	+.0018
40	50	+.0000	+.0004	+.0002	+.0009	+.0007	+.0014	+.0012	+.0020
50	65	+.0000	+.0006	+.0003	+.0011	+.0009	+.0017	+.0015	+.0024
65	80	+.0000	+.0006	+.0004	+.0012	+.0010	+.0020	+.0018	+.0028
80	100	+.0000	+.0007	+.0005	+.0014	+.0012	+.0023	+.0021	+.0033
100	120	+.0001	+.0008	+.0006	+.0016	+.0014	+.0026	+.0024	+.0038
120	140	+.0001	+.0009	+.0007	+.0019	+.0016	+.0032	+.0028	+.0045
140	160	+.0001	+.0009	+.0007	+.0021	+.0018	+.0036	+.0032	+.0051
160	180	+.0001	+.0010	+.0008	+.0024	+.0021	+.0040	+.0036	+.0058
180	200	+.0001	+.0012	+.0010	+.0028	+.0025	+.0046	+.0042	+.0064
200	225	–	+.0013	+.0010	+.0315	+.0029	+.0053	+.0049	+.0074
225	250	–	+.0014	+.0012	+.0035	+.0033	+.0059	+.0057	+.0084
250	280	–	+.0016	+.0014	+.0037	+.0035	+.0063	+.0061	+.0092
280	315	–	+.0020	+.0020	+.0043	+.0043	+.0071	+.0075	+.0104
315	355	–	+.0022	+.0022	+.0049	+.0049	+.0079	+.0085	+.0116
355	400	–	+.0026	+.0026	+.0055	+.0055	+.0089	+.0096	+.0134

*For bore sizes smaller than 10mm, refer to Table 10.39.

Radial Internal Clearances in Extra Small & Miniature Ball Bearings Under No Load

Units: inch

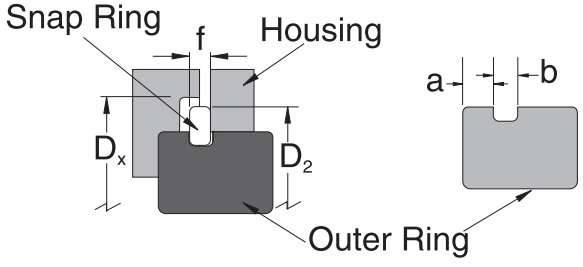
Clearance Symbols (Among these NSK Standard Clearances, MC5 is the most widely used)											
MC1		MC2		MC3		MC4		MC5		MC6	
low	high	low	high	low	high	low	high	low	high	low	high
+.0000	+.0002	+.0001	+.0003	+.0002	+.0004	+.0003	+.0005	+.0005	+.0008	+.0008	+.0011

Snap Ring and Groove Dimensions

Series 6000, 6200, 6300 and 6400

Units: inch

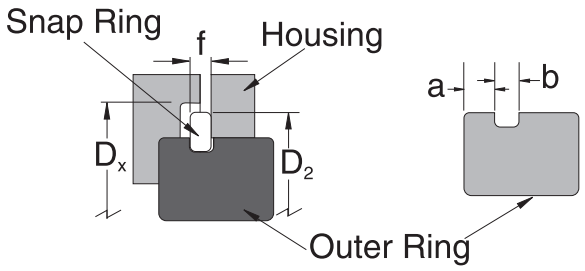
Bearing Bore d (mm)				Snap Ring Groove Position, a		Groove Width, b	Snap Ring Thickness, f	Snap Ring O.D., D_2	Housing Bore, Dx
Dimension Series									
0	2	3	4	0	2,3,4	med.	med.	max.	min.
10	–	–	–	0.0500	–	0.0402	0.0311	1.1299	1.1575
12	–	–	–	0.0500	–	0.0402	0.0311	1.2087	1.2362
–	10	9	8	–	0.0780	0.0591	0.0421	1.3661	1.3976
15	12	–	9	0.0780	0.0780	0.0591	0.0421	1.4449	1.4764
17	15	10		0.0780	0.0591	0.0421	1.5630	1.5945	1.5945
–	–	12	10	–	0.0780	0.0591	0.0421	1.626	1.6535
–	17	–	–	–	0.0780	0.0591	0.0421	1.7559	1.7913
20	–	15	12	0.0780	0.0780	0.0591	0.0421	1.8228	1.8504
22	–	–	–	0.0780	–	0.0591	0.0421	1.9016	1.9291
25	20	17		0.0939	0.0591	0.0421	2.0748	2.1063	2.1063
–	22	–	–	–	0.0939	0.0591	0.0421	2.1929	2.2244
28	25	20	15	0.0780	0.0939	0.0591	0.0421	2.2795	2.3031
30	–	–	–	0.0780	–	0.0591	0.0421	2.3898	2.4213
–	–	22	–	–	0.0939	0.0591	0.0421	2.4291	2.4606
32	28	–	–	0.0780	0.0939	0.0591	0.0421	2.5079	2.5394
35	30	25	17	0.0780	0.1250	0.0807	0.0650	2.6654	2.6969
–	32	–	–	–	0.1250	0.0807	0.0650	2.7835	2.815
40	–	28	–	0.0941	0.1250	0.0807	0.0650	2.937	2.9921
–	35	30	20	–	0.1250	0.0807	0.0650	3.0945	3.1496
45	32			0.0807	0.0650	3.2126	3.2677	3.2126	3.2677
50	40	35	25	0.0941	0.1250	0.0807	0.0650	3.4094	3.4646
–	45	–	–	–	0.1250	0.0807	0.0650	3.6063	3.6614
55	50	40	30	0.1130	0.1250	0.1122	0.0949	3.7992	3.8583
60	–	–	–	0.1130	–	0.1122	0.0949	4.0000	4.0551
65	55	45	35	0.1130	0.1250	0.1122	0.0949	4.1929	4.252
70	60	50	40	0.1130	0.1250	0.1122	0.0949	4.5906	4.6457
75	–	–	–	0.1130	–	0.1122	0.0949	4.7874	4.8425
–	65	55	45	–	0.1559	0.1280	0.1091	5.1063	5.1772
80	70	–	–	0.1130	0.1559	0.1280	0.1091	5.3031	5.374
85	75	60	50	0.1130	0.1559	0.1280	0.1091	5.5000	5.5709
90	80	65	55	0.1409	0.1880	0.1280	0.1091	5.8937	5.9843
95	–	–	–	0.1409	–	0.1280	0.1091	6.0906	6.1811
100	85	70	60	0.1409	0.1880	0.1280	0.1091	6.2874	6.378
105	90	75	65	0.1409	0.1880	0.1280	0.1091	6.6811	6.7717
110	95	80		0.2191	0.1437	0.1437	7.2008	7.2835	7.2835
120	100	85	70	0.1409	0.2191	0.1437	0.1437	7.5945	7.6772
–	105	90	75	–	0.2191	0.1437	0.1437	7.9882	8.0709
130	110	95	80	0.2191	0.2191	0.1437	0.1437	8.3819	8.4646



Series 6800 and 6900

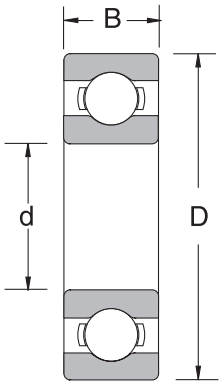
Units: inch

Bearing Bore d (mm)		Snap Ring Groove Position, a		Groove Width, b	Snap Ring Thickness, f	Snap Ring O.D., D_2	Housing Bore, Dx
Dimension Series							
8	9	8	9	med.	med.	max.	min.
–	10	–	1.0677	0.0222	0.0256	0.9764	1.0039
–	12	–	1.0677	0.0222	0.0256	1.0551	1.0827
–	15	–	1.3226	0.0423	0.0315	1.2126	1.2402
–	17	–	1.3226	0.0423	0.0315	1.2913	1.3189
20	–	0.0482	–	0.0423	0.0315	1.3701	1.3976
22	–	0.0482	–	0.0423	0.0315	1.4488	1.4764
25	20	0.0482	1.7305	0.0423	0.0315	1.5669	1.5945
–	22	–	1.7305	0.0423	0.0315	1.6457	1.6732
28	–	0.0482	–	0.0423	0.0315	1.685	1.7126
30	25	0.0482	1.7305	0.0423	0.0315	1.7638	1.7913
32	–	0.0482	–	0.0423	0.0315	1.8425	1.8701
–	28	–	1.7305	0.0423	0.0315	1.8819	1.9094
35	30	0.0482	1.7305	0.0423	0.0315	1.9606	1.9882
40	32	0.0482	1.7305	0.0423	0.0315	2.1575	2.1850
–	35	–	1.7305	0.0423	0.0315	2.2756	2.3031
45	–	0.0482	–	0.0423	0.0315	2.3937	2.4213
–	40	–	1.7305	0.0423	0.0315	2.5512	2.5787
50	–	0.0482	–	0.0423	0.0315	2.6693	2.6969
–	45	–	1.7305	0.0571	0.0421	2.7874	2.8346
55	50	0.064	1.7305	0.0571	0.0421	2.9449	2.9921
60	–	0.064	–	0.0571	0.0421	3.2559	3.3071
–	55	–	2.1374	0.0571	0.0421	3.3228	3.3858
65	60	0.0640	2.1374	0.0571	0.0421	3.5197	3.5827
70	65	0.0640	2.1374	0.0571	0.0421	3.7165	3.7795
75	–	0.0640	–	0.0571	0.0421	3.9134	3.9764
80	70	0.0640	2.5453	0.0571	0.0421	4.1102	4.1732
–	75	–	2.5453	0.0571	0.0421	4.3583	4.4094
85	80	0.0787	2.5453	0.0571	0.0421	4.5551	4.6063
90	–	0.0787	–	0.0571	0.0421	4.752	4.8031
95	85	0.0787	3.3610	0.0571	0.0421	4.9488	5.0000
100	90	0.0787	3.3610	0.0571	0.0421	5.1457	5.1969
105	95	0.0787	3.3610	0.0571	0.0421	5.3425	5.3937
110	100	0.0945	3.3610	0.0807	0.065	5.7362	5.7874
–	105	–	3.3610	0.0807	0.065	5.9331	5.9843
120	110	0.0945	3.3610	0.0807	0.065	6.1299	6.1811
130	120	0.126	3.3610	0.0807	0.065	6.7520	6.8110
140	–	0.126	–	0.0807	0.065	7.1457	7.2047
–	130	–	3.3610	0.0807	0.065	7.3425	7.4016
150	140	0.126	3.3610	0.0807	0.065	7.7362	7.7953
160	–	0.126	–	0.0807	0.065	8.1299	8.1890



Ball Bearings: R-Series

Single Row, Inch Dimension



Common Options	
VV	Two Non-Contact Seals
DDU	Two Contact Seals
ZZ	Two Shields
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
T1X	Polyamide Cage
*Not shown in part number	

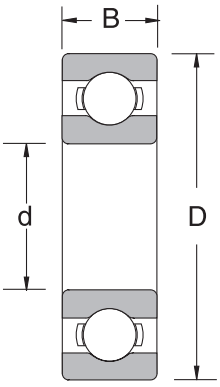
Bearing Number	Nominal Bearing Dimensions			Preferred Shoulder Diameters			Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	d	D	B	r*	Shaft	Housing					
	inch	inch	inch	inch	inch	inch	C_r	C_{or}	Grease	Oil	lbs
R2	0.1250	0.375	0.1562	0.012	0.188	0.313	141	49	56	67	0.003
R2A	0.1250	0.500	0.1719	0.012	0.188	0.438	143	51	56	67	0.006
R3	0.1875	0.500	0.1562	0.012	0.250	0.438	293	108	43	53	0.005
R3ZZ	0.1875	0.500	0.1960	0.012	0.250	0.438	293	108	53	53	0.006
R4B	0.2500	0.625	0.1960	0.012	0.313	0.563	362	150	38	45	0.010
R4AA	0.2500	0.750	0.2188	0.016	0.344	0.656	589	238	36	45	0.015
R4AAZZ	0.2500	0.750	0.2812	0.016	0.344	0.656	589	238	36	45	0.018
R6	0.3750	0.875	0.2188	0.016	0.469	0.781	750	317	32	38	0.020
R6ZZ\VV	0.3750	0.875	0.2812	0.016	0.469	0.781	750	317	38	38	0.026
R8	0.5000	1.125	0.2500	0.016	0.594	1.031	1150	538	26	32	0.040
R8ZZ\VV	0.5000	1.125	0.3125	0.016	0.594	1.031	1150	538	30	32	0.050
R10	0.6250	1.375	0.2812	0.031	0.750	1.250	1340	728	22	26	0.060
R10ZZ\VV	0.6250	1.375	0.3438	0.031	0.750	1.250	1340	728	24	26	0.070
R12	0.7500	1.625	0.3125	0.031	0.906	1.469	2110	1120	18	20	0.100
R12ZZ\VV	0.7500	1.625	0.4375	0.031	0.906	1.469	2110	1120	20	20	0.120
R14	0.8750	1.875	0.3750	0.031	1.031	1.719	2270	1310	15	18	0.160
R14ZZ	0.8750	1.875	0.5000	0.031	1.031	1.719	2270	1310	18	18	0.180
R16	1.0000	2.000	0.3750	0.031	1.156	1.844	2270	1310	15	18	0.170
R16ZZ	1.0000	2.000	0.5000	0.031	1.156	1.844	2270	1310	18	18	0.190
R18	1.1250	2.125	0.3750	0.031	1.281	1.969	2980	1860	13	15	0.190
R18ZZ	1.1250	2.125	0.5000	0.031	1.281	1.969	2980	1860	15	15	0.210
R20	1.2500	2.250	0.3750	0.031	1.406	2.094	2980	1860	15	15	0.210
R20ZZ	1.2500	2.250	0.5000	0.031	1.406	2.094	2980	1860	15	15	0.230
R22	1.3750	2.500	0.4375	0.031	1.531	2.344	3590	2320	13	15	0.270
R22ZZ	1.3750	2.500	0.5625	0.031	1.531	2.344	3590	2320	13	15	0.290
R24	1.5000	2.625	0.4375	0.031	1.656	2.469	3770	2600	12	15	0.300

*Maximum fillet which corner radius of bearing will clear. C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Ball Bearings: 600 Series

Single Row, Extra Small



Common Options	
VV	Two Non-Contact Seals
DDU	Two Contact Seals
ZZ	Two Shields
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
T1X	Polyamide Cage
*Not shown in part number	

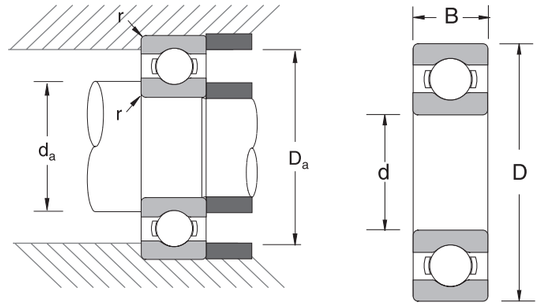
Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters			Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	d		D		B		r*	Shaft	Housing					
	mm	inch	mm	inch	mm	inch	inch	inch	inch	C_r	C_{or}	Grease	Oil	lbs
693	3.0	0.1181	8	0.3150	3.0	0.1181	0.006	0.169	0.287	126	40	60	67	0.001
693ZZ\VV	3.0	0.1181	8	0.3150	4.0	0.1575	0.006	0.165	0.268	126	40	60	67	0.002
623	3.0	0.1181	10	0.3937	4.0	0.1575	0.006	0.165	0.346	141	49	50	60	0.003
684	4.0	0.1575	9	0.3543	2.5	0.0984	0.004	0.205	0.319	143	51	53	63	0.001
684ZZ\VV	4.0	0.1575	9	0.3543	4.0	0.1575	0.004	0.189	0.323	143	51	53	63	0.002
694	4.0	0.1575	11	0.4331	4.0	0.1575	0.006	0.205	0.386	216	77	48	56	0.003
604	4.0	0.1575	12	0.4724	4.0	0.1575	0.008	0.220	0.409	216	77	48	56	0.004
624	4.0	0.1575	13	0.5118	5.0	0.1969	0.008	0.220	0.449	293	108	40	48	0.006
634	4.0	0.1575	16	0.6299	5.0	0.1969	0.012	0.236	0.551	390	151	36	43	0.015
685	5.0	0.1969	11	0.4331	3.0	0.1181	0.006	0.244	0.390	161	64	45	53	0.002
685ZZ\VV	5.0	0.1969	11	0.4331	5.0	0.1969	0.006	0.244	0.386	161	64	45	53	0.004
695	5.0	0.1969	13	0.5118	4.0	0.1575	0.008	0.260	0.449	243	97	43	50	0.005
605	5.0	0.1969	14	0.5512	5.0	0.1969	0.008	0.260	0.488	298	115	40	50	0.007
625	5.0	0.1969	16	0.6299	5.0	0.1969	0.012	0.276	0.551	390	150	36	43	0.010
635	5.0	0.1969	19	0.7480	6.0	0.2362	0.012	0.276	0.669	526	199	32	40	0.022
686	6.0	0.2362	13	0.5118	3.5	0.1378	0.006	0.291	0.461	243	99	40	50	0.004
686ZZ\VV	6.0	0.2362	13	0.5118	5.0	0.1969	0.006	0.283	0.465	243	99	40	50	0.005
696	6.0	0.2362	15	0.5906	5.0	0.1969	0.008	0.299	0.528	390	150	40	45	0.008
606	6.0	0.2362	17	0.6693	6.0	0.2362	0.012	0.315	0.591	509	187	38	45	0.012
626	6.0	0.2362	19	0.7480	6.0	0.2362	0.012	0.315	0.669	526	199	32	40	0.021
687	7.0	0.2756	14	0.5512	3.5	0.1378	0.006	0.335	0.500	265	115	40	45	0.004
687ZZ\VV	7.0	0.2756	14	0.5512	5.0	0.1969	0.006	0.323	0.504	265	115	40	45	0.006
697	7.0	0.2756	17	0.6693	5.0	0.1969	0.012	0.354	0.591	362	161	36	43	0.011
607	7.0	0.2756	19	0.7480	6.0	0.2362	0.012	0.354	0.669	525	198	36	43	0.015
627	7.0	0.2756	22	0.8661	7.0	0.2756	0.012	0.354	0.787	741	308	30	36	0.031
608-5	7.9	0.3123	22	0.8661	7.0	0.2756	0.012	0.394	0.787	741	308	34	40	0.030
698	8.0	0.3150	19	0.7480	6.0	0.2362	0.012	0.394	0.650	503	205	36	43	0.014
608	8.0	0.3150	22	0.8661	7.0	0.2756	0.012	0.394	0.787	741	308	34	40	0.030
628	8.0	0.3150	24	0.9449	8.0	0.3150	0.012	0.394	0.669	750	322	28	34	0.034
638	8.0	0.3150	28	1.1024	9.0	0.3543	0.012	0.394	1.024	1030	443	28	34	0.057
689	9.0	0.3543	17	0.6693	4.0	0.1575	0.008	0.421	0.598	300	150	36	43	0.007
689ZZ\VV	9.0	0.3543	17	0.6693	5.0	0.1969	0.008	0.417	0.606	300	150	36	43	0.009
609	9.0	0.3543	24	0.9449	7.0	0.2756	0.012	0.433	0.866	750	322	32	38	0.029
629	9.0	0.3543	26	1.0236	8.0	0.3150	0.024	0.453	0.945	1030	444	28	34	0.044

*Maximum fillet which corner radius of bearing will clear. C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Ball Bearings: 6000 Series

Single Row, Deep Groove, Conrad Type



Common Options	
V	One Non-Contact Seal
VV	Two Non-Contact Seals
DU	One Contact Seal
DDU	Two Contact Seals
Z	One Shield
ZZ	Two Shields
NR	Snap Ring
M**	Brass Cage
C0*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

** Not available on all sizes, consult NSK for availability.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters			
	d		D		B		r**	da (in)		Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max	max
6000	10	0.3937	26	1.0236	8	0.3150	0.012	0.472	0.512	0.949
6001	12	0.4724	28	1.1024	8	0.3150	0.012	0.551	0.611	1.024
6002	15	0.5906	32	1.2598	9	0.3543	0.012	0.669	0.749	1.181
6003	17	0.6693	35	1.3780	10	0.3937	0.012	0.748	0.847	1.299
6004	20	0.7874	42	1.6535	12	0.4724	0.024	0.945	1.005	1.496
6005	25	0.9843	47	1.8504	12	0.4724	0.024	1.142	1.182	1.693
6006	30	1.1811	55	2.1654	13	0.5118	0.039	1.378	1.438	1.969
6007	35	1.3780	62	2.4409	14	0.5512	0.039	1.575	1.635	2.244
6008	40	1.5748	68	2.6772	15	0.5906	0.039	1.772	1.872	2.480
6009	45	1.7717	75	2.9528	16	0.6299	0.039	1.969	2.108	2.756
6010	50	1.9685	80	3.1496	16	0.6299	0.039	2.165	2.305	2.953
6011*	55	2.1654	90	3.5433	18	0.7087	0.039	2.421	2.528	3.287
6012*	60	2.3622	95	3.7402	18	0.7087	0.039	2.618	2.719	3.484
6013*	65	2.5591	100	3.9370	18	0.7087	0.039	2.815	2.876	3.681
6014*	70	2.7559	110	4.3307	20	0.7874	0.039	3.012	3.172	4.075
6015*	75	2.9528	115	4.5276	20	0.7874	0.039	3.209	3.369	4.272
6016*	80	3.1496	125	4.9213	22	0.8661	0.039	3.406	3.585	4.665
6017*	85	3.3465	130	5.1181	22	0.8661	0.039	3.602	3.782	4.862
6018*	90	3.5433	140	5.5118	24	0.9449	0.059	3.858	4.058	5.197
6019*	95	3.7402	145	5.7087	24	0.9449	0.059	4.055	4.275	5.394
6020*	100	3.9370	150	5.9055	24	0.9449	0.059	4.252	4.452	5.591
6021*	105	4.1339	160	6.2992	26	1.0236	0.079	4.528	4.728	5.906
6022*	110	4.3307	170	6.6929	28	1.1024	0.079	4.724	4.905	6.299
6024*	120	4.7244	180	7.0866	28	1.1024	0.079	5.118	5.299	6.693
6026	130	5.1181	200	7.8740	33	1.2992	0.079	5.512	5.851	7.480
6028	140	5.5118	210	8.2677	33	1.2992	0.079	5.906	6.245	7.874
6030	150	5.9055	225	8.8583	35	1.3780	0.079	6.339	6.698	8.425
6032	160	6.2992	240	9.4488	38	1.4961	0.079	6.732	7.131	9.016
6034	170	6.6929	260	10.2362	42	1.6535	0.079	7.126	7.663	9.803
6036	180	7.0866	280	11.0236	46	1.8110	0.079	7.520	8.195	10.591
6038	190	7.4803	290	11.4173	46	1.8110	0.079	7.913	8.589	10.984
6040	200	7.8740	310	12.2047	51	2.0079	0.079	8.307	9.121	11.772

*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear. Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Bearing Number	Basic Load Ratings (lbs)		Factor	Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	f_o	Grease	Oil	lbs
6000	1030	443	12.4	30.0	36.0	0.04
6001	1150	531	13.0	28.0	32.0	0.05
6002	1260	637	13.9	24.0	28.0	0.07
6003	1350	732	14.4	22.0	26.0	0.09
6004	2110	1130	13.8	18.0	20.0	0.16
6005	2270	1310	14.5	15.0	18.0	0.18
6006	2980	1860	14.7	13.0	15.0	0.26
6007	3590	2315	14.8	11.0	13.0	0.35
6008	3770	2600	15.3	10.0	12.0	0.43
6009	4720	3420	15.3	9.0	11.0	0.54
6010	4900	3750	15.6	8.5	10.0	0.58
6011*	6680	4780	15.3	7.5	9.0	0.85
6012*	6963	5230	15.6	7.1	8.5	0.92
6013*	7200	5670	15.8	6.7	8.0	0.96
6014*	8970	6970	15.6	6.0	7.1	1.33
6015*	9324	7540	15.8	5.6	6.7	1.41
6016*	11212	8950	15.6	5.3	6.3	1.87
6017*	11684	9680	15.8	5.0	6.0	1.96
6018*	13691	11200	15.6	4.8	5.6	2.56
6019*	14281	12100	15.8	4.5	5.3	2.67
6020*	14163	12200	15.9	4.3	5.3	2.76
6021*	17114	14800	15.8	4.0	4.8	3.51
6022*	20064	16400	15.5	3.8	4.5	4.32
6024*	20772	18000	15.7	3.6	4.3	5.34
6026	23800	22700	15.8	3.0	3.6	8.16
6028	24700	24300	16.0	2.8	3.4	8.62
6030	28200	28200	15.9	2.6	3.0	10.60
6032	30600	30400	15.9	2.4	2.8	13.00
6034	36200	36200	15.8	2.2	2.6	17.50
6036	40600	41500	15.6	2.0	2.4	23.00
6038	48815	45200	15.8	2.0	2.4	24.50
6040	53748	50700	15.6	1.9	2.2	31.00

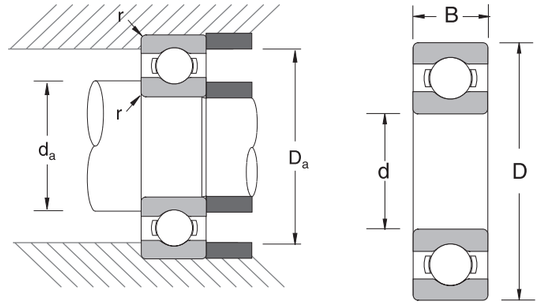
C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

*Indicates NSK (HPS) High Performance Standard bearing.

Ball Bearings: 6200 Series

Single Row, Deep Groove, Conrad Type



Common Options	
V	One Non-Contact Seal
VV	Two Non-Contact Seals
DU	One Contact Seal
DDU	Two Contact Seals
Z	One Shield
ZZ	Two Shields
NR	Snap Ring
M**	Brass Cage
C0*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

** Not available on all sizes, consult NSK for availability.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters			
	d		D		B		r**	da (in)		Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max	max
6200	10.00	0.3937	30	1.1811	9	0.3543	0.024	0.500	0.630	0.984
6201	12.00	0.4724	32	1.2598	10	0.3937	0.024	0.578	0.670	1.063
6201-08	12.70	0.5000	32	1.2598	10	0.3937	0.024	0.595	0.670	1.063
6201-13M	13.00	0.5118	32	1.2598	10	0.3937	0.024	0.610	0.670	1.063
6202	15.00	0.5906	35	1.3780	11	0.4331	0.024	0.703	0.749	1.181
6202-10	15.87	0.6250	35	1.3780	11	0.4331	0.024	0.730	0.749	1.181
6202-16M	16.00	0.6299	35	1.3780	11	0.4331	0.024	0.740	0.749	1.181
6203	17.00	0.6693	40	1.5748	12	0.4724	0.024	0.787	0.926	1.380
6203-625	15.90	0.6250	40	1.5748	12	0.4724	0.024	0.750	0.926	1.380
6204	20.00	0.7874	47	1.8504	14	0.5512	0.039	0.969	1.044	1.614
6205	25.00	0.9843	52	2.0472	15	0.5906	0.039	1.172	1.261	1.811
6206	30.00	1.1811	62	2.4409	16	0.6299	0.039	1.406	1.517	2.205
6207	35.00	1.3780	72	2.8346	17	0.6693	0.039	1.614	1.753	2.559
6208	40.00	1.5748	80	3.1496	18	0.7087	0.039	1.811	1.990	2.874
6209*	45.00	1.7717	85	3.3465	19	0.7480	0.039	2.008	2.187	3.071
6210*	50.00	1.9685	90	3.5433	20	0.7874	0.039	2.205	2.364	3.268
6211*	55.00	2.1654	100	3.9370	21	0.8268	0.059	2.441	2.620	3.602
6212*	60.00	2.3622	110	4.3307	22	0.8661	0.059	2.717	2.935	3.996
6213*	65.00	2.5591	120	4.7244	23	0.9055	0.059	2.913	3.152	4.390
6214*	70.00	2.7559	125	4.9213	24	0.9449	0.059	3.110	3.310	4.587
6215*	75.00	2.9528	130	5.1181	25	0.9843	0.059	3.307	3.546	4.783
6216*	80.00	3.1496	140	5.5118	26	1.0236	0.079	3.504	3.763	5.118
6217*	85.00	3.3465	150	5.9055	28	1.1024	0.079	3.740	4.019	5.512
6218*	90.00	3.5433	160	6.2992	30	1.1811	0.079	3.937	4.236	5.906
6219*	95.00	3.7402	170	6.6929	32	1.2598	0.079	4.213	4.492	6.220
6220*	100.00	3.9370	180	7.0866	34	1.3386	0.079	4.409	4.787	6.614
6221*	105.00	4.1339	190	7.4803	36	1.4173	0.079	4.606	5.024	7.008
6222	110.00	4.3307	200	7.8740	38	1.4961	0.079	4.803	5.280	7.402
6224	120.00	4.7244	215	8.4646	40	1.5748	0.079	5.197	5.752	7.992
6226	130.00	5.1181	230	9.0551	40	1.5748	0.098	5.669	6.206	8.504
6228	140.00	5.5118	250	9.8425	42	1.6535	0.098	6.063	6.757	9.291
6230	150.00	5.9055	270	10.6299	45	1.7717	0.098	6.457	7.328	10.079
6232	160.00	6.2992	290	11.4173	48	1.8898	0.098	6.850	7.959	10.886
6234	170.00	6.6929	310	12.2047	52	2.0472	0.118	7.362	8.471	11.535
6236	180.00	7.0866	320	12.5984	52	2.0472	0.118	7.758	8.786	11.929
6238	190.00	7.4803	340	13.3858	55	2.1654	0.118	8.150	9.298	12.717

*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear. Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

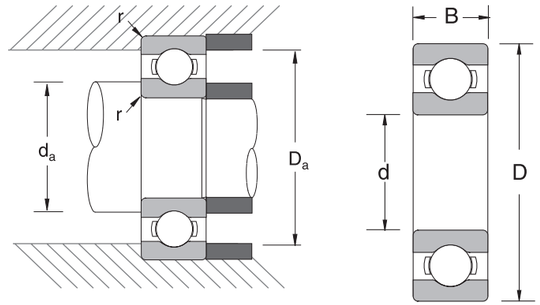
Bearing Number	Basic Load Ratings (lbs)		Factor	Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	f_0	Grease	Oil	lbs
6200	1150	538	13.2	24.0	30.0	0.07
6201	1530	685	12.3	22.0	28.0	0.08
6201-08	1530	685	12.3	22.0	28.0	0.08
6201-13M	1530	685	12.3	22.0	28.0	0.08
6202	1720	839	13.2	20.0	24.0	0.10
6202-10	1720	839	13.2	20.0	24.0	0.10
6202-16M	1720	839	13.2	20.0	24.0	0.10
6203	2150	1080	13.2	17.0	20.0	0.14
6203-625	2150	1080	13.2	17.0	20.0	0.14
6204	2880	1480	13.1	15.0	18.0	0.23
6205	3150	1770	13.9	13.0	15.0	0.29
6206	4380	2540	13.8	11.0	13.0	0.44
6207	5770	3440	13.8	9.5	11.0	0.64
6208	6550	4010	14.0	8.5	10.0	0.82
6209*	7436	4580	14.4	7.5	9.0	0.89
6210*	8262	5220	14.4	7.1	8.5	1.02
6211*	10268	6580	14.3	6.3	7.5	1.36
6212*	12393	8130	14.3	5.6	7.1	1.73
6213*	13573	9010	14.4	5.3	6.3	2.18
6214*	14635	9910	14.5	5.0	6.3	2.31
6215*	15579	11100	14.7	4.8	5.6	2.64
6216*	17114	11900	14.6	4.5	5.3	3.09
6217*	19828	13900	14.5	4.3	5.0	3.97
6218*	22661	16100	14.5	4.0	4.8	4.74
6219*	25729	18400	14.4	3.8	4.5	5.73
6220*	28798	20900	14.4	3.6	4.3	6.94
6221*	31395	23500	14.4	3.4	4.0	8.15
6222	32400	26300	14.3	2.8	3.4	9.59
6224	34900	29500	14.4	2.6	3.2	11.40
6226	37500	32900	14.5	2.4	3.0	12.70
6228	37400	33700	14.9	2.2	2.8	19.60
6230	39600	37700	15.1	2.0	2.6	25.30
6232	41600	41800	15.4	1.9	2.4	28.16
6234	47700	50300	15.3	1.8	2.2	34.32
6236	51100	55000	15.1	1.7	2.0	34.76
6238	66212	63300	15.0	1.6	2.0	48.84

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.
*Indicates NSK (HPS) High Performance Standard bearing.

Ball Bearings: 6300 Series

Single Row, Deep Groove, Conrad Type



Common Options	
V	One Non-Contact Seal
VV	Two Non-Contact Seals
DU	One Contact Seal
DDU	Two Contact Seals
Z	One Shield
ZZ	Two Shields
NR	Snap Ring
M**	Brass Cage
C0*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

** Not available on all sizes, consult NSK for availability.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters			
	d		D		B		r**	da (in)		Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max	max
6300	10	0.3937	35	1.3780	11	0.4331	0.024	0.563	0.650	1.181
6301	12	0.4724	37	1.4567	12	0.4724	0.039	0.656	0.709	1.220
6302	15	0.5906	42	1.6535	13	0.5118	0.039	0.781	0.887	1.417
6303	17	0.6693	47	1.8504	14	0.5512	0.039	0.875	1.005	1.614
6304	20	0.7874	52	2.0472	15	0.5906	0.039	1.016	1.103	1.772
6305	25	0.9843	62	2.4409	17	0.6693	0.039	1.220	1.418	2.165
6306	30	1.1811	72	2.8346	19	0.7480	0.039	1.469	1.675	2.559
6307*	35	1.3780	80	3.1496	21	0.8268	0.059	1.688	1.852	2.795
6308*	40	1.5748	90	3.5433	23	0.9055	0.059	1.929	2.088	3.189
6309*	45	1.7717	100	3.9370	25	0.9843	0.059	2.126	2.423	3.583
6310*	50	1.9685	110	4.3307	27	1.0630	0.079	2.362	2.679	3.937
6311*	55	2.1654	120	4.7244	29	1.1417	0.079	2.559	2.857	4.331
6312*	60	2.3622	130	5.1181	31	1.2205	0.079	2.835	3.113	4.646
6313*	65	2.5591	140	5.5118	33	1.2992	0.079	3.031	3.369	5.039
6314*	70	2.7559	150	5.9055	35	1.3780	0.079	3.228	3.625	5.433
6315*	75	2.9528	160	6.2992	37	1.4567	0.079	3.425	3.881	5.827
6316*	80	3.1496	170	6.6929	39	1.5354	0.079	3.622	4.117	6.220
6317*	85	3.3465	180	7.0866	41	1.6142	0.098	3.898	4.354	6.535
6318*	90	3.5433	190	7.4803	43	1.6929	0.098	4.094	4.610	6.929
6319*	95	3.7402	200	7.8740	45	1.7717	0.098	4.291	4.866	7.323
6320	100	3.9370	215	8.4646	47	1.8504	0.098	4.488	5.240	7.913
6321	105	4.1339	225	8.8583	49	1.9291	0.098	4.685	5.437	8.307
6322	110	4.3307	240	9.4488	50	1.9685	0.098	4.882	5.851	8.898
6324	120	4.7244	260	10.2362	55	2.1654	0.098	5.276	6.343	9.685
6326	130	5.1181	280	11.0236	58	2.2835	0.118	5.827	6.895	10.315
6328	140	5.5118	300	11.8110	62	2.4409	0.118	6.220	7.368	11.102
6330	150	5.9055	320	12.5984	65	2.5591	0.118	6.614	7.998	11.890
6332	160	6.2992	340	13.3858	68	2.6772	0.118	7.008	-	12.677
6334	170	6.6929	360	14.1732	72	2.8346	0.118	7.402	-	13.465
6336	180	7.0866	380	14.9606	75	2.9528	0.118	7.795	-	14.252
6338	190	7.4803	400	15.7480	78	3.0709	0.157	8.346	-	14.882
6340	200	7.8740	420	16.5354	80	3.1496	0.157	8.740	-	15.669

*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear. Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Bearing Number	Basic Load Ratings (lbs)		Factor	Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	f_0	Grease	Oil	lbs
6300	1820	772	11.2	22.0	26.0	0.12
6301	2180	941	11.1	20.0	24.0	0.13
6302	2570	1220	12.3	17.0	20.0	0.18
6303	3060	1490	12.4	15.0	18.0	0.25
6304	3580	1770	12.4	14.0	17.0	0.32
6305	4630	2530	13.2	11.0	13.0	0.52
6306	5990	3380	13.3	9.5	12.0	0.76
6307*	7908	4320	13.2	8.5	10.0	1.01
6308*	9560	5400	13.2	7.5	9.0	1.40
6309*	12511	7210	13.1	6.7	8.0	1.84
6310*	14635	8610	13.2	6.0	7.5	2.42
6311*	16878	10040	13.1	5.6	6.7	2.98
6312*	19356	11680	13.1	5.3	6.3	3.75
6313*	21835	13450	13.2	4.8	6.0	4.63
6314*	24549	15300	13.2	4.5	5.3	5.51
6315*	26674	17400	13.2	4.3	5.0	6.61
6316*	29034	19500	13.3	4.0	4.8	7.93
6317*	31395	21800	13.3	3.8	4.5	9.37
6318*	33755	24100	13.3	3.6	4.3	10.80
6319*	36116	26700	13.3	3.0	3.6	12.50
6320	38900	31800	13.2	2.8	3.4	15.30
6321	41300	34500	13.2	2.6	3.2	17.90
6322	46200	40300	13.2	2.4	3.0	21.00
6324	46500	41500	13.5	2.2	2.8	27.60
6326	51600	48200	13.6	2.2	2.6	40.80
6328	65693	55300	13.6	2.0	2.4	48.50
6330	61700	63800	13.9	1.8	2.2	57.30
6332	62400	64400	13.9	1.7	2.0	58.00
6334	73400	79800	13.6	1.6	2.0	84.00
6336	79600	91600	13.9	1.5	1.8	98.00
6338	92177	93200	14.1	1.4	1.7	112.00
6340	85300	100400	13.8	1.3	1.6	127.00

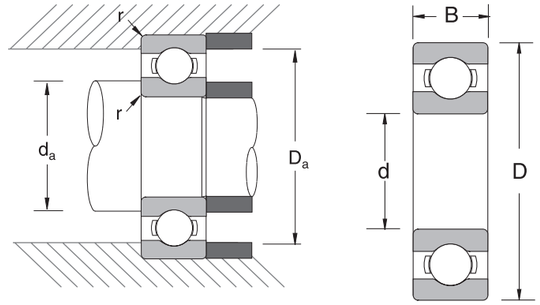
C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

*Indicates NSK (HPS) High Performance Standard bearing.

Ball Bearings: 6800 Series

Single Row, Deep Groove, Conrad Type



Common Options	
V	One Non-Contact Seal
VV	Two Non-Contact Seals
DU	One Contact Seal
DDU	Two Contact Seals
Z	One Shield
ZZ	Two Shields
NR	Snap Ring
M**	Brass Cage
C0*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

** Not available on all sizes, consult NSK for availability.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters			
	d		D		B		r*	da (in)		Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max	max
6800	10	0.3937	19	0.7480	5	0.1969	0.012	0.551	0.551	0.700
6801	12	0.4724	21	0.8268	5	0.1969	0.012	0.551	0.551	0.748
6802	15	0.5906	24	0.9449	5	0.1969	0.012	0.669	0.669	0.866
6803	17	0.6693	26	1.0236	5	0.1969	0.012	0.748	0.748	0.945
6804	20	0.7874	32	1.2598	7	0.2756	0.012	0.866	0.886	1.181
6805	25	0.9843	37	1.4567	7	0.2756	0.012	1.063	1.063	1.378
6806	30	1.1811	42	1.6535	7	0.2756	0.012	1.260	1.260	1.575
6807	35	1.3780	47	1.8504	7	0.2756	0.012	1.457	1.457	1.772
6808	40	1.5748	52	2.0472	7	0.2756	0.012	1.654	1.654	1.969
6809	45	1.7717	58	2.2835	7	0.2756	0.012	1.850	1.870	2.205
6810	50	1.9685	65	2.5591	7	0.2756	0.012	2.047	2.067	2.480
6811	55	2.1654	72	2.8346	9	0.3543	0.012	2.244	2.323	2.756
6812	60	2.3622	78	3.0709	10	0.3937	0.012	2.441	2.520	2.992
6813	65	2.5591	85	3.3465	10	0.3937	0.024	2.717	2.717	3.189
6814	70	2.7559	90	3.5433	10	0.3937	0.024	2.913	2.933	3.386
6815	75	2.9528	95	3.7402	10	0.3937	0.024	3.110	3.130	3.583
6816	80	3.1496	100	3.9370	10	0.3937	0.024	3.307	3.327	3.780
6817	85	3.3465	110	4.3307	13	0.5118	0.039	3.543	3.563	4.134
6818	90	3.5433	115	4.5276	13	0.5118	0.039	3.740	3.760	4.331
6819	95	3.7402	120	4.7244	13	0.5118	0.039	3.937	3.957	4.528
6820	100	3.9370	125	4.9213	13	0.5118	0.039	4.134	4.154	4.724
6821	105	4.1339	130	5.1181	13	0.5118	0.039	4.331	4.350	4.921
6822	110	4.3307	140	5.5118	16	0.6299	0.039	4.528	4.606	5.315
6824	120	4.7244	150	5.9055	16	0.6299	0.039	4.921	5.000	5.709
6826	130	5.1181	165	6.4961	18	0.7087	0.039	5.374	5.433	6.240
6828	140	5.5118	175	6.8898	18	0.7087	0.039	5.768	-	6.634
6830	150	5.9055	190	7.4803	20	0.7874	0.039	6.161	-	7.224
6832	160	6.2992	200	7.8740	20	0.7874	0.039	6.555	6.713	7.618
6834	170	6.6929	215	8.4646	22	0.8661	0.039	6.949	7.165	8.209
6836	180	7.0866	225	8.8583	22	0.8661	0.039	7.343	-	8.602
6838	190	7.4803	240	9.4488	24	0.9449	0.059	7.795	7.972	9.134
6840	200	7.8740	250	9.8425	24	0.9449	0.059	8.189	-	9.528

*Maximum fillet which corner radius of bearing will clear. Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

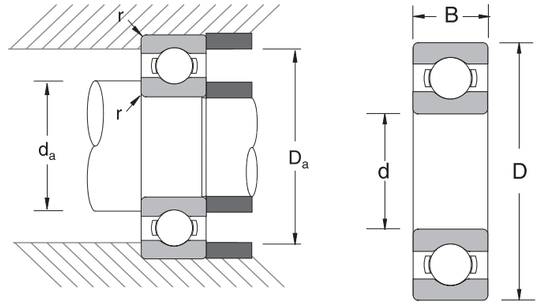
Bearing Number	Basic Load Ratings (lbs)		Factor	Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	f_0	Grease	Oil	lbs
6800	385	189	14.8	34.0	40.0	0.01
6801	429	233	15.3	32.0	38.0	0.01
6802	466	282	15.8	28.0	34.0	0.02
6803	590	352	15.7	26.0	30.0	0.02
6804	902	554	15.5	22.0	26.0	0.04
6805	968	660	16.1	18.0	22.0	0.05
6806	1010	770	16.4	15.0	18.0	0.05
6807	1070	880	16.7	13.0	16.0	0.06
6808	1100	979	17.0	12.0	14.0	0.07
6809	1210	1180	17.2	11.0	13.0	0.08
6810	1440	1400	17.2	9.5	11.0	0.11
6811	1980	1900	17.0	8.5	10.0	0.18
6812	2570	2460	16.9	8.0	9.5	0.22
6813	2680	2710	17.0	7.5	8.5	0.28
6814	2710	2860	17.2	6.7	8.0	0.29
6815	2820	3100	17.3	6.3	7.5	0.32
6816	2840	3230	17.4	6.0	7.4	0.32
6817	4200	4490	17.1	5.6	6.7	0.56
6818	4270	4710	17.2	5.3	6.3	0.59
6819	4330	4930	17.2	5.0	6.0	0.63
6820	4400	5150	17.3	4.8	5.6	0.66
6821	4440	5370	17.4	4.8	5.6	0.69
6822	6290	7370	17.1	4.3	5.3	1.07
6824	6490	8030	17.3	4.0	4.8	1.16
6826	8250	9790	17.1	3.6	4.3	1.63
6828	8580	10700	17.3	3.4	4.0	1.79
6830	10700	10900	17.1	3.2	3.8	2.49
6832	10900	13800	17.2	2.6	3.2	3.08
6834	13400	16800	17.1	2.6	3.0	4.11
6836	13600	17600	17.2	2.4	2.8	4.36
6838	18955	21000	17.1	2.2	2.6	5.57
6840	19214	22000	17.2	2.2	2.6	5.85

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Ball Bearings: 6900 Series

Single Row, Deep Groove, Conrad Type



Common Options	
V	One Non-Contact Seal
VV	Two Non-Contact Seals
DU	One Contact Seal
DDU	Two Contact Seals
Z	One Shield
ZZ	Two Shields
NR	Snap Ring
M**	Brass Cage
C0*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

** Not available on all sizes, consult NSK for availability.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters			
	d		D		B		r*	da (in)		Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max	max
6900	10	0.3937	22	0.8661	6	0.2362	0.012	0.472	0.492	0.787
6901	12	0.4724	24	0.9449	6	0.2362	0.012	0.551	0.571	0.866
6902	15	0.5906	28	1.1024	7	0.2756	0.012	0.669	0.669	1.024
6903	17	0.6693	30	1.1811	7	0.2756	0.012	0.748	0.768	1.102
6904	20	0.7874	37	1.4567	9	0.3543	0.012	0.866	0.945	1.378
6905	25	0.9843	42	1.6535	9	0.3543	0.012	1.063	1.122	1.575
6906	30	1.1811	47	1.8504	9	0.3543	0.012	1.260	1.339	1.772
6907	35	1.3780	55	2.1654	10	0.3937	0.024	1.535	1.535	2.008
6908	40	1.5748	62	2.4409	12	0.4724	0.024	1.732	1.811	2.283
6909	45	1.7717	68	2.6772	12	0.4724	0.024	1.929	1.969	2.520
6910	50	1.9685	72	2.8346	12	0.4724	0.024	2.126	2.165	2.677
6911	55	2.1654	80	3.1496	13	0.5118	0.039	2.362	2.421	2.953
6912	60	2.3622	85	3.3465	13	0.5118	0.039	2.559	2.598	3.150
6913	65	2.5591	90	3.5433	13	0.5118	0.039	2.756	2.815	3.346
6914	70	2.7559	100	3.9370	16	0.6299	0.039	2.953	3.051	3.740
6915	75	2.9528	105	4.1339	16	0.6299	0.039	3.150	3.228	3.937
6916	80	3.1496	110	4.3307	16	0.6299	0.039	3.346	3.445	4.134
6917	85	3.3465	120	4.7244	18	0.7087	0.039	3.602	3.720	4.469
6918	90	3.5433	125	4.9213	18	0.7087	0.039	3.799	3.878	4.665
6919	95	3.7402	130	5.1181	18	0.7087	0.039	3.996	4.075	4.862
6920	100	3.9370	140	5.5118	20	0.7874	0.039	4.193	4.370	5.256
6921	105	4.1339	145	5.7087	20	0.7874	0.039	4.390	4.567	5.453
6922	110	4.3307	150	5.9055	20	0.7874	0.039	4.587	4.764	5.650
6924	120	4.7244	165	6.4961	22	0.8661	0.039	4.980	5.197	6.240
6926	130	5.1181	180	7.0866	24	0.9449	0.059	5.433	5.669	6.772
6928	140	5.5118	190	7.4803	24	0.9449	0.059	5.827	6.043	7.165
6930	150	5.9055	210	8.2677	28	1.1024	0.079	6.260	6.535	7.913
6932	160	6.2992	220	8.6614	28	1.1024	0.079	6.654	6.929	8.307
6934	170	6.6929	230	9.0551	28	1.1024	0.079	7.047	7.323	8.701
6936	180	7.0866	250	9.8425	33	1.2992	0.079	7.441	7.815	9.488
6938	190	7.4803	260	10.2362	33	1.2992	0.079	7.835	-	9.882
6940	200	7.8740	280	11.0236	38	1.4961	0.079	8.307	8.740	10.591

*Maximum fillet which corner radius of bearing will clear. Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

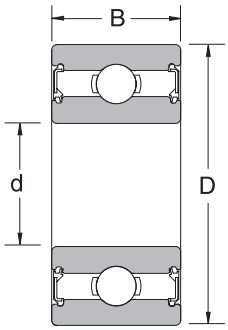
Bearing Number	Basic Load Ratings (lbs)		Factor	Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	f_0	Grease	Oil	lbs
6900	605	284	14.0	32.0	38.0	0.02
6901	649	328	14.5	30.0	36.0	0.02
6902	968	506	14.3	26.0	30.0	0.03
6903	1030	572	14.7	24.0	28.0	0.04
6904	1430	825	14.7	19.0	22.0	0.08
6905	1570	1010	15.4	16.0	19.0	0.09
6906	1630	1120	15.8	14.0	17.0	0.11
6907	2380	1630	15.5	12.0	15.0	0.16
6908	3060	2240	15.7	11.0	13.0	0.24
6909	3170	2440	15.9	9.5	12.0	0.27
6910	3260	2640	16.1	9.0	11.0	0.29
6911	3590	2970	16.2	8.0	9.5	0.40
6912	4360	3650	16.2	7.5	9.0	0.41
6913	3890	3610	16.6	7.1	8.5	0.47
6914	5320	4750	16.3	6.3	7.5	0.75
6915	5460	5060	16.5	6.0	7.4	0.79
6916	5590	5390	16.6	5.6	6.7	0.84
6917	7150	6600	16.4	5.3	6.3	1.19
6918	7370	7040	16.5	5.0	6.0	1.25
6919	7590	7480	16.6	4.8	5.6	1.28
6920	9570	9350	16.4	4.5	5.3	1.78
6921	9460	9460	16.5	4.3	5.3	1.84
6922	9790	10000	16.6	4.3	5.0	1.91
6924	11900	12100	16.5	3.8	4.5	2.62
6926	14600	15100	16.5	3.4	4.0	3.41
6928	15000	16100	16.6	3.2	3.8	3.61
6930	19000	20200	16.5	2.6	3.2	6.56
6932	19500	21600	16.6	2.6	3.0	6.89
6934	19300	21700	16.7	2.4	2.8	7.28
6936	26600	28800	16.4	2.2	2.6	10.76
6938	29341	28600	16.6	2.2	2.6	11.31
6940	32100	35400	16.4	2.0	2.4	15.82

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Ball Bearings: 63200 Series

Single Row, Deep Groove, Cartridge

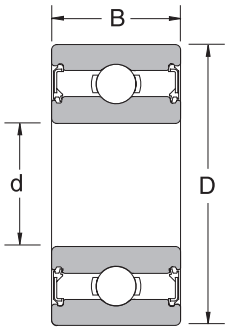


Bearing Number	Nominal Bearing Dimensions					Preferred Shoulder Diameters			Basic Load Ratings (lbs)		Bearing Weight Approx.
	d		D		B	r*	Shaft	Housing			
	mm	inch	mm	inch	inch	inch	inch	inch	C_r	C_{or}	lbs
63204DDU	20	0.7874	47	1.8504	0.8125	0.039	0.969	1.614	2870	1480	0.34
63205DDU	25	0.9843	52	2.0472	0.8125	0.039	1.172	1.811	3150	1760	0.39
63206DDU	30	1.1811	62	2.4409	0.9375	0.039	1.406	2.205	4370	2540	0.96
63207DDU	35	1.3780	72	2.8346	1.0625	0.039	1.614	2.559	5780	3440	0.96
63208DDU	40	1.5748	80	3.1496	1.1875	0.039	1.811	2.874	6550	4010	1.28
63209DDU	45	1.7717	85	3.3465	1.1875	0.039	2.008	3.071	7050	4590	1.37

*Maximum fillet which corner radius of bearing will clear. C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Ball Bearings: 63300 Series

Single Row, Deep Groove, Cartridge

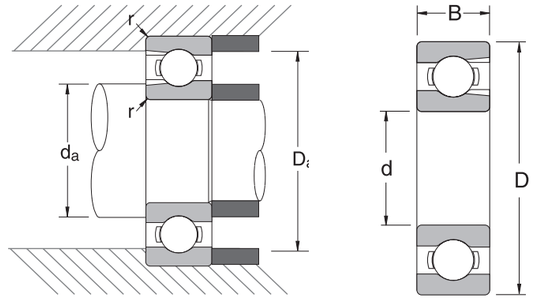


Bearing Number	Nominal Bearing Dimensions					Preferred Shoulder Diameters			Basic Load Ratings (lbs)		Bearing Weight Approx.
	d		D		B	r*	Shaft	Housing			
	mm	inch	mm	inch	inch	inch	inch	inch	C_r	C_{or}	lbs
63304DDU	20	0.7874	52	2.0472	0.8750	0.039	1.016	1.772	3580	1770	0.44
63305DDU	25	0.9843	62	2.4409	1.0000	0.039	1.220	2.165	4630	2530	0.78
63306DDU	30	1.1811	72	2.8346	1.1875	0.039	1.469	2.559	5990	3380	1.13
63307DDU	35	1.3780	80	3.1496	1.3750	0.059	1.688	2.795	7490	4320	1.64
63308DDU	40	1.5748	90	3.5433	1.4375	0.059	1.929	3.189	9160	5400	2.06
63309DDU	45	1.7717	100	3.9370	1.5625	0.059	2.126	3.583	11910	7210	3.00
63310DDU	50	1.9685	110	4.3307	1.7500	0.079	2.362	3.937	13940	8610	3.75
63311DDU	55	2.1654	120	4.7244	1.9375	0.079	2.559	4.331	16070	10040	5.12
63312DDU	60	2.3622	130	5.1181	2.1250	0.079	2.835	4.646	18400	11700	6.50

*Maximum fillet which corner radius of bearing will clear. C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Ball Bearings: BL200/300 Series

Maximum Capacity Type



COMMON OPTIONS	
Z	One Shield
ZZ	Two Shields
NR	Snap Ring
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance

* Not shown in part number

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters			
	d		D		B		r*	da (in)		Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max	max
BL205	25	0.9843	52	2.0472	15	0.5906	0.039	1.182	1.261	1.852
BL305	25	0.9843	62	2.4409	17	0.6693	0.039	1.241	1.418	2.187
BL206	30	1.1811	62	2.4409	16	0.6299	0.039	1.379	1.517	2.246
BL306	30	1.1811	72	2.8346	19	0.7480	0.039	1.438	1.655	2.581
BL207	35	1.3780	72	2.8346	17	0.6693	0.039	1.635	1.753	2.581
BL307	35	1.3780	80	3.1496	21	0.8268	0.059	1.694	1.753	2.837
BL208	40	1.5748	80	3.1496	18	0.7087	0.039	1.832	1.970	2.896
BL308	40	1.5748	90	3.5433	23	0.9055	0.059	1.891	2.069	3.231
BL209	45	1.7717	85	3.3465	19	0.7480	0.039	2.029	2.187	3.093
BL309	45	1.7717	100	3.9370	25	0.9843	0.059	2.088	2.423	3.625
BL210	50	1.9685	90	3.5433	20	0.7874	0.039	2.226	2.364	3.290
BL310	50	1.9685	110	4.3307	27	1.0630	0.079	2.325	2.679	3.979
BL211	55	2.1654	100	3.9370	21	0.8268	0.059	2.482	2.620	3.625
BL311	55	2.1654	120	4.7244	29	1.1417	0.079	2.522	2.857	4.373
BL212	60	2.3622	110	4.3307	22	0.8661	0.059	2.679	2.935	4.019
BL312	60	2.3622	130	5.1181	31	1.2205	0.079	2.797	3.113	4.689
BL213	65	2.5591	120	4.7244	23	0.9055	0.059	2.876	3.152	4.413
BL313	65	2.5591	140	5.5118	33	1.2992	0.079	2.994	3.369	5.083
BL214	70	2.7559	125	4.9213	24	0.9449	0.059	3.073	3.310	4.610
BL314	70	2.7559	150	5.9055	35	1.3780	0.079	3.191	3.625	5.477
BL215	75	2.9528	130	5.1181	25	0.9843	0.059	3.270	3.546	4.807
BL315	75	2.9528	160	6.2992	37	1.4567	0.079	3.388	3.881	5.871
BL216	80	3.1496	140	5.5118	26	1.0236	0.079	3.507	3.763	5.161
BL316	80	3.1496	170	6.6929	39	1.5354	0.079	3.585	4.117	6.265
BL217	85	3.3465	150	5.9055	28	1.1024	0.079	3.704	4.019	5.555
BL317	85	3.3465	180	7.0866	41	1.6142	0.099	3.861	4.354	6.580
BL218	90	3.5433	160	6.2992	30	1.1811	0.079	3.901	4.236	5.949
BL318	90	3.5433	190	7.4803	43	1.6929	0.099	4.058	4.610	6.974
BL219	95	3.7402	170	6.6929	32	1.2598	0.079	4.176	4.492	6.265
BL319	95	3.7402	200	7.8740	45	1.7717	0.099	4.255	4.886	7.368
BL220	100	3.9370	180	7.0866	34	1.3386	0.079	4.373	4.787	6.659
BL221	105	4.1339	190	7.4803	36	1.4173	0.079	4.570	5.024	7.053

*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
BL205	3250	2360	12.0	15.0	0.29
BL305	4850	3450	11.0	13.0	0.54
BL206	4750	3650	10.0	12.0	0.47
BL306	6250	4650	9.0	11.0	0.80
BL207	6250	4950	9.0	11.0	0.68
BL307	8350	6550	8.0	9.5	1.07
BL208	7950	6500	8.0	9.5	0.87
BL308	10400	8050	7.5	9.0	1.47
BL209	8350	7150	7.5	9.0	0.99
BL309	12500	9900	6.3	8.0	1.94
BL210	8750	7850	6.7	8.5	1.11
BL310	14600	11800	6.0	7.1	2.51
BL211	10800	9900	6.3	7.5	1.46
BL311	16800	13800	5.6	6.7	3.23
BL212	13100	12200	5.6	6.7	1.88
BL312	19200	16100	5.0	6.0	4.07
BL213	14300	13500	5.3	6.3	2.40
BL313	23100	20200	4.8	5.6	5.10
BL214	15500	14900	5.0	6.0	2.62
BL314	26000	23000	4.3	5.3	6.23
BL215	16200	16100	4.5	5.6	2.84
BL315	28300	26000	4.0	5.0	7.44
BL216	18900	19100	4.3	5.3	3.48
BL316	30500	29200	3.8	4.5	8.89
BL217	20900	20900	4.0	5.0	4.29
BL317	33000	32500	3.6	4.3	10.36
BL218	23900	24100	3.8	4.5	5.30
BL318	35500	36000	3.4	4.0	11.84
BL219	27100	27600	3.6	4.3	6.38
BL319	38000	40000	2.8	3.6	14.08
BL220	30500	31500	3.4	4.0	7.68
BL221	43000	47500	3.0	3.6	9.20

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Double Row Angular Contact Ball Bearings

Basic Type & Series
3200: Metric, Max Capacity, Light, 32º Contact Angle
3200B: Metric, Conrad, Light, 25º Contact Angle
3300: Metric, Max Capacity, Medium, 32º Contact Angle
3300B: Metric, Conrad, Medium, 25º Contact Angle
5200: Metric, Conrad, Light, 25º Contact Angle
5300: Metric, Conrad, Medium, 25º Contact Angle

32

10

Bore Size
(04 and up: multiply last two numbers by 5 to get bore in mm)
00: 10 mm
01: 12 mm
02: 15 mm
03: 17 mm
04: 20 mm

Contact Angle
Blank for 3xxx Series: 32º
Blank for 5xxx Series: 25º
B for 3xxx Series: 25º

B

2RS

Bearing Protection
Blank: Open
2RS: Double Contact Seal
2Z: Double Shield

Cage Material
J, Blank: Steel
TNG: Polyamide

TNG

C3

Internal Clearance
C2: Tight
Blank: Normal
C3: Greater than Normal
C4: Greater than C3

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

Interchange

Description		Interchange				
		NSK	SKF	FAG	NTN	FAF/TIMKEN
Part Number	Maximum Capacity, Light	32xx, 32xxJ	52xxE, 32xx	32xx, 32xxC	32xx	52xx, 52xxW
	Maximum Capacity, Medium	33xx, 33xxJ	53xxE, 33xx	33xx, 33xxC	33xx	53xx, 53xxW
	Conrad, Light	32xxB, 52xx	52xxA, 32xxA	32xxB, 32xxBC	52xx	52xxK
	Conrad, Medium	33xxB, 53xx	53xxA, 33xxA	33xxB, 33xxBC	53xx	53xxK
Part Number Suffix	Polyamide Cage	TNG/TNH	TN9	TVP, TVH	--	PRB
	Steel Cage	Blank	Blank	Blank	Blank	Blank
	2 Contact Seals	2RS	2RS1	2RSR	LLU	PP
	2 Shields	2Z	2Z	2ZR	ZZ	FF
	Tight Clearance	C2	C2	C2	C2	H
	Normal Clearance	Blank	Blank	Blank	Blank	R
	Greater than Normal Clearance	C3	C3	C3	C3	P

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

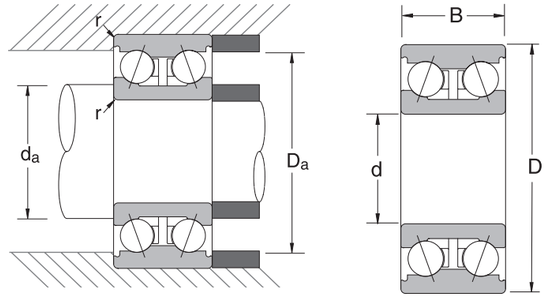
Applications

› Petrochemical Equipment › Gear Boxes › Centrifugal Pumps › Electrical Motors › Pumps and Compressors
› Transmissions › Worm Drives › Blowers and Fans

Please contact NSK Engineering for internal clearance information.

Ball Bearings: 3200/3300 Series

Double Row, Maximum Capacity, 32⁰ Contact Angle



COMMON OPTIONS	
NR	Snap Ring
C0*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance

*Not shown in part number

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters		
	d		D		B		r*	da (in)	Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max
3200J	10	0.3937	30	1.1811	14.0	0.5512	0.023	0.546	1.014
3201J	12	0.4724	32	1.2598	15.9	0.6260	0.023	0.624	1.092
3202J	15	0.5906	35	1.3780	15.9	0.6260	0.023	0.741	1.209
3302J	15	0.5906	42	1.6535	19.0	0.7480	0.039	0.819	1.404
3203J	17	0.6693	40	1.5748	17.5	0.6890	0.023	0.819	1.404
3303J	17	0.6693	47	1.8504	22.2	0.8740	0.039	0.897	1.599
3204J	20	0.7874	47	1.8504	20.6	0.8110	0.039	1.014	1.599
3304J	20	0.7874	52	2.0472	22.2	0.8740	0.039	1.053	1.755
3205J	25	0.9843	52	2.0472	20.6	0.8110	0.039	1.209	1.794
3305J	25	0.9843	62	2.4409	25.4	1.0000	0.039	1.209	2.145
3206J	30	1.1811	62	2.4409	23.8	0.9370	0.039	1.404	2.184
3306J	30	1.1811	72	2.8346	30.2	1.1890	0.039	1.443	2.535
3207J	35	1.3780	72	2.8346	27.0	1.0630	0.039	1.638	2.535
3307J	35	1.3780	80	3.1496	34.9	1.3740	0.059	1.716	2.769
3208J	40	1.5748	80	3.1496	30.2	1.1890	0.039	1.833	2.847
3308J	40	1.5748	90	3.5433	36.5	1.4370	0.059	1.911	3.159
3209J	45	1.7717	85	3.3465	30.2	1.1890	0.039	2.028	3.042
3309J	45	1.7717	100	3.9370	39.7	1.5630	0.059	2.106	3.549
3210J	50	1.9685	90	3.5433	30.2	1.1890	0.039	2.223	3.237
3310J	50	1.9685	110	4.3307	44.4	1.7480	0.078	2.340	3.900
3211J	55	2.1654	100	3.9370	33.3	1.3110	0.059	2.496	3.549
3311J	55	2.1654	120	4.7244	49.2	1.9370	0.078	2.535	4.290
3212J	60	2.3622	110	4.3307	36.5	1.4370	0.059	2.691	3.939
3312J	60	2.3622	130	5.1181	54.0	2.1260	0.078	2.808	4.602
3213J	65	2.5591	120	4.7244	38.1	1.5000	0.059	2.886	4.329
3313J	65	2.5591	140	5.5118	58.7	2.3110	0.078	3.003	4.992
3214J	70	2.7559	125	4.9213	39.7	1.5630	0.059	3.081	4.524
3314J	70	2.7559	150	5.9055	63.5	2.5000	0.078	3.198	5.382

*Maximum fillet which corner radius of bearing will clear. Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

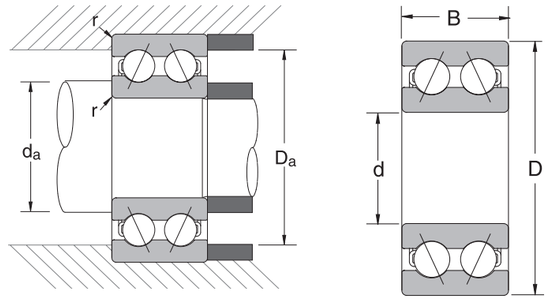
Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
3200J	1820	1330	17.0	24.0	0.11
3201J	2180	1620	15.0	20.0	0.14
3202J	2470	1890	13.0	18.0	0.16
3302J	3190	2380	12.0	17.0	0.29
3203J	2880	2290	12.0	17.0	0.23
3303J	4520	3420	10.0	15.0	0.42
3204J	3960	3240	10.0	15.0	0.37
3304J	4610	3570	9.5	14.0	0.51
3205J	4360	3840	8.5	12.0	0.43
3305J	6320	5150	7.5	10.0	0.81
3206J	5940	5440	7.0	9.5	0.70
3306J	8410	7010	6.3	8.5	1.29
3207J	8410	7940	6.3	8.5	1.06
3307J	10600	9130	5.6	7.5	1.80
3208J	9290	8680	5.6	7.5	1.44
3308J	13100	11900	4.8	6.3	2.35
3209J	9890	10100	5.0	6.7	1.56
3309J	16000	15100	4.3	5.6	3.08
3210J	11100	11300	4.8	6.3	1.68
3310J	19100	18300	4.0	5.3	4.29
3211J	13200	12100	4.3	5.6	2.31
3311J	22000	21400	3.6	4.8	5.61
3212J	15600	16200	3.8	5.0	3.08
3312J	25600	25200	3.4	4.5	7.15
3213J	16500	18700	3.6	4.8	3.85
3313J	29000	29000	3.2	4.3	9.02
3214J	18300	20600	3.2	4.3	4.18
3314J	32100	32800	2.8	3.8	11.11

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Ball Bearings: 5200/5300 Series

Double Row, Conrad Type, Bore Sizes: 10mm to 40mm, 25⁰ Contact Angle



COMMON OPTIONS	
2RS**	Two Seals
ZZ	Two Shields
NR	Snap Ring
J	Steel Cage
TN	Polyamide Cage
C0*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance

*Not shown in part number

** Available with TN only

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters		
	d		D		B		r*	da (in)	Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max
5200TN	10	0.3937	30	1.1811	14.3	0.5512	0.023	0.585	0.984
5200J	10	0.3937	30	1.1811	14.3	0.5512	0.023	0.585	0.984
5201TN	12	0.4724	32	1.2598	15.9	0.6260	0.023	0.663	1.063
5201J	12	0.4724	32	1.2598	15.9	0.6260	0.023	0.663	1.063
5202TN	15	0.5906	35	1.3780	15.9	0.6260	0.023	0.787	1.170
5202J	15	0.5906	35	1.3780	15.9	0.6260	0.023	0.787	1.404
5302TN	15	0.5906	42	1.6535	19.0	0.7480	0.039	0.819	1.404
5203TN	17	0.6693	40	1.5748	17.5	0.6890	0.023	0.866	1.380
5203J	17	0.6693	40	1.5748	17.5	0.6890	0.023	0.866	1.380
5303TN	17	0.6693	47	1.8504	22.2	0.8740	0.039	0.906	1.615
5303J	17	0.6693	47	1.8504	22.2	0.8740	0.039	0.906	1.615
5204TN	20	0.7874	47	1.8504	20.6	0.8110	0.039	1.014	1.614
5204J	20	0.7874	47	1.8504	20.6	0.8110	0.039	1.014	1.614
5304TN	20	0.7874	52	2.0472	22.2	0.8740	0.039	1.053	1.772
5304J	20	0.7874	52	2.0472	22.2	0.8740	0.039	1.053	1.772
5205TN	25	0.9843	52	2.0472	20.6	0.8110	0.039	1.220	1.811
5205J	25	0.9843	52	2.0472	20.6	0.8110	0.039	1.220	1.811
5305TN	25	0.9843	62	2.4409	25.4	1.0000	0.039	1.260	2.165
5305J	25	0.9843	62	2.4409	25.4	1.0000	0.039	1.260	2.165
5206TN	30	1.1811	62	2.4409	23.8	0.9370	0.039	1.404	2.205
5206J	30	1.1811	62	2.4409	23.8	0.9370	0.039	1.404	2.205
5306TN	30	1.1811	72	2.8346	30.2	1.1890	0.039	1.457	2.559
5306J	30	1.1811	72	2.8346	30.2	1.1890	0.039	1.457	2.559
5207TN	35	1.3780	72	2.8346	27.0	1.0630	0.039	1.638	2.559
5207J	35	1.3780	72	2.8346	27.0	1.0630	0.039	1.638	2.559
5307TN	35	1.3780	80	3.1496	34.9	1.3740	0.059	1.716	2.795
5307J	35	1.3780	80	3.1496	34.9	1.3740	0.059	1.716	2.795
5208TN	40	1.5748	80	3.1496	30.2	1.1890	0.039	1.833	2.874
5208J	40	1.5748	80	3.1496	30.2	1.1890	0.039	1.833	2.874
5308TN	40	1.5748	90	3.5433	36.5	1.4370	0.059	1.911	3.189
5308J	40	1.5748	90	3.5433	36.5	1.4370	0.059	1.911	3.189

*Maximum fillet which corner radius of bearing will clear.

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

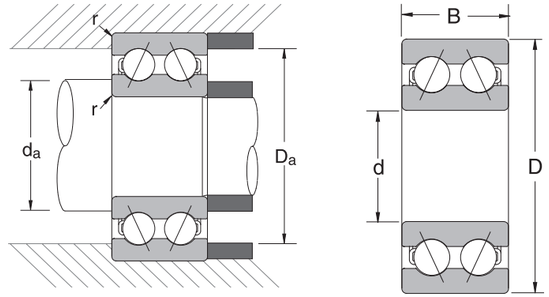
Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
5200TN	1750	877	16.0	22.0	0.09
5200J	1610	878	17.0	22.0	0.10
5201TN	2380	1150	15.0	20.0	0.11
5201J	2360	1300	15.0	20.0	0.12
5202TN	2650	1370	13.0	18.0	0.13
5202J	2630	1580	13.0	17.0	0.14
5302TN	3660	1940	10.0	15.0	0.25
5203TN	3280	1750	10.0	15.0	0.19
5203J	3290	2030	11.0	15.0	0.20
5303TN	4680	2380	9.5	14.0	0.35
5303J	4730	2830	10.0	13.0	0.31
5204TN	4410	2430	9.0	13.0	0.31
5204J	4410	2790	10.0	13.0	0.26
5304TN	5220	2900	8.5	12.0	0.43
5304J	5530	3370	9.0	12.0	0.51
5205TN	4770	2860	8.0	11.0	0.35
5205J	4790	3310	8.5	11.0	0.42
5305TN	6740	3890	7.5	10.0	0.70
5305J	7330	4650	7.5	10.0	0.75
5206TN	6740	4110	7.1	9.0	0.58
5206J	6650	4740	7.1	9.5	0.64
5306TN	9330	5510	6.2	7.9	1.09
5306J	9150	6320	6.3	8.5	1.12
5207TN	8770	5620	5.6	7.1	0.91
5207J	8770	6450	6.3	8.0	0.95
5307TN	11500	6740	5.1	6.5	1.46
5307J	11500	8100	5.6	7.5	1.74
5208TN	10800	7080	5.0	6.3	1.21
5208J	9930	7510	5.3	7.1	1.26
5308TN	13900	8770	4.7	5.8	1.99
5308J	12700	9250	5.3	6.7	2.30

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Ball Bearings: 5200/5300 Series (cont.)

Double Row, Conrad Type, Bore Sizes: 45mm to 85mm, 25⁰ Contact Angle



COMMON OPTIONS	
2RS**	Two Seals
ZZ	Two Shields
NR	Snap Ring
J	Steel Cage
TN	Polyamide Cage
C0*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance

*Not shown in part number

** Available with TN only

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters		
	d		D		B		r*	da (in)	Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max
5209TN	45	1.7717	85	3.3465	30.2	1.189	0.039	2.047	3.071
5209J	45	1.7717	85	3.3465	30.2	1.189	0.039	2.047	3.071
5309TN	45	1.7717	100	3.9370	39.7	1.563	0.059	2.126	3.583
5309J	45	1.7717	100	3.9370	39.7	1.563	0.059	2.126	3.583
5210TN	50	1.9685	90	3.5433	30.2	1.189	0.039	2.224	3.268
5210J	50	1.9685	90	3.5433	30.2	1.189	0.039	2.224	3.268
5310TN	50	1.9685	110	4.3307	44.4	1.748	0.078	2.362	3.937
5310J	50	1.9685	110	4.3307	44.4	1.748	0.078	2.362	3.937
5211TN	55	2.1654	100	3.9370	33.3	1.311	0.059	2.520	3.602
5211J	55	2.1654	100	3.9370	33.3	1.311	0.059	2.520	3.602
5311TN	55	2.1654	120	4.7244	49.2	1.937	0.078	2.559	4.331
5311J	55	2.1654	120	4.7244	49.2	1.937	0.078	2.559	4.331
5212TN	60	2.3622	110	4.3307	36.5	1.437	0.059	2.717	3.996
5212J	60	2.3622	110	4.3307	36.5	1.437	0.059	2.717	3.996
5312TN	60	2.3622	130	5.1181	54.0	2.126	0.078	2.835	4.646
5312J	60	2.3622	130	5.1181	54.0	2.126	0.078	2.835	4.646
5213TN	65	2.5591	120	4.7244	38.1	1.500	0.059	2.913	4.370
5213J	65	2.5591	120	4.7244	38.1	1.500	0.059	2.913	4.370
5313TN	65	2.5591	140	5.5118	58.7	2.311	0.078	3.034	5.039
5313J	65	2.5591	140	5.5118	58.7	2.311	0.078	3.034	5.039
5214TN	70	2.7559	125	4.9213	39.7	1.563	0.059	3.110	4.567
5214J	70	2.7559	125	4.9213	39.7	1.563	0.059	3.110	4.567
5314J	70	2.7559	150	5.9055	63.5	2.500	0.078	3.228	5.433
5215J	75	2.9528	130	5.1181	41.3	1.626	0.059	3.307	4.764
5216J	80	3.1496	140	5.5118	44.4	1.748	0.078	3.543	5.118
5217J	85	3.3465	150	5.9055	49.2	1.937	0.078	3.740	5.512

*Maximum fillet which corner radius of bearing will clear.

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
5209TN	10800	7190	4.5	5.4	1.28
5209J	11100	8580	5.0	6.7	1.37
5309TN	15300	9780	4.3	5.0	2.66
5309J	15400	11400	4.5	6.0	3.10
5210TN	11500	8210	4.0	4.6	1.39
5210J	11900	9740	4.8	6.0	1.48
5310TN	18200	11900	3.6	4.2	3.52
5310J	18300	13800	4.3	5.6	4.30
5211TN	13200	9670	4.3	5.6	1.93
5211J	12600	11000	4.3	5.6	2.12
5311TN	22900	15300	3.8	5.0	4.64
5311J	21400	16400	3.8	5.0	5.10
5212TN	16200	11900	3.8	5.0	2.60
5212J	15600	13900	3.8	5.0	2.98
5312TN	28100	19100	3.4	4.5	5.94
5312J	28200	22100	3.4	4.5	7.00
5213TN	18000	14200	3.4	4.5	3.34
5213J	17100	15500	3.6	4.5	3.64
5313TN	33700	22900	3.2	4.3	7.46
5313J	25400	32000	3.2	4.3	8.49
5214TN	18700	15100	3.4	4.5	3.61
5214J	21100	18500	3.4	4.5	4.00
5314J	35700	28900	3.0	3.8	10.80
5215J	21100	18700	3.2	4.3	4.19
5216J	22300	20900	3.0	3.8	5.51
5217J	26000	24700	2.8	3.6	7.50

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Self-Aligning Ball Bearings

Basic Type & Series
1200: Metric, Self-Aligning, Extra Narrow
1300: Metric, Self-Aligning, Narrow
2200: Metric, Self-Aligning, Wide
2300: Metric, Self-Aligning, Extra Wide
NLJ: Inches, Self-Aligning, Light
NMJ: Inches, Self-Aligning, Medium

Suffixes
2RS: Double Contact Seal
K: Taper Bore 1:12
E: Extra Capacity
NR: Snap Ring

Internal Clearance
C2: Tight
Blank: Normal
C3: Greater than Normal
C4: Greater than C3

22	06	2RS	TNG	C3

Bore Size
(04 and up: multiply last two numbers by 5 to get bore in mm)
00: 10 mm
01: 12 mm
02: 15 mm
03: 17 mm
04: 20 mm
05: 25 mm
12: 60 mm
20: 100 mm
Inch: directly indicated

Cage Material
TNG: Polyamide
J: Pressed Steel

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

Applications

› Film Processing Equipment › Vertical Spinning Equipment › Vertical Weaving Equipment › Industrial Countershafts › Paper Making – Fourdrinier

Interchange

Description		Interchange			
		NSK	SKF	FAG	NTN
Part Number	Metric, Self-Aligning, Extra Narrow	12xx	12xx	12xx	12xx
	Metric, Self-Aligning, Narrow	13xx	13xx	13xx	13xx
	Metric, Self-Aligning, Wide	22xx	22xx	22xx	22xx
	Metric, Self-Aligning, Extra Wide	23xx	23xx	23xx	23xx
Part Number Suffix	Polyamide Cage	TNG	TN9	TV	--
	Steel Cage	Blank, J	Blank	Blank	Blank
	2 Contact Seals	2RS	2RS1	2RSR	LLU
	Tight Clearance	C2	C2	C2	C2
	Normal Clearance	Blank	Blank	Blank	Blank
	Greater than Normal Clearance	C3	C3	C3	C3
	Tapered Bore 1:12	K	K	K	K

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

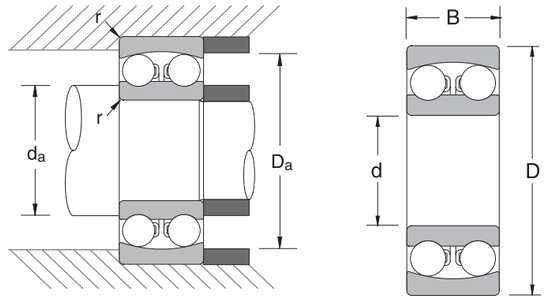
Radial Internal Clearance

Unit: µm

Nominal Bore Diameter d (mm)		Clearance in Bearings with Cylindrical Bores										Clearance in Bearings with Tapered Bores									
		C2		CN		C3		C4		C5		C2		CN		C3		C4		C5	
over	incl.	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
2.5	6	1	8	5	15	10	20	15	25	21	33	--	--	--	--	--	--	--	--	--	--
6	10	2	9	6	17	12	25	19	33	27	42	--	--	--	--	--	--	--	--	--	--
10	14	2	10	6	19	13	26	21	35	30	48	--	--	--	--	--	--	--	--	--	--
14	18	3	12	8	21	15	28	23	37	32	50	--	--	--	--	--	--	--	--	--	--
18	24	4	14	10	23	17	30	25	39	34	52	7	17	13	26	20	33	28	42	37	55
24	30	5	16	11	24	19	35	29	46	40	58	9	20	15	28	23	39	33	50	44	62
30	40	6	18	13	29	23	40	34	53	46	66	12	24	19	35	29	46	40	59	52	72
40	50	6	19	14	31	25	44	37	57	50	71	14	27	22	39	33	52	45	65	58	79
50	65	7	21	16	36	30	50	45	69	62	88	18	32	27	47	41	61	56	80	73	99
65	80	8	24	18	40	35	60	54	83	76	108	23	39	35	57	50	75	69	98	91	123
80	100	9	27	22	48	42	70	64	96	89	124	29	47	42	68	62	90	84	116	109	144
100	120	10	31	25	56	50	83	75	114	105	145	35	56	50	81	75	108	100	139	130	170
120	140	10	38	30	68	60	100	90	135	125	175	40	68	60	98	90	130	120	165	155	205
140	160	15	44	35	80	70	120	110	161	150	210	45	74	65	110	100	150	140	191	180	240

Ball Bearings: 1200/1300 Series

Double Row, Self-Aligning



COMMON OPTIONS	
E	Extra Capacity
K	Tapered Bore
C0*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance

*Not shown in part number

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters		
	d		D		B		r*	da (in)	Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max
1200	10	0.3937	30	1.1811	9	0.3543	0.024	0.552	1.024
1201	12	0.4724	32	1.2598	10	0.3937	0.024	0.630	1.103
1301	12	0.4724	37	1.4567	12	0.4724	0.039	0.670	1.261
1202	15	0.5906	35	1.3780	11	0.4331	0.024	0.749	1.221
1302	15	0.5906	42	1.6535	13	0.5118	0.039	0.788	1.458
1203	17	0.6693	40	1.5748	12	0.4724	0.024	0.827	1.418
1303	17	0.6693	47	1.8504	14	0.5512	0.039	0.867	1.655
1204	20	0.7874	47	1.8504	14	0.5512	0.039	0.985	1.655
1304	20	0.7874	52	2.0472	15	0.5906	0.039	1.044	1.793
1205	25	0.9843	52	2.0472	15	0.5906	0.039	1.182	1.852
1305	25	0.9843	62	2.4409	17	0.6693	0.039	1.241	2.187
1206	30	1.1811	62	2.4409	16	0.6299	0.039	1.379	2.246
1306	30	1.1811	72	2.8346	19	0.7480	0.039	1.438	2.581
1207	35	1.3780	72	2.8346	17	0.6693	0.039	1.635	2.581
1307	35	1.3780	80	3.1496	21	0.8268	0.059	1.694	2.837
1208	40	1.5748	80	0.3150	18	0.7087	0.039	1.832	2.896
1308	40	1.5748	90	3.5433	23	0.9055	0.059	1.891	3.231
1209	45	1.7717	85	3.3465	19	0.7480	0.039	2.029	3.093
1309	45	1.7717	100	3.9370	25	0.9843	0.059	2.088	3.625
1210	50	1.9685	90	3.5433	20	0.7874	0.039	2.226	3.290
1310	50	1.9685	110	4.3307	27	1.0630	0.079	2.325	3.979
1211	55	2.1654	100	3.9370	21	0.8268	0.059	2.482	3.625
1311	55	2.1654	120	4.7244	29	1.1417	0.079	2.522	4.373
1212	60	2.3622	110	4.3307	22	0.8661	0.059	2.679	4.019
1312	60	2.3622	130	5.1181	31	1.2205	0.079	2.797	4.689
1213	65	2.5591	120	4.7244	23	0.9055	0.059	2.876	4.413
1313	65	2.5591	140	5.5118	33	1.2992	0.079	2.994	5.083
1214	70	2.7559	125	4.9213	24	0.9449	0.059	3.073	4.610
1314	70	2.7559	150	5.9055	35	1.3780	0.079	3.191	5.477
1215	75	2.9528	130	5.1181	25	0.9843	0.059	3.270	4.807
1315	75	2.9528	160	6.2992	37	1.4567	0.079	3.388	5.871

*Maximum fillet which corner radius of bearing will clear. Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

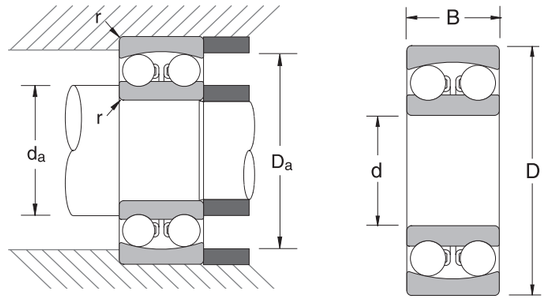
Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
1200	1240	344	24.0	30.0	0.07
1201	1260	373	24.0	30.0	0.09
1301	2140	629	18.0	22.0	0.15
1202	1690	513	20.0	36.0	0.11
1302	2140	674	17.0	20.0	0.21
1203	1800	596	18.0	22.0	0.16
1303	2810	933	15.0	17.0	0.30
1204	2250	776	15.0	18.0	0.26
1304	2810	989	13.0	15.0	0.38
1205	2740	989	13.0	16.0	0.30
1305	4050	1510	11.0	13.0	0.61
1206	3510	1390	11.0	14.0	0.49
1306	4770	1910	9.0	11.0	0.90
1207	3600	1560	9.5	12.0	0.73
1307	5620	2380	8.0	9.5	1.18
1208	4340	1980	8.5	10.0	0.92
1308	6520	2900	7.0	8.5	1.64
1209	4950	2250	7.5	9.0	1.02
1309	8540	3820	6.3	7.5	2.19
1210	5130	2470	7.0	8.5	1.17
1310	9330	4340	5.6	6.7	2.84
1211	6070	3080	6.3	7.5	1.53
1311	11500	5400	5.0	6.0	3.62
1212	6740	3600	5.6	6.7	1.98
1312	12800	6290	4.5	5.3	4.48
1213	6970	3890	5.3	6.3	2.54
1313	13900	6970	4.3	5.0	5.56
1214	7760	4270	5.0	6.0	2.84
1314	16900	8430	4.0	4.8	6.79
1215	8770	3530	4.3	5.3	2.98
1315	18000	6740	3.8		

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Ball Bearings: 2200/2300 Series

Double Row, Self-Aligning



COMMON OPTIONS	
E	Extra Capacity
K	Tapered Bore
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance

*Not shown in part number

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters		
	d		D		B		r*	da (in)	Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max
2200	10	0.3937	30	1.1811	14	0.5512	0.024	0.552	1.024
2201	12	0.4724	32	1.2598	14	0.5512	0.024	0.630	1.103
2202	15	0.5906	35	1.3780	14	0.5512	0.024	0.749	1.221
2302	15	0.5906	42	1.6535	17	0.6693	0.039	0.788	1.458
2203	17	0.6693	40	1.5748	16	0.6299	0.024	0.827	1.418
2303	17	0.6693	47	1.8504	19	0.7480	0.039	0.867	1.655
2204	20	0.7874	47	1.8504	18	0.7087	0.039	0.985	1.655
2304	20	0.7874	52	2.0472	21	0.8268	0.043	1.044	1.793
2205	25	0.9843	52	2.0472	18	0.7087	0.039	1.182	1.852
2305	25	0.9843	62	2.4409	24	0.9449	0.043	1.241	2.187
2206	30	1.1811	62	2.4409	20	0.7874	0.039	1.379	2.246
2306	30	1.1811	72	2.8346	27	1.0630	0.043	1.438	2.581
2207	35	1.3780	72	2.8346	23	0.9055	0.043	1.635	2.581
2307	35	1.3780	80	3.1496	31	1.2205	0.059	1.694	2.837
2208	40	1.5748	80	3.1496	23	0.9055	0.043	1.832	2.896
2308	40	1.5748	90	3.5433	33	1.2992	0.059	1.891	3.231
2209	45	1.7717	85	3.3465	23	0.9055	0.043	2.029	3.093
2309	45	1.7717	100	3.9370	36	1.4173	0.059	2.088	3.625
2210	50	1.9685	90	3.5433	23	0.9055	0.043	2.226	3.290
2310	50	1.9685	110	4.3307	40	1.5748	0.079	2.325	3.979
2211	55	2.1654	100	3.9370	25	0.9843	0.059	2.482	3.625
2311	55	2.1654	120	4.7244	43	1.6929	0.079	2.522	4.373
2212	60	2.3622	110	4.3307	28	1.1024	0.059	2.679	4.019
2312	60	2.3622	130	5.1181	46	1.8110	0.079	2.797	4.689
2213	65	2.5591	120	4.7244	31	1.2205	0.059	2.876	4.413
2313	65	2.5591	140	5.5118	48	1.8898	0.079	2.994	5.083
2214	70	2.7559	125	4.9213	31	1.2205	0.059	3.073	4.610
2314	70	2.7559	150	5.9055	51	2.0079	0.079	3.191	5.477
2215	75	2.9528	130	5.1181	31	1.2205	0.059	3.270	4.807
2315	75	2.9528	160	6.2992	55	2.1654	0.079	3.388	5.871
2216	80	3.1496	140	5.5118	33	1.2992	0.079	3.507	5.161
2316	80	3.1496	170	6.6929	58	2.2835	0.079	3.585	6.265

*Maximum fillet which corner radius of bearing will clear. Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
2200	1620	459	24.0	30.0	0.10
2201	1690	504	24.0	30.0	0.12
2202	1720	540	22.0	26.0	0.13
2302	2290	843	16.0	19.0	0.24
2203	2200	708	17.0	20.0	0.19
2303	3210	1020	14.0	17.0	0.39
2204	3210	1050	14.0	17.0	0.31
2304	4050	1370	13.0	16.0	0.52
2205	3820	1320	12.0	15.0	0.35
2305	5510	1910	10.0	13.0	0.82
2206	5730	2020	9.5	12.0	0.55
2306	7080	2560	8.5	10.0	1.22
2207	7190	2650	8.0	9.5	0.88
2307	8770	3280	7.5	9.0	1.64
2208	7080	2810	7.5	9.0	1.08
2308	10100	3960	6.7	8.0	2.20
2209	6290	2700	7.1	8.5	1.17
2309	12100	4950	6.0	7.1	2.91
2210	6290	2900	6.7	8.0	1.26
2310	14400	5960	5.3	6.3	3.92
2211	5960	3010	6.3	7.5	1.83
2311	16900	7080	4.8	5.6	5.05
2212	7640	3890	5.6	6.7	2.54
2312	19400	8430	4.3	5.0	6.24
2213	9890	5040	5.0	6.0	3.35
2313	21400	9670	4.0	4.8	7.56
2214	9890	5220	4.8	5.6	3.51
2314	24700	11200	3.6	4.5	9.19
2215	10000	4000	4.3	5.3	3.40
2315	28100	9670	3.4	4.3	10.30
2216	11000	4470	4.0	5.0	4.19
2316	29200	10100	3.2	4.0	11.99

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Note: Limiting speeds are lower with contact seals. For more information, contact NSK.

Angular Contact Ball Bearings

Basic Type & Series
7200: Metric, Angular Contact, Light
7300: Metric, Angular Contact, Medium
7400: Metric, Angular Contact, Heavy

Contact Angle
B: 40°
C: 15°
A: 30°

Other Features
G: Ground on Both Sides for use in Universal Duplex Mounting with Clearance
PC: Combination of Flush Ground Faces, Normal Axial Clearance and ABEC3 (ISO Class 6) Tolerance

72	10	B	Y	G

Bore Size
(04 and up: multiply last two numbers by 5 to get bore in mm)
00: 10 mm
01: 12 mm
02: 15 mm
03: 17 mm
04: 20 mm
05: 25 mm
12: 60 mm
20: 100 mm

Retainer
M: Machined Brass, Land Riding
Y: Pressed Brass
W: Steel

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

High Performance Standard (HPS)

Basic Type & Series
7200: Metric, Angular Contact, Light
7300: Metric, Angular Contact, Medium
7400: Metric, Angular Contact, Heavy

Contact Angle
B: 40°

Retainer
MR: Machined Brass, Ball Riding

Interal Clearance
CNB: Normal
VA: Light Preload

72	10	B	EA	MR	SU	CNB

Bore Size
(04 and up: multiply last two numbers by 5 to get bore in mm)
00: 10 mm
01: 12 mm
02: 15 mm
03: 17 mm
04: 20 mm
05: 25 mm
12: 60 mm
20: 100 mm

Capacity
EA: Extra Capacity

Other Features
SU: Single Universal Flush Ground
DU: Duplex Universal Flush Ground

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

Interchange

Description		Interchange					
		NSK	SKF	FAF/TIMKEN	FAG	MRC	NTN
Part No.	Light	72xx	72xx	72xx	72xx	72xx	72xx
	Medium	73xx	73xx	73xx	73xx	73xx	73xx
	Heavy	74xx	74xx	74xx	74xx	74xx	74xx
Part No. Suffix	40° Contact	B	B	WN	B	P	B
	30° Contact	A	A	--	--	BLANK	BLANK
	25° Contact	A5	ACD, AC	--	E	--	--
	15° Contact	C	CD	--	C	R	C
	Machined Brass Cage	M	M	MBR	MP	BRZ	L1
	Pressed Brass Cage	Y	Y	BLANK	YP	--	--
	Polyamide Cage	TY	P	PRC	TVP	BKE	T2
	Steel Cage	W	J	--	JP	BLANK	J
	Universal Ground Faces	G	CA, CB	SU	UA	DE	G
	Petrochemical	BMPC	BECBM	--	--	PumpPac*	--

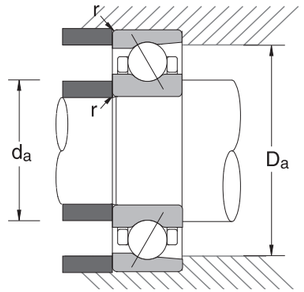
The competitive manufacturers are provided for a convenient source of unit substitution. They can be considered interchangeable in most instances, but for special applications, please consult NSK Engineering. NSK assumes no liability with respect to errors or omissions. *PumpPac is a registered trademark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

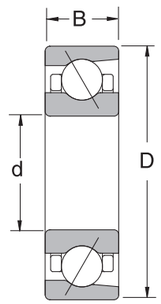
Applications

› Metal Rolling Mills › Oil Field Equipment › Gear Boxes & Drives › Deep Well Pumps › Centrifugal Pumps
› Electric Motors & Generators › Blowers & Fans › Gear Reducers

Ball Bearings: 7200 Series

Angular Contact, 40⁰ Contact Angle





COMMON OPTIONS	
B	40⁰ Contact Angle
C**	15⁰ Contact Angle
TY	Polyamide Cage
Y	Pressed Brass Cage
M	Machined Brass Cage
W	Pressed Steel Cage
G	Flush Ground Faces
PC	Flush Ground Faces Normal Axial Clearance and ABEC6

**Load and speed ratings are not shown in the table below.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters		
	d		D		B		r**	da (in)	Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max
7200B	10	0.3937	30	1.1811	9	0.3543	0.024	0.591	0.984
7201B*	12	0.4724	32	1.2598	10	0.3937	0.024	0.669	1.063
7202B*	15	0.5906	35	1.3780	11	0.5331	0.024	0.787	1.181
7203B*	17	0.6693	40	1.5748	12	0.4724	0.024	0.866	1.378
7204B*	20	0.7874	47	1.8504	14	0.5512	0.039	1.024	1.614
7205B*	25	0.9843	52	2.0472	15	0.5906	0.039	1.220	1.911
7206B*	30	1.1811	62	2.4409	16	0.6299	0.039	1.417	2.205
7207B*	35	1.3780	72	2.8346	17	0.6693	0.039	1.654	2.559
7208B*	40	1.5748	80	3.1496	18	0.7087	0.039	1.850	2.874
7209B*	45	1.7717	85	3.3465	19	0.7480	0.039	2.047	3.071
7210B*	50	1.9685	90	3.5433	20	0.7874	0.039	2.244	3.268
7211B*	55	2.1654	100	3.9370	21	0.8268	0.059	2.500	3.602
7212B*	60	2.3622	110	4.3307	22	0.8661	0.059	2.697	3.996
7213B*	65	2.5591	120	4.7244	23	0.9005	0.059	2.894	4.390
7214B*	70	2.7559	125	4.9213	24	0.9449	0.059	3.091	4.587
7215B*	75	2.9528	130	5.1181	25	0.9843	0.059	3.287	4.783
7216B*	80	3.1496	140	5.5118	26	1.0236	0.079	3.543	5.118
7217B	85	3.3465	150	5.9055	28	1.1024	0.079	3.740	5.512
7218B*	90	3.5433	160	6.2992	30	1.1811	0.079	3.937	5.906
7219B*	95	3.7402	170	6.6929	32	1.2598	0.079	4.213	6.220
7220B*	100	3.9370	180	7.0866	34	1.3386	0.079	4.409	6.614
7221B	105	4.1339	190	7.4803	36	1.4173	0.079	4.606	7.008
7222B*	110	4.3307	200	7.8740	38	1.4961	0.079	4.803	7.402
7224B*	120	4.7244	215	8.4646	40	1.5748	0.079	5.197	7.992
7226B	130	5.1181	230	9.0551	40	1.5748	0.098	5.669	8.504
7228B	140	5.5118	250	9.8425	42	1.6535	0.098	6.063	9.291
7230B	150	5.9055	270	10.6299	45	1.7717	0.098	6.457	10.079
7232B	160	6.2992	290	11.4173	48	1.8898	0.098	6.850	10.866
7234B	170	6.6929	310	12.2047	52	2.0472	0.118	7.402	11.496
7236B	180	7.0866	320	12.5984	52	2.0472	0.118	7.795	11.890
7238B	190	7.4803	340	13.3858	55	2.1654	0.118	8.190	12.677
7240B	200	7.8740	360	14.1732	58	2.2835	0.118	8.583	13.465

*Indicates NSK (HPS) High Performance Standard bearing.. **Maximum fillet which corner radius of bearing will clear.

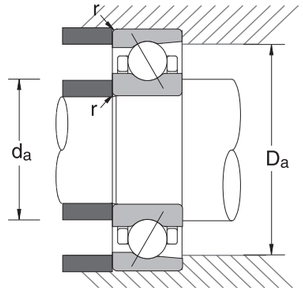
Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
7200B	1050	505	20.0	28.0	0.07
7201B*	1832	761	18.0	26.0	0.08
7202B*	2203	882	16.0	22.0	0.11
7203B*	2608	1120	14.0	19.0	0.15
7204B*	3507	1570	12.0	16.0	0.24
7205B*	3957	1950	10.0	14.0	0.30
7206B*	5328	2800	8.5	12.0	0.46
7207B*	7306	3810	7.5	10.0	0.65
7208B*	8655	4810	6.7	9.0	0.84
7209B*	9105	5470	6.3	8.5	0.95
7210B*	9442	6000	5.6	8.0	1.07
7211B*	11578	7610	5.3	7.1	1.40
7212B*	13826	9370	4.8	6.3	1.81
7213B*	15737	11100	4.3	6.0	2.20
7214B*	16973	12200	4.0	5.6	2.42
7215B*	17647	13100	3.8	5.3	3.02
7216B*	19671	14700	3.6	5.0	3.68
7217B	20100	17100	3.4	4.8	4.58
7218B*	24504	19700	3.2	4.3	5.62
7219B*	27651	21200	3.0	4.0	6.83
7220B*	30574	24000	2.8	3.8	8.15
7221B	30400	27100	2.6	3.6	9.70
7222B*	34621	30200	2.6	3.4	11.40
7224B*	40241	36400	2.4	3.2	13.70
7226B	38400	39200	2.2	3.0	15.40
7228B	44300	47800	2.0	2.8	19.40
7230B	50500	57100	1.8	2.6	24.20
7232B	53400	62600	1.7	2.4	30.20
7234B	60000	72800	1.6	2.2	37.50
7236B	62000	78300	1.5	2.0	39.00
7238B	73742	83800	1.4	2.0	47.00
7240B	79195	91500	1.3	1.8	55.80

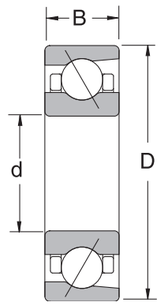
C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

*Indicates NSK (HPS) High Performance Standard bearing.

Ball Bearings: 7300 Series

Angular Contact, 40⁰ Contact Angle





COMMON OPTIONS	
B	40⁰ Contact Angle
C**	15⁰ Contact Angle
TY	Polyamide Cage
Y	Pressed Brass Cage
M	Machined Brass Cage
W	Pressed Steel Cage
G	Flush Ground Faces
PC	Flush Ground Faces Normal Axial Clearance and ABEC6

**Load and speed ratings are not shown in the table below.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters		
	d		D		B		r**	da (in)	Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max
7300B	10	0.3937	35	1.3780	11	0.4331	0.024	0.591	1.181
7301B*	12	0.4724	37	1.4567	12	0.4724	0.039	0.709	1.221
7302B*	15	0.5906	42	1.6535	13	0.5118	0.039	0.827	1.418
7303B*	17	0.6693	47	1.8504	14	0.5512	0.039	0.906	1.614
7304B*	20	0.7874	52	2.0472	15	0.5906	0.039	1.063	1.772
7305B*	25	0.9843	62	2.4409	17	0.6693	0.039	1.260	2.165
7306B*	30	1.1811	72	2.8346	19	0.7480	0.039	1.457	2.559
7307B*	35	1.3780	80	3.1496	21	0.8268	0.059	1.712	2.815
7308B*	40	1.5748	90	3.5433	23	0.9055	0.059	1.909	3.209
7309B*	45	1.7717	100	3.9370	25	0.9843	0.059	2.106	3.602
7310B*	50	1.9685	110	4.3307	27	1.0630	0.079	2.362	3.937
7311B*	55	2.1654	120	4.7244	29	1.1417	0.079	2.559	4.331
7312B*	60	2.3622	130	5.1181	31	1.2205	0.079	2.835	4.646
7313B*	65	2.5591	140	5.5118	33	1.2992	0.079	3.031	5.039
7314B*	70	2.7559	150	5.9055	35	1.3780	0.079	3.228	5.433
7315B*	75	2.9528	160	6.2992	37	1.4567	0.079	3.425	5.827
7316B*	80	3.1496	170	6.6929	39	1.5354	0.079	3.622	6.220
7317B*	85	3.3465	180	7.0866	41	1.6142	0.098	3.898	6.535
7318B*	90	3.5433	190	7.4803	43	1.6929	0.098	4.094	6.929
7319B*	95	3.7402	200	7.8740	45	1.7717	0.098	4.291	7.323
7320B*	100	3.9370	215	8.4646	47	1.8504	0.098	4.488	7.913
7321B*	105	4.1339	225	8.8583	49	1.9291	0.098	4.685	8.307
7322B*	110	4.3307	240	9.4488	50	1.9685	0.098	4.882	8.898
7324B*	120	4.7244	260	10.2362	55	2.1654	0.098	5.276	9.685
7326B	130	5.1181	280	11.0236	58	2.2835	0.118	5.827	10.315
7328B	140	5.5118	300	11.8110	62	2.4409	0.118	6.220	11.102
7330B	150	5.9055	320	12.5984	65	2.5591	0.118	6.614	11.890
7332B	160	6.2992	340	13.3858	68	2.6772	0.118	7.008	12.677
7334B	170	6.6929	360	14.1732	72	2.8346	0.118	7.402	13.465
7336B	180	7.0866	380	14.9606	75	2.9528	0.118	7.795	14.252
7338B	190	7.4803	400	15.7480	78	3.0709	0.157	8.346	14.882
7340B	200	7.8740	420	16.5354	80	3.1496	0.157	8.740	15.669

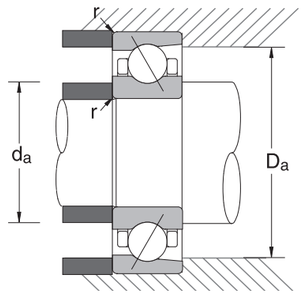
*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear.

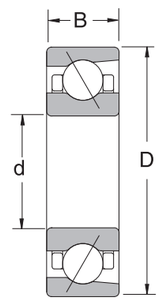
Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
7300B	1960	904	18.0	24.0	0.12
7301B*	2495	940	16.0	22.0	0.14
7302B*	3215	1330	14.0	19.0	0.19
7303B*	3777	1620	13.0	17.0	0.26
7304B*	4451	1950	11.0	15.0	0.33
7305B*	6115	3000	9.0	13.0	0.54
7306B*	8206	3950	8.0	11.0	0.79
7307B*	9105	4980	7.1	9.5	1.05
7308B*	11915	6240	6.3	8.5	1.45
7309B*	14051	8270	5.6	7.5	1.93
7310B*	17535	9920	5.0	6.7	2.53
7311B*	20008	11700	4.5	6.3	3.35
7312B*	22931	13600	4.3	5.6	4.41
7313B*	25628	15500	3.8	5.3	5.44
7314B*	27876	17700	3.6	5.0	6.61
7315B*	29978	20100	3.4	4.8	7.93
7316B*	32575	22500	3.2	4.3	9.37
7317B*	35295	25100	3.0	4.0	11.10
7318B*	37993	27800	2.8	3.8	12.90
7319B*	40466	30600	2.6	3.6	14.90
7320B*	45411	39900	2.4	3.4	18.30
7321B*	47884	39900	2.4	3.2	20.70
7322B*	50807	44300	2.2	3.0	24.50
7324B*	53505	52000	2.0	2.8	31.50
7326B	56200	60400	1.9	2.6	38.30
7328B	62000	69500	1.7	2.4	46.90
7330B	64800	76100	1.6	2.2	55.80
7332B	70600	87100	1.5	2.0	65.70
7334B	79400	100100	1.4	2.0	78.20
7336B	83800	110000	1.3	1.8	90.40
7338B	92600	123200	1.3	1.7	104.00
7340B	97000	135300	1.2	1.6	117.00

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Ball Bearings: 7400 Series

Angular Contact, 40⁰ Contact Angle





COMMON OPTIONS	
B	40⁰ Contact Angle
C**	15⁰ Contact Angle
TY	Polyamide Cage
Y	Pressed Brass Cage
M	Machined Brass Cage
W	Pressed Steel Cage
G	Flush Ground Faces
PC	Flush Ground Faces Normal Axial Clearance and ABEC6

**Load and speed ratings are not shown in the table below.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters		
	d		D		B		r*	da (in)	Da (in)
	mm	inch	mm	inch	mm	inch	inch	min	max
7405B	25	0.9843	80	3.1496	21	0.8268	0.059	1.319	2.815
7406B	30	1.1811	90	3.5433	23	0.9055	0.059	1.516	3.209
7407B	35	1.3780	100	3.9370	25	0.9843	0.059	1.713	3.602
7408B	40	1.5748	110	4.3307	27	1.0630	0.079	1.969	3.937
7409B	45	1.7717	120	4.7244	29	1.1417	0.079	2.165	4.331
7410B	50	1.9685	130	5.1181	31	1.2205	0.079	2.441	4.646
7411B	55	2.1654	140	5.5118	33	1.2992	0.079	2.638	5.039
7412B	60	2.3622	150	5.9055	35	1.3780	0.079	2.835	5.433
7413B	65	2.5591	160	6.2992	37	1.4567	0.079	3.031	5.827
7414B	70	2.7559	180	7.0866	42	1.6535	0.098	3.307	6.535
7415B	75	2.9528	190	7.4803	45	1.7717	0.098	3.504	6.929
7416B	80	3.1496	200	7.8740	48	1.8898	0.098	3.701	7.323
7420B[1]	100	3.9370	250	9.8425	58	2.2835	0.118	4.646	9.134
A7420B[1]	100	3.9370	265	10.4331	60	2.3622	0.118	4.646	9.125

*Maximum fillet which corner radius of bearing will clear.

[1]NSK part number 7420 conforms to ISO and ABMA standards. Part number 7420 of other manufacturers may be equivalent to NSK A7420.

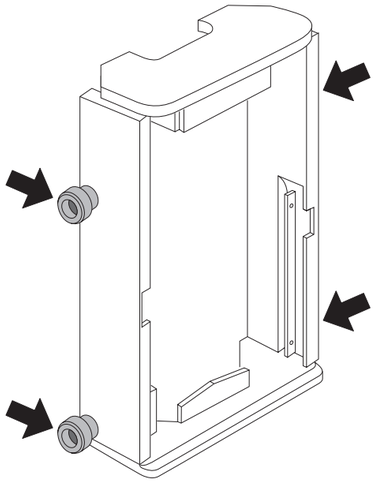
Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
7405B	9700	5310	7.6	10.5	1.4
7406B	10700	6330	6.7	9.2	2.9
7407B	12600	7600	5.9	8.2	3.0
7408B	14600	9000	5.3	7.3	3.1
7409B	16600	10600	4.9	6.7	3.9
7410B	18900	12200	4.5	6.0	4.8
7411B	23200	15400	4.1	5.6	5.8
7412B	24900	17400	3.8	5.2	7.0
7413B	26900	19500	3.5	4.9	8.4
7414B	33300	26500	3.2	4.4	10.4
7415B	37700	31500	3.0	4.1	12.6
7416B	37900	32000	2.8	3.9	16.7
7420B[1]	49800	47800	2.2	3.1	33.0
A7420B[1]	53100	53400	2.1	2.9	40.1

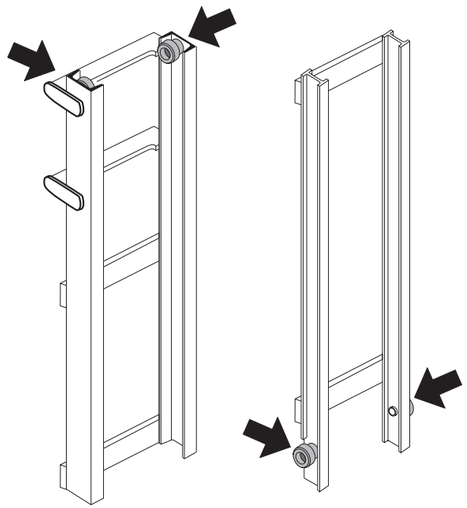
C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

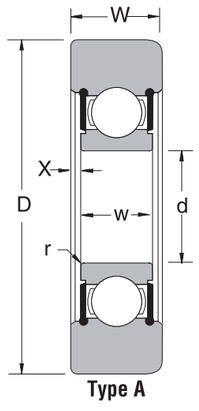
[1]NSK part number 7420 conforms to ISO and ABMA standards. Part number 7420 of other manufacturers may be equivalent to NSK A7420.

Mast Guide Bearings

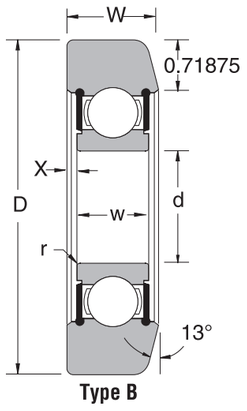
Typical Applications







Type A



Type B

Interchange Table		
NSK	**MRC**	**BCA**
X421RS	305SZZ3	MG305DD
X549RS	307SZZ9	MG307FFK
X376RS	307SZZ10	MG307FFH
X501	309SZZ4	MGA309DD

Dimensions

Bearing Number	Type	Bore (d)		O.D (D) inches	Outer width (W) inches	Fillet Radius (r) inches	Ref. (X) inches
		mm	inches				
X421RS	A	25	0.9843	3.0000	1.000	1.000	0.1628
X549RS	A	35	1.3780	3.7250	1.000	1.000	0.1287
X376RS	A	35	1.3780	3.9930	1.125	1.125	0.1772
X501	B	45	1.7717	5.0025	1.250	1.250	0.1303

Specifications

Bearing Number	Type	Dynamic Capacity (lbs)	Static Capacity (lbs)	Number of Balls	Diameter of Balls inches
X421RS	A	4630	2540	8	13/32
X549RS	A	7500	4320	8	17/32
X376RS	A	7500	4320	8	17/32
X501	B	11900	7170	8	11/16

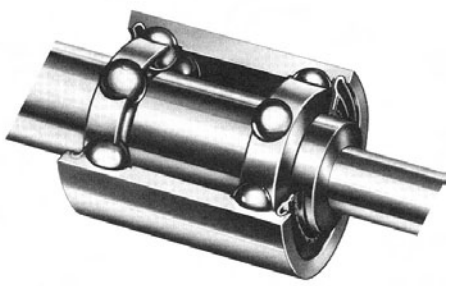
Magnetic Clutch Bearings and Integral Shaft Bearings

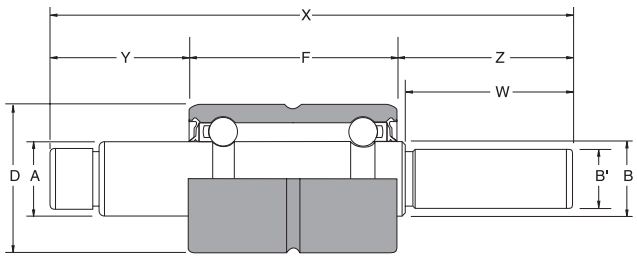
Magnetic Clutch Bearing

Bearing	Bore (mm/in)	O.D. (mm/in)	Width (mm/in)	
			IR	OR
30BD5222	30 / 1.18	52 / 2.05	22 / 0.866	22 / 0.866
30BD40	30 / 1.18	55 / 2.17	23 / 0.905	23 / 0.905
40BD49 T	40 / 1.57	62 / 2.44	20.625 / 0.812	20.625 / 0.812

Integral Shaft Bearing

Bearing Number	Shaft O.D. (inch)			D	F	X	Y	Z	H	W
	Standard		Step							
	A	B	B′							
885807C	0.7465	0.7465	0.6267	1.5000	2.125	6.040	1.800	2.115	—	1.99
885586	0.6267	0.6267	—	1.1811	1.531	6.281	1.747	3.003	—	—
885820	0.7465	0.7465	—	1.5000	2.125	6.625	2.000	2.500	—	—





Notes

Notes

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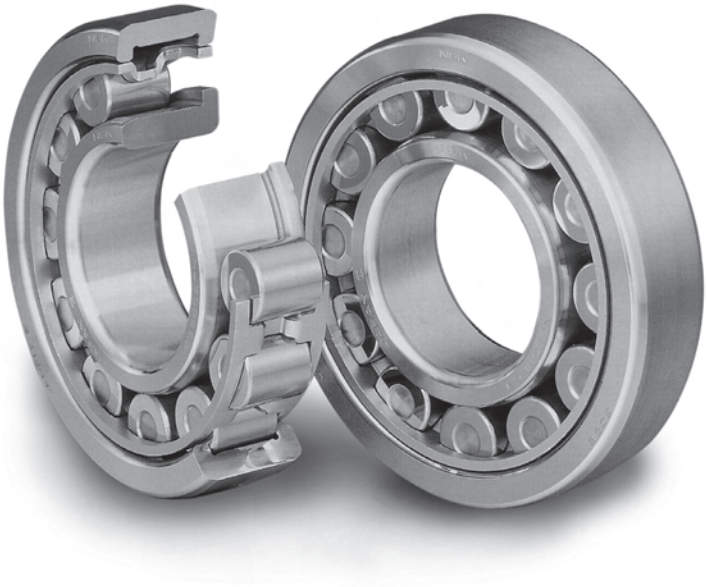
Cylindrical Roller Bearings



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 with Locating Ring
NF: Single Row, One Flange on Outer Ring
NH: Single Row, NJ with Stabilizing Ring
NN: Double Row, No Flanges on Outer Ring
NNU: Double Row, No Flanges on Inner Ring

Bore Size
(04 and up: multiply last two numbers by 5 to get bore in mm)
00: 10 mm
01: 12 mm
02: 15 mm
03: 17 mm
04: 20 mm
05: 25 mm
12: 60 mm
20: 100 mm

Cage Style
T: Glass-Fiber Reinforced Polyamide (only available with type "E" high capacity bearings)
M: Machined Brass
W: Pressed Steel
WS: Pressed Steel for Type "E" High Capacity Bearings

E: Electric Motor Quality

NJ	3	20	E	M	C3	E

Series
2: Light
3: Medium

Other Features
Bank: Standard Design
E: High Capacity Design

Internal Clearance
C2: Tight
Blank: Normal
C3: Greater than Normal
C4: Greater than C3

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

Applications

› Traction Motors (NH and NU) › Electric Motors, medium to large size
› Pumps and Compressors (Centrifugal Pump, Deepwell Pump, Slurry Pump, Screw Compressor) › Plastic Forming Equipment
› Blowers and Fans › Gears and Drives › Coal Pulverizers (NN) › Construction Equipment › Heavy Equipment
› Machine Tool Spindle › Calender Rolls of Paper Making Machines › Transmissions › Printing Presses › Mold Oscillator Tables
› Continuous Casters › Turbines › Crushers › Journal Boxes › Speed Reducers › Table Rollers for Steel Mills
› Oil Field Equipment (Pump Jack)

Cylindrical roller bearings are designed to carry heavy radial loads and are suitable for high speed applications. Their rolling elements are ground to provide maximum contact with the raceway and are precisely crowned to avoid edge loading due to shaft misalignment.

NU style bearings have two machined flanges on the outer ring and no flanges on the inner ring. The rollers and cages are assembled in the outer ring. Because there are no flanges in the inner ring, this bearing cannot carry a thrust load.

N style bearings have two machined flanges on the inner ring and no flanges on the outer ring, with rollers and cage on the inner ring. Like the NU style, the N has no thrust load carrying capability.

NJ style bearings have two machined flanges on the outer ring and a machined flange on one side of the inner ring. The roller and cage assembly is in the outer ring. The integral flange on the inner ring allows this bearing to carry an axial load.

NF style bearings have two machined flanges on the inner ring and one flange on the outer ring, with roller and cage on the inner ring. Like the NJ bearing, these bearings have some thrust load capability.

NH style bearings are similar to the **NJ** style and come with a stabilizing ring often called a thrust collar. Mounted on the non-flange side of the inner ring, the thrust collar allows the bearing to carry an axial load in both directions. The thrust collar extends out of the bearing on one side, so the dimension across the inner ring is slightly greater than that of the outer ring.

NUP style bearings have two machined flanges on the outer ring and a machined flange on one side of the inner ring. A special-design inner ring allows use of a stabilizing ring on the non-flange side. As a result, these bearings can carry axial loads in both directions. The roller and cage assembly is mounted in the outer ring.

Double Row cylindrical roller bearings are denoted by two N's within the part number (e.g., **NN** or **NNU**). The dimensions for these can be found in the Super Precision section of this catalog and can be ordered with standard precision.

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 with Stabalizing Ring	NH	NH	NH
	Stabalizing 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
	Greater than Normal Clearance	C3	C3	C3
	Greater than C3 Clearance	C4	C4	C4

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

Cylindrical Roller Bearings Radial Internal Clearances

Radial Internal Clearances in Cylindrical Roller Bearings with Cylindrical Bores

Units: inch

Nominal Bore Diameter d (mm)		Clearances in Interchangeable Bearings with Cylindrical Bores										Clearances in Matched Bearings with Cylindrical Bores											
		C2		C0		C3		C4		C5		CC1		CC2		CC[1]		CC3		CC4		CC5	
over	incl.	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
0	10	.0000	.0010	.0008	.0018	.0014	.0024	.0020	.0030	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	24	.0000	.0010	.0008	.0018	.0014	.0024	.0020	.0030	.0026	.0035	.0002	.0006	.0004	.0008	.0008	.0012	.0014	.0018	.0018	.0022	.0026	.0030
24	30	.0000	.0010	.0008	.0018	.0014	.0024	.0020	.0030	.0028	.0037	.0002	.0006	.0004	.0010	.0010	.0014	.0016	.0020	.0020	.0024	.0028	.0031
30	40	.0002	.0012	.0010	.0020	.0018	.0028	.0024	.0033	.0031	.0041	.0002	.0006	.0005	.0010	.0010	.0016	.0018	.0022	.0022	.0028	.0031	.0037
40	50	.0002	.0014	.0012	.0024	.0020	.0031	.0028	.0039	.0037	.0049	.0002	.0007	.0006	.0012	.0012	.0018	.0020	.0026	.0026	.0031	.0037	.0043
50	65	.0004	.0016	.0016	.0028	.0024	.0035	.0031	.0043	.0039	.0055	.0002	.0008	.0006	.0014	.0014	.0020	.0022	.0030	.0030	.0035	.0043	.0051
65	80	.0004	.0018	.0016	.0030	.0026	.0039	.0035	.0049	.0051	.0065	.0004	.0010	.0008	.0016	.0016	.0024	.0028	.0035	.0035	.0043	.0051	.0059
80	100	.0006	.0020	.0020	.0033	.0030	.0043	.0041	.0055	.0061	.0075	.0004	.0012	.0010	.0018	.0018	.0028	.0031	.0041	.0041	.0049	.0061	.0071
100	120	.0006	.0022	.0020	.0035	.0033	.0049	.0049	.0065	.0071	.0087	.0004	.0012	.0010	.0020	.0020	.0031	.0037	.0047	.0047	.0057	.0071	.0081
120	140	.0006	.0024	.0024	.0041	.0039	.0057	.0057	.0075	.0079	.0096	.0004	.0014	.0012	.0024	.0024	.0035	.0041	.0053	.0053	.0063	.0079	.0091
140	160	.0008	.0028	.0028	.0047	.0045	.0065	.0065	.0085	.0089	.0108	.0004	.0014	.0014	.0026	.0026	.0039	.0045	.0059	.0059	.0071	.0089	.0102
160	180	.0010	.0030	.0030	.0049	.0047	.0067	.0067	.0087	.0098	.0118	.0004	.0016	.0014	.0030	.0030	.0043	.0049	.0065	.0065	.0079	.0098	.0112
180	200	.0014	.0035	.0035	.0057	.0055	.0077	.0077	.0098	.0108	.0130	.0006	.0018	.0016	.0031	.0031	.0047	.0055	.0071	.0071	.0087	.0108	.0124
200	225	.0018	.0041	.0041	.0065	.0063	.0087	.0087	.0110	.0120	.0144	.0006	.0020	.0018	.0035	.0035	.0053	.0061	.0079	.0079	.0094	.0120	.0138
225	250	.0018	.0043	.0043	.0069	.0067	.0093	.0093	.0118	.0130	.0156	.0006	.0020	.0020	.0039	.0039	.0059	.0067	.0085	.0085	.0104	.0130	.0150
250	280	.0022	.0049	.0049	.0077	.0075	.0102	.0102	.0130	.0146	.0173	.0008	.0022	.0022	.0043	.0043	.0065	.0073	.0094	.0094	.0116	.0146	.0165
280	315	.0022	.0051	.0051	.0081	.0079	.0108	.0108	.0138	.0161	.0191	.0008	.0024	.0024	.0047	.0047	.0071	.0081	.0104	.0104	.0128	.0161	.0185
315	355	.0026	.0057	.0057	.0089	.0089	.0120	.0120	.0152	.0179	.0211	.0008	.0026	.0026	.0053	.0053	.0079	.0089	.0116	.0116	.0142	.0179	.0205
355	400	.0039	.0075	.0075	.0110	.0110	.0146	.0146	.0181	.0201	.0236	.0010	.0030	.0030	.0059	.0059	.0089	.0100	.0130	.0130	.0159	.0201	.0230
400	450	.0043	.0083	.0083	.0122	.0122	.0161	.0161	.0201	.0222	.0262	.0010	.0033	.0033	.0067	.0067	.0100	.0112	.0146	.0146	.0179	.0222	.0256
450	500	.0043	.0087	.0087	.0130	.0130	.0173	.0173	.0217	.0246	.0289	.0010	.0037	.0037	.0075	.0075	.0112	.0124	.0161	.0161	.0199	.0246	.0283

Note: [1] CC is the symbol for normal clearance for matched cylindrical roller bearings and solid-type needle roller bearings.
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.

Radial Internal Clearances in Cylindrical Roller Bearings with Tapered Bores

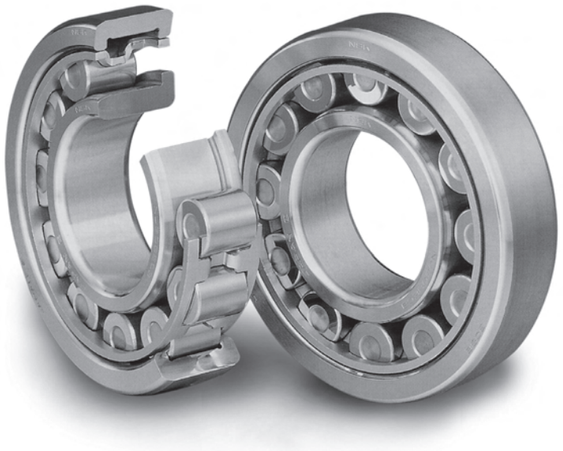
Units: inch

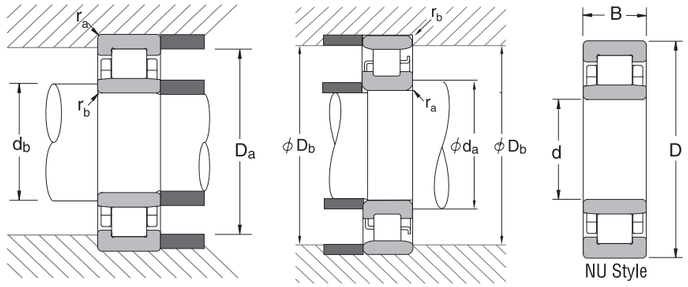
Nominal Bore Diameter d (mm)		Clearances in Matched Bearings with Tapered Bores													
		CC9 [1]		CC1		CC2		CC		CC3		CC4		CC5	
over	incl.	min	max	min	max	min	max	min	max	min	max	min	max	min	max
10	24	.0002	.0004	.0004	.0008	.0008	.0012	.0014	.0018	.0018	.0022	.0022	.0026	.0030	.0033
24	30	.0002	.0004	.0004	.0010	.0010	.0014	.0016	.0020	.0020	.0024	.0024	.0028	.0031	.0037
30	40	.0002	.0005	.0005	.0010	.0010	.0016	.0018	.0022	.0022	.0028	.0028	.0031	.0037	.0043
40	50	.0002	.0006	.0006	.0012	.0012	.0018	.0020	.0026	.0026	.0031	.0031	.0037	.0043	.0049
50	65	.0002	.0006	.0006	.0014	.0014	.0020	.0022	.0030	.0030	.0035	.0035	.0043	.0051	.0059
65	80	.0004	.0008	.0008	.0016	.0016	.0024	.0028	.0035	.0035	.0043	.0043	.0051	.0059	.0067
80	100	.0004	.0010	.0010	.0018	.0018	.0028	.0031	.0041	.0041	.0049	.0049	.0059	.0071	.0081
100	120	.0004	.0010	.0010	.0020	.0020	.0031	.0037	.0047	.0047	.0057	.0057	.0067	.0081	.0091
120	140	.0006	.0012	.0012	.0024	.0024	.0035	.0041	.0053	.0053	.0063	.0063	.0075	.0091	.0102
140	160	.0006	.0014	.0014	.0026	.0026	.0039	.0045	.0059	.0059	.0071	.0071	.0085	.0102	.0116
160	180	.0006	.0014	.0014	.0030	.0030	.0043	.0049	.0065	.0065	.0079	.0079	.0094	.0112	.0126
180	200	.0008	.0016	.0016	.0031	.0031	.0047	.0055	.0071	.0071	.0087	.0087	.0102	.0124	.0140
200	225	.0008	.0018	.0018	.0035	.0035	.0053	.0061	.0079	.0079	.0094	.0094	.0112	.0138	.0156
225	250	.0010	.0020	.0020	.0039	.0039	.0059	.0067	.0085	.0085	.0104	.0104	.0124	.0150	.0169
250	280	.0010	.0022	.0022	.0043	.0043	.0065	.0073	.0094	.0094	.0116	.0116	.0138	.0165	.0187
280	315	.0012	.0024	.0024	.0047	.0047	.0071	.0081	.0104	.0104	.0128	.0128	.0152	.0185	.0209
315	355	.0012	.0026	.0026	.0053	.0053	.0079	.0089	.0116	.0116	.0142	.0142	.0169	.0205	.0230
355	400	.0014	.0030	.0030	.0059	.0059	.0089	.0100	.0130	.0130	.0159	.0159	.0189	.0230	.0260
400	450	.0016	.0033	.0033	.0067	.0067	.0100	.0112	.0146	.0146	.0179	.0179	.0213	.0256	.0289
450	500	.0018	.0037	.0037	.0075	.0075	.0112	.0124	.0161	.0161	.0199	.0199	.0236	.0283	.0321

Note: [1] Clearance CC9 is applicable to cylindrical roller bearings with tapered bores in ISO tolerance Classes 5 and 4.

Cylindrical Roller Bearing: 200 Series

NU, N, NJ, NUP, NF, NH and HJ Stabilizing Ring





COMMON OPTIONS	
M	Machined Brass Cage
W	Pressed Steel Cage
ET	High Capacity Polyamide Cage
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

Bearing Number	Nominal Bearing Dimensions							Preferred Shoulder Diameters (for shoulders that contact flanged rings)			
	d		D		B			r_a* (in)	da (in)	Da (in)	r_b* (in)
Prefix	Series	mm	inch	mm	inch	mm	inch	max	min	max	max
ADD PREFIX NU, N, NJ, NUP, NF OR NH FOR REQUIRED STYLE	205	25	0.9843	52	2.0472	15	0.590	0.039	1.181	1.850	0.024
	206	30	1.1811	62	2.4409	16	0.629	0.039	1.380	2.244	0.024
	207	35	1.3780	72	2.8346	17	0.669	0.039	1.575	2.579	0.024
	208	40	1.5748	80	3.1496	18	0.708	0.039	1.850	2.894	0.039
	209	45	1.7717	85	3.3465	19	0.748	0.039	2.047	3.091	0.039
	210	50	1.9685	90	3.5433	20	0.787	0.039	2.244	3.287	0.039
	211	55	2.1654	100	3.9370	21	0.826	0.059	2.441	3.622	0.039
	212	60	2.3622	110	4.3307	22	0.866	0.059	2.697	4.016	0.059
	213	65	2.5591	120	4.7244	23	0.905	0.059	2.894	4.409	0.059
	214	70	2.7559	125	4.9213	24	0.944	0.059	3.091	4.606	0.059
	215	75	2.9528	130	5.1181	25	0.984	0.059	3.287	4.803	0.059
	216	80	3.1496	140	5.5118	26	1.023	0.079	3.543	5.157	0.079
	217	85	3.3465	150	5.9055	28	1.102	0.079	3.740	5.551	0.079
	218	90	3.5433	160	6.2992	30	1.181	0.079	3.937	5.945	0.079
	219	95	3.7402	170	6.6929	32	1.259	0.079	4.213	6.260	0.079
	220	100	3.9370	180	7.0866	34	1.338	0.079	4.409	6.654	0.079
	221	105	4.1339	190	7.4803	36	1.417	0.079	4.606	7.047	0.079
	222	110	4.3307	200	7.8740	38	1.496	0.079	4.803	7.441	0.079
	224	120	4.7244	215	8.4646	40	1.574	0.079	5.197	8.031	0.079
	226	130	5.1181	230	9.0551	40	1.574	0.099	5.669	8.543	0.098
	228	140	5.5118	250	9.8425	42	1.653	0.099	6.063	9.331	0.098
	230	150	5.9055	270	10.6299	45	1.771	0.099	6.457	10.118	0.098
	232	160	6.2992	290	11.4173	48	1.889	0.099	6.850	10.906	0.098
	234	170	6.6929	310	12.2047	52	2.047	0.118	7.402	11.575	0.118
	236	180	7.0866	320	12.5984	52	2.047	0.118	7.795	11.969	0.118
	238	190	7.4803	340	13.3858	55	2.165	0.118	8.189	12.756	0.118
	240	200	7.8740	360	14.1732	58	2.283	0.118	9.409	13.543	0.118
	244	220	8.6614	400	15.7480	65	2.559	0.118	10.394	15.118	0.118
	248	240	9.4488	440	17.3228	72	2.834	0.118	11.378	16.693	0.118
	252	260	10.2362	480	18.8976	80	3.149	0.157	12.362	18.110	0.157
	256	280	11.0236	500	19.6850	80	3.149	0.157	13.150	18.898	0.157
	260	300	11.8110	540	21.2598	85	3.346	0.157	14.094	20.472	0.157

*Maximum fillet which corner radius of bearing will clear.

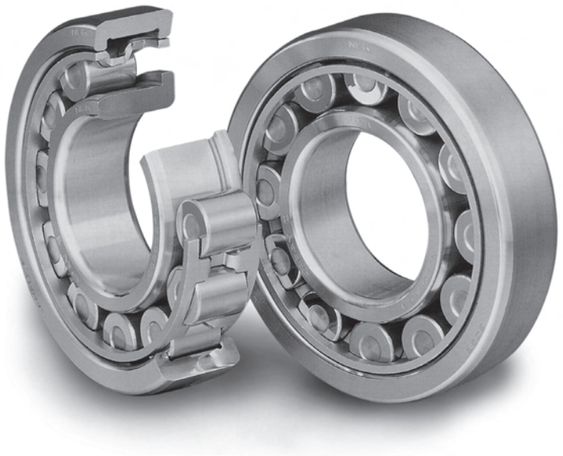
Bearing Number	Preferred Shoulder Diameters (for shoulders that contact unflanged rings)				Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)	Stabilizing Ring
	d_b (in)		D_b (in)							
Prefix	min	max	min	max	C_r	C_{or}	Grease	Oil	lbs	
ADD PREFIX NU, N, NJ, NUP, NF OR NH FOR REQUIRED STYLE	205	1.142	1.181	1.811	1.890	3960	3520	13.0	16.0	0.30	HJ205
	206	1.339	1.457	2.165	2.283	5260	4840	11.0	13.0	0.47	HJ206
	207	1.535	1.654	2.48	2.677	7590	7040	9.5	11.0	0.66	HJ207
	208	1.831	1.890	2.835	2.894	9790	9570	8.5	10.0	0.85	HJ208
	209	2.028	2.087	3.031	3.091	10300	10600	7.5	9.0	0.97	HJ209
	210	2.224	2.283	3.228	3.287	10800	11400	7.1	8.5	1.10	HJ210
	211	2.421	2.520	3.583	3.681	13000	14000	6.3	7.5	1.44	HJ211
	212	2.677	2.795	3.937	4.016	15400	16800	6.0	7.1	1.85	HJ212
	213	2.874	3.031	4.252	4.409	18800	21200	5.3	6.3	2.27	HJ213
	214	3.071	3.228	4.449	4.606	18700	21300	5.0	6.3	2.54	HJ214
	215	3.268	3.386	4.685	4.80	21700	24900	4.8	6.0	2.69	HJ215
	216	3.504	3.622	5.039	5.157	23800	27500	4.5	5.3	3.40	HJ216
	217	3.701	3.898	5.394	5.551	27100	31500	4.3	5.0	4.23	HJ217
	218	3.898	4.094	5.748	5.945	34100	39800	4.0	4.8	5.18	HJ218
	219	4.173	4.370	6.102	6.260	35400	40900	3.8	4.5	6.06	HJ219
	220	4.370	4.606	6.417	6.654	40900	48800	3.6	4.3	7.50	HJ220
	221	4.567	4.843	6.772	7.047	45100	54100	3.4	4.0	8.93	HJ221
	222	4.764	5.079	7.165	7.441	51300	60900	3.2	3.8	10.30	HJ222
	224	5.157	5.512	7.717	8.031	55700	67100	3.0	3.4	12.00	HJ224
	226	5.630	5.984	8.189	8.543	58100	72600	2.6	3.2	14.00	HJ226
	228	6.024	6.496	8.858	9.331	67100	83600	2.4	3.0	18.00	HJ228
	230	6.417	6.969	9.528	10.118	77000	97900	2.2	2.8	25.00	HJ230
	232	6.811	7.480	10.276	10.906	95700	128000	2.2	2.6	32.00	HJ232
	234	7.323	7.992	10.945	11.575	107000	143000	2.0	2.4	40.00	HJ234
	236	7.717	8.386	11.339	11.969	111000	152000	1.9	2.2	42.00	HJ236
	238	8.110	8.898	12.008	12.756	180460	173000	1.8	2.2	49.00	HJ238
	240	8.504	9.409	12.717	13.543	140000	195000	1.7	2.0	58.00	HJ240
	244	9.291	10.394	14.055	15.118	197337	242000	1.5	1.8	82.00	HJ244
	248	10.079	11.378	15.433	16.693	210000	299000	1.3	1.6	111.00	HJ248
	252	11.024	12.362	16.85	18.110	249000	354000	1.2	1.5	147.00	HJ252
	256	11.811	13.150	17.638	18.898	257000	376000	1.1	1.4	155.00	HJ256
	260	12.598	14.094	19.055	20.472	315000	464000	1.1	1.3	196.00	HJ260

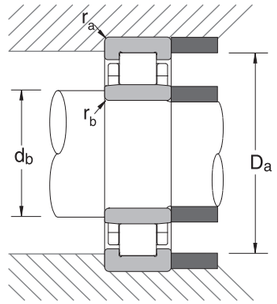
C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

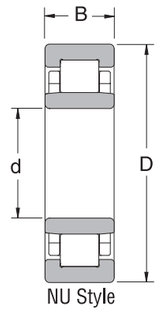
*Maximum fillet which corner radius of bearing will clear.

Cylindrical Roller Bearing: 300 Series

NU, N, NJ, NUP, NF, NH and HJ Stabilizing Ring







COMMON OPTIONS	
M	Machined Brass Cage
W	Pressed Steel Cage
ET	High Capacity Polyamide Cage
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

Bearing Number		Nominal Bearing Dimensions						Preferred Shoulder Diameters (for shoulders that contact flanged rings)			
		d		D		B		r_a* (in)	da (in)	Da (in)	r_b* (in)
Prefix	Series	mm	inch	mm	inch	mm	inch	max	min	max	max
ADD PREFIX NU, N, NJ, NUP, NF OR NH FOR REQUIRED STYLE	305	25	0.9843	62	2.4409	17	0.6693	0.039	1.240	2.185	0.039
	306	30	1.1811	72	2.8346	19	0.748	0.039	1.437	2.579	0.039
	307	35	1.3780	80	3.1496	21	0.8268	0.059	1.693	2.835	0.039
	308	40	1.5748	90	3.5433	23	0.9055	0.059	1.890	0.126	0.059
	309	45	1.7717	100	3.9370	25	0.9843	0.059	2.087	0.142	0.059
	310	50	1.9685	110	4.3307	27	1.063	0.079	2.323	0.155	0.079
	311	55	2.1654	120	4.7244	29	1.1417	0.079	2.520	0.171	0.079
	312	60	2.3622	130	5.1181	31	1.2205	0.079	2.795	0.183	0.079
	313	65	2.5591	140	5.5118	33	1.2992	0.079	2.992	0.198	0.079
	314	70	2.7559	150	5.9055	35	1.378	0.079	3.189	5.433	0.079
	315	75	2.9528	160	6.2992	37	1.4567	0.079	3.386	5.827	0.079
	316	80	3.1496	170	6.6929	39	1.5354	0.079	3.583	6.220	0.079
	317	85	3.3465	180	7.0866	41	1.6142	0.099	3.858	6.535	0.079
	318	90	3.5433	190	7.4803	43	1.6929	0.099	4.055	6.929	0.098
	319	95	3.7402	200	7.8740	45	1.7717	0.099	4.252	7.323	0.098
	320	100	3.9370	215	8.4646	47	1.8504	0.099	4.449	7.913	0.098
	321	105	4.1339	225	8.8583	49	1.9291	0.099	4.646	8.307	0.098
	322	110	4.3307	240	9.4488	50	1.9685	0.099	4.843	8.898	0.098
	324	120	4.7244	260	10.2362	55	2.1654	0.099	5.236	9.685	0.098
	326	130	5.1181	280	11.0236	58	2.2835	0.118	5.748	10.315	0.118
	328	140	5.5118	300	11.8110	62	2.4409	0.118	6.142	11.102	0.118
	330	150	5.9055	320	12.5984	65	2.5591	0.118	6.535	11.890	0.118
	332	160	6.2992	340	13.3858	68	2.6772	0.118	6.929	12.677	0.118
	334	170	6.6929	360	14.1732	72	2.8346	0.118	7.323	13.543	0.118
	336	180	7.0866	380	14.9606	75	2.9528	0.118	7.717	11.969	0.118
	338	190	7.4803	400	15.7480	78	3.0709	0.157	8.268	14.961	0.157
	340	200	7.8740	420	16.5354	80	3.1496	0.157	8.661	15.748	0.157
	344	220	8.6614	460	18.1102	88	3.4646	0.157	9.449	17.323	0.157
	348	240	9.4488	500	19.6850	95	3.7402	0.157	10.236	18.898	0.157
	352	260	10.2362	540	21.2598	102	4.0157	0.197	11.260	20.236	0.197

*Maximum fillet which corner radius of bearing will clear.

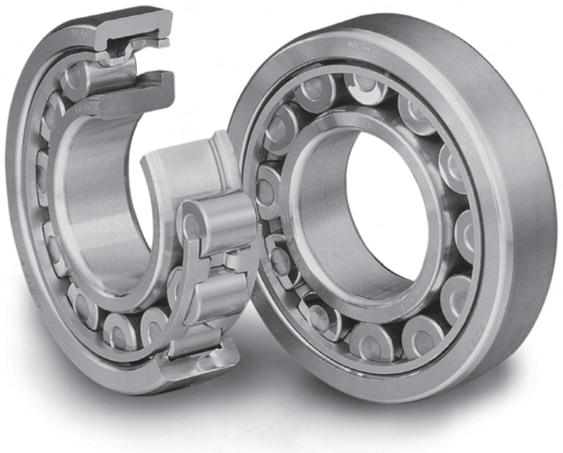
Bearing Number		Preferred Shoulder Diameters (for shoulders that contact unflanged rings)				Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)	Stabilizing Ring
		d_b (in)		D_b (in)							
Prefix	Series	min	max	min	max	C_r	C_{or}	Grease	Oil	lbs	
ADD PREFIX NU, N, NJ, NUP, NF OR NH FOR REQUIRED STYLE	305	1.240	1.299	2.165	2.185	6560	5650	10.0	13.0	0.53	HJ305
	306	1.437	1.575	2.520	2.520	8690	7920	8.5	11.0	0.79	HJ306
	307	1.634	1.732	2.756	2.894	11100	10600	8.0	9.5	0.99	HJ307
	308	1.890	2.008	3.110	3.228	13200	12800	6.7	8.5	1.44	HJ308
	309	2.087	2.205	3.504	3.622	16600	16000	6.3	7.5	1.94	HJ309
	310	2.323	2.480	3.819	3.819	19500	19400	5.6	6.7	2.50	HJ310
	311	2.520	2.677	4.213	4.370	24900	25100	5.0	6.3	3.20	HJ311
	312	2.795	2.953	4.528	4.685	27700	28400	4.8	5.6	4.50	HJ312
	313	2.992	3.189	4.921	5.079	30400	31200	4.3	5.3	4.90	HJ313
	314	3.189	3.425	5.236	5.472	35400	37800	4.0	5.0	6.00	HJ314
	315	3.386	3.661	5.630	5.866	40300	42500	3.8	4.8	7.10	HJ315
	316	3.583	3.937	5.906	6.260	42700	46400	3.6	4.3	8.50	HJ316
	317	3.701	4.134	6.260	6.575	47500	51300	3.4	4.0	10.00	HJ317
	318	4.055	4.409	6.614	6.969	53900	59600	3.2	3.8	12.00	HJ318
	319	4.252	4.646	6.969	7.362	58100	64900	3.0	3.6	14.00	HJ319
	320	4.449	4.961	7.480	7.953	67100	75900	2.8	3.4	17.00	HJ320
	321	4.764	5.157	7.835	8.346	71500	80300	2.6	3.2	19.00	HJ321
	322	4.843	5.472	8.307	8.937	80300	90200	2.6	3.0	22.00	HJ322
	324	5.236	5.906	9.055	9.724	101000	114000	2.2	2.8	29.00	HJ324
	326	5.748	6.417	9.724	10.394	112000	129000	2.2	2.6	35.00	HJ326
	328	6.142	6.929	10.472	11.181	123000	143000	2.0	2.4	42.00	HJ328
	330	6.535	7.402	11.142	11.969	133000	155000	1.8	2.2	58.00	HJ330
	332	6.929	7.992	11.732	12.756	156000	197000	1.7	2.0	68.00	HJ332
	334	7.323	8.465	12.441	13.543	179000	227000	1.6	2.0	82.00	HJ334
	336	7.717	8.937	13.189	14.331	202000	260000	1.5	1.8	95.00	HJ336
	338	8.268	9.449	13.858	14.961	219000	284000	1.4	1.7	109.00	HJ338
	340	8.661	10.000	14.449	15.748	219000	286000	1.3	1.6	124.00	HJ340
	344	9.449	10.945	15.866	17.323	268000	354000	1.2	1.5	165.00	HJ344
	348	10.236	11.850	17.244	18.898	306000	409000	1.1	1.3	207.00	HJ348
	352	11.260	12.992	18.583	20.236	345000	469000	1.0	1.2	257.00	HJ352

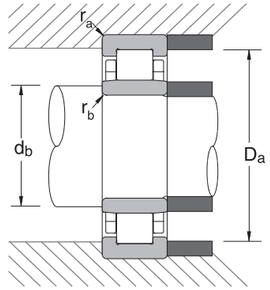
C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

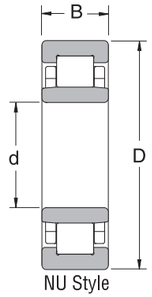
*Maximum fillet which corner radius of bearing will clear.

Cylindrical Roller Bearing: 400 Series

NU, N, NJ, NUP, NF, NH and HJ Stabilizing Ring







NU Style

COMMON OPTIONS	
M	Machined Brass Cage
W	Pressed Steel Cage
ET	High Capacity Polyamide Cage
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

Bearing Number		Nominal Bearing Dimensions						Preferred Shoulder Diameters (for shoulders that contact flanged rings)			
		d		D		B		r_a* (in)	da (in)	Da (in)	r_b* (in)
Prefix	Series	mm	inch	mm	inch	mm	inch	max	min	max	max
ADD PREFIX NU, N, NJ, NUP, NF OR NH FOR REQUIRED STYLE	405	25	0.9843	80	3.1496	21	0.8268	0.059	1.299	2.835	0.059
	406	30	1.1811	90	3.5433	23	0.9055	0.059	1.496	3.228	0.059
	407	35	1.3780	100	3.9370	25	0.9843	0.059	1.693	3.622	0.059
	408	40	1.5748	110	4.3307	27	1.063	0.079	1.929	3.976	0.079
	409	45	1.7717	120	4.7244	29	1.1417	0.079	2.126	4.370	0.079
	410	50	1.9685	130	5.1181	31	1.2205	0.079	2.402	4.685	0.079
	411	55	2.1654	140	5.5118	33	1.2992	0.079	2.598	5.079	0.079
	412	60	2.3622	150	5.9055	35	1.378	0.079	2.795	5.472	0.079
	413	65	2.5591	160	6.2992	37	1.4567	0.039	2.992	5.866	0.079
	414	70	2.7559	180	7.0866	42	1.6535	0.098	3.268	6.575	0.098
	415	75	2.9528	190	7.4803	45	1.7717	0.098	3.465	6.969	0.098
	416	80	3.1496	200	7.8740	48	1.8898	0.098	3.661	7.362	0.098
	417	85	3.3465	210	8.2677	52	2.0472	0.118	3.976	7.638	0.118
	418	90	3.5433	225	8.8583	54	2.126	0.118	4.173	8.228	0.118
	419	95	3.7402	240	9.4488	55	2.1654	0.118	4.370	8.819	0.118
	420	100	3.9370	250	9.8425	58	2.2835	0.118	4.567	9.213	0.118
	421	105	4.1339	260	10.2362	60	2.3622	0.118	--	9.606	0.118
	422	110	4.3307	280	11.0236	65	2.5591	0.118	--	10.394	0.118
	424	120	4.7244	310	12.2047	72	2.8346	0.157	5.512	11.417	0.157
	426	130	5.1181	340	13.3858	78	3.0709	0.157	--	12.598	0.157
	428	140	5.5118	360	14.1732	82	3.2283	0.157	6.299	13.386	0.157
	430	150	5.9055	380	14.9606	85	3.3465	0.157	--	14.173	0.157

*Maximum fillet which corner radius of bearing will clear.

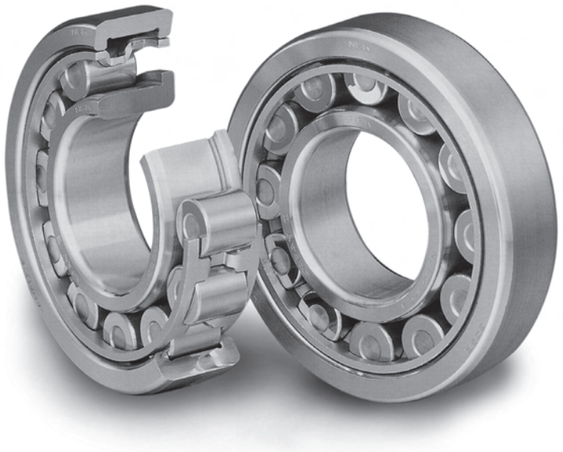
Bearing Number		Preferred Shoulder Diameters (for shoulders that contact unflanged rings)				Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)	Stabilizing Ring
		d_b (in)		D_b (in)							
Prefix	Series	min	max	min	max	C_r	C_{or}	Grease	Oil	lbs	
ADD PREFIX NU, N, NJ, NUP, NF OR NH FOR REQUIRED STYLE	405	1.299	1.457	2.520	2.835	10500	8910	9.0	11.0	1.225	HJ405
	406	1.496	1.693	2.953	3.228	14100	12300	7.5	9.5	1.632	HJ406
	407	1.693	2.008	3.346	3.622	16900	15500	6.7	8.0	2.193	HJ407
	408	1.929	2.205	3.701	3.976	21500	20000	6.0	7.5	2.794	HJ408
	409	2.126	2.441	4.055	4.370	24000	22900	5.6	6.7	3.542	HJ409
	410	2.402	2.677	4.449	4.685	29000	27700	5.0	6.0	4.312	HJ410
	411	2.598	2.953	4.685	5.079	31200	31000	4.5	5.6	5.412	HJ411
	412	2.795	3.150	5.118	5.472	37600	37800	4.3	5.3	6.600	HJ412
	413	2.992	3.386	5.433	5.866	40900	41800	4.0	4.8	7.876	HJ413
	414	3.268	3.819	6.102	6.575	51000	52800	3.6	4.3	12.000	HJ414
	415	3.465	4.016	6.457	6.969	59000	61400	3.4	4.0	14.000	HJ415
	416	3.661	4.213	6.811	7.362	67100	70400	3.2	3.8	16.000	HJ416
	417	3.976	4.331	7.087	7.638	74800	78100	3.0	3.8	21.000	HJ417
	418	4.173	4.724	7.717	8.228	83600	90200	2.8	3.4	25.000	HJ418
	419	4.37	5.118	8.110	8.740	90200	99000	2.6	3.2	30.000	HJ419
	420	4.567	5.315	8.465	9.213	100000	112000	2.6	3.0	34.000	HJ420
	421	4.764	5.551	--	--	111000	124000	2.4	3.0	38.000	HJ421
	422	4.961	5.945	--	--	123000	140000	2.2	2.8	48.000	HJ422
	424	5.512	6.535	10.472	11.417	151000	173000	2.0	2.4	66.000	HJ424
	426	5.906	7.087	--	--	185000	215000	1.8	2.2	87.000	HJ426
	428	6.299	7.598	12.126	13.386	196000	229000	1.7	2.0	102.000	HJ428
	430	6.693	8.189	--	--	209000	253000	1.6	2.0	118.000	HJ430

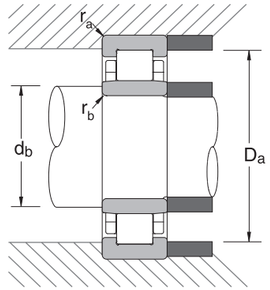
C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

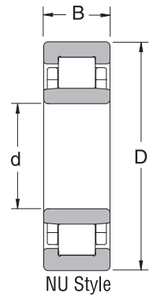
*Maximum fillet which corner radius of bearing will clear.

Cylindrical Roller Bearing: 1000 Series

NU and N







NU Style

COMMON OPTIONS	
M	Machined Brass Cage
W	Pressed Steel Cage
ET	High Capacity Polyamide Cage
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

Bearing Number		Nominal Bearing Dimensions						Preferred Shoulder Diameters (for shoulders that contact flanged rings)			
		d		D		B		r_a* (in)	da (in)	Da (in)	r_b* (in)
Prefix	Series	mm	inch	mm	inch	mm	inch	max	min	max	max
ADD PREFIX NU OR N FOR REQUIRED STYLE	1005	25	0.9843	47	1.8504	12	0.4724	0.024	--	1.693	0.012
	1006	30	1.1811	55	2.1654	13	0.5118	0.039	1.378	1.969	0.020
	1007	35	1.3780	62	2.4409	14	0.5512	0.039	1.575	2.244	0.020
	1008	40	1.5748	68	2.6772	15	0.5906	0.039	1.772	2.480	0.024
	1009	45	1.7717	75	2.9528	16	0.6299	0.039	1.969	2.756	0.024
	1010	50	1.9685	80	3.1496	16	0.6299	0.039	2.165	2.953	0.024
	1011	55	2.1654	90	3.5433	18	0.7087	0.039	2.421	3.287	0.039
	1012	60	2.3622	95	3.7402	18	0.7087	0.039	2.618	3.484	0.039
	1013	65	2.5591	100	3.9370	18	0.7087	0.039	2.815	3.681	0.039
	1014	70	2.7559	110	4.3307	20	0.7874	0.039	3.012	4.075	0.039
	1015	75	2.9528	115	4.5276	20	0.7874	0.039	3.209	4.272	0.039
	1016	80	3.1496	125	4.9213	22	0.8661	0.039	3.406	4.665	0.039
	1017	85	3.3465	130	5.1181	22	0.8661	0.039	3.602	4.862	0.039
	1018	90	3.5433	140	5.5118	24	0.9449	0.059	3.858	5.197	0.039
	1019	95	3.7402	145	5.7087	24	0.9449	0.059	4.055	5.394	0.039
	1020	100	3.9370	150	5.9055	24	0.9449	0.059	4.252	5.591	0.039
	1021	105	4.1339	160	6.2992	26	1.0236	0.079	4.488	5.945	0.039
	1022	110	4.3307	170	6.6929	28	1.1024	0.079	4.685	6.339	0.039
	1024	120	4.7244	180	7.0866	28	1.1024	0.079	5.079	6.732	0.039
	1026	130	5.1181	200	7.8740	33	1.2992	0.079	5.472	7.520	0.039
	1028	140	5.5118	210	8.2677	33	1.2992	0.079	5.866	7.913	0.039
	1030	150	5.9055	225	8.8583	35	1.378	0.079	6.339	8.425	0.059
	1032	160	6.2992	240	9.4488	38	1.4961	0.079	6.732	9.016	0.059
	1034	170	6.6929	260	10.2362	42	1.6535	0.079	7.126	9.803	0.079
	1036	180	7.0866	280	11.0236	46	1.8110	0.079	7.520	10.591	0.079
	1038	190	7.4803	290	11.4173	46	1.8110	0.079	7.913	10.984	0.079
	1040	200	7.8740	310	12.2047	51	2.0079	0.079	8.307	11.772	0.079
	1044	220	8.6614	340	13.3858	56	2.2047	0.098	9.173	12.874	0.098
	1048	240	9.4488	360	14.1732	56	2.2047	0.098	9.961	13.661	0.098
	1052	260	10.2362	400	15.7480	65	2.5591	0.118	10.866	14.449	0.118
	1056	280	11.0236	420	16.5354	65	2.5591	0.118	11.654	15.906	0.118
	1060	300	11.8110	460	18.1102	74	2.9134	0.118	12.441	17.480	0.118

*Maximum fillet which corner radius of bearing will clear.

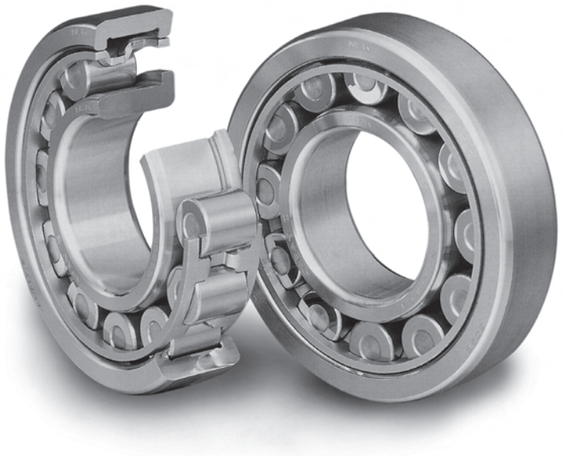
Bearing Number		Preferred Shoulder Diameters (for shoulders that contact unflanged rings)				Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)
		d_b (in)		D_b (in)						
Prefix	Series	min	max	min	max	C_r	C_{or}	Grease	Oil	lbs
ADD PREFIX NU OR N FOR REQUIRED STYLE	1005	1.063	1.181	--	--	3210	2930	15.0	18.0	0.21
	1006	1.339	1.417	1.929	1.929	4400	4400	12.0	15.0	0.30
	1007	1.535	1.614	2.205	2.283	5080	5190	11.0	13.0	0.39
	1008	1.732	1.811	2.441	2.520	6120	6490	10.0	12.0	0.48
	1009	1.929	2.008	2.677	2.795	7260	8030	9.0	11.0	0.61
	1010	2.126	2.205	2.874	2.992	7260	8140	8.0	10.0	0.65
	1011	2.362	2.480	3.228	3.228	8470	9790	7.5	9.0	0.96
	1012	2.559	2.677	3.425	3.543	9020	10900	6.7	8.5	1.03
	1013	2.756	2.874	3.622	3.740	9240	11400	6.3	8.0	1.09
	1014	2.953	3.110	3.976	4.134	13100	15800	6.0	7.1	1.51
	1015	3.150	3.268	4.173	4.331	13400	16700	5.6	6.7	1.59
	1016	3.346	3.543	4.528	4.724	16300	20400	5.3	6.3	2.11
	1017	3.543	3.740	4.724	4.921	16700	21500	5.0	6.0	2.20
	1018	3.799	3.976	5.079	5.256	19800	25700	4.5	5.6	2.93
	1019	3.996	4.173	5.276	5.453	20400	27100	4.3	5.3	3.06
	1020	4.193	4.370	5.472	5.650	20900	28200	4.3	5.3	3.17
	1021	4.390	4.646	5.787	6.043	24400	33400	4.0	4.8	3.98
	1022	4.587	4.843	6.181	6.437	29500	38900	3.8	4.5	4.93
	1024	4.980	5.236	6.575	6.831	31000	42900	3.4	4.3	5.30
	1026	5.374	5.748	7.244	7.618	39600	52800	3.2	3.8	8.01
	1028	5.768	6.142	7.638	8.012	39400	56100	3.0	3.6	8.47
	1030	6.220	6.575	8.189	8.543	45300	65800	2.8	3.4	10.00
	1032	6.614	7.008	8.740	9.134	53200	77000	2.6	3.2	13.00
	1034	7.126	7.480	9.409	9.803	64200	93500	2.4	2.8	17.00
	1036	7.520	7.953	10.157	10.591	79200	114000	2.2	2.6	22.00
	1038	7.913	8.346	10.551	10.984	81400	120000	2.0	2.6	23.00
	1040	8.307	8.898	11.181	11.772	101265	131000	2.0	2.4	31.00
	1044	9.173	9.724	12.323	12.874	129827	168000	1.8	2.2	40.00
	1048	9.961	10.472	13.110	13.661	119000	184000	1.6	2.0	43.00
	1052	10.866	11.496	14.449	15.118	144000	224000	1.5	1.8	64.00
	1056	11.654	12.283	15.236	15.906	147000	235000	1.4	1.7	67.00
	1060	12.441	13.228	16.693	17.480	198000	315000	1.3	1.5	96.00

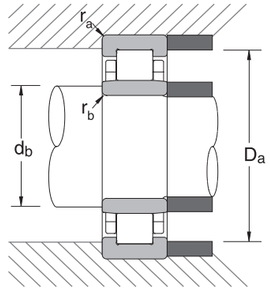
C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

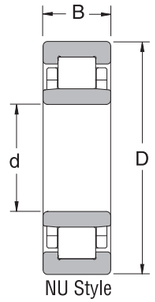
*Maximum fillet which corner radius of bearing will clear

Cylindrical Roller Bearing: 2200 Series

NU, NJ, NUP, NH and HJ Stabilizing Ring







NU Style

COMMON OPTIONS	
M	Machined Brass Cage
W	Pressed Steel Cage
ET	High Capacity Polyamide Cage
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

Bearing Number		Nominal Bearing Dimensions						Preferred Shoulder Diameters (for shoulders that contact flanged rings)			
		d		D		B		r_a* (in)	da (in)	Da (in)	r_b* (in)
Prefix	Series	mm	inch	mm	inch	mm	inch	max	min	max	max
ADD PREFIX NU, NJ, NUP, OR NH FOR REQUIRED STYLE	2205	25	0.9843	52	2.0472	18	0.7087	0.039	1.181	1.850	0.024
	2206	30	1.1811	62	2.4409	20	0.7874	0.039	1.378	2.244	0.024
	2207	35	1.3780	72	2.8346	23	0.9055	0.039	1.634	2.579	0.024
	2208	40	1.5748	80	3.1496	23	0.9055	0.039	1.831	2.894	0.039
	2209	45	1.7717	85	3.3465	23	0.9055	0.039	2.028	3.091	0.039
	2210	50	1.9685	90	3.5433	23	0.9055	0.039	2.224	3.287	0.039
	2211	55	2.1654	100	3.9370	25	0.9843	0.059	2.480	3.622	0.039
	2212	60	2.3622	110	4.3307	28	1.1024	0.059	2.677	0.047	0.059
	2213	65	2.5591	120	4.7244	31	1.2205	0.059	2.874	4.409	0.059
	2214	70	2.7559	125	4.9213	31	1.2205	0.059	3.071	4.606	0.059
	2215	75	2.9528	130	5.1181	31	1.2205	0.059	3.268	4.803	0.059
	2216	80	3.1496	140	5.5118	33	1.2992	0.079	3.504	5.157	0.079
	2217	85	3.3465	150	5.9055	36	1.4173	0.079	3.701	5.551	0.079
	2218	90	3.5433	160	6.2992	40	1.5748	0.079	3.898	5.945	0.079
	2219	95	3.7402	170	6.6929	43	1.6929	0.079	4.173	6.260	0.079
	2220	100	3.9370	180	7.0866	46	1.8110	0.079	4.370	6.654	0.079
	2222	110	4.3307	200	7.8740	53	2.0866	0.079	4.764	7.441	0.079
	2224	120	4.7244	215	8.4646	58	2.2835	0.079	5.157	8.031	0.079
	2226	130	5.1181	230	9.0551	64	2.5197	0.098	5.630	8.543	0.098
	2228	140	5.5118	250	9.8425	68	2.6772	0.098	6.024	9.331	0.098
	2230	150	5.9055	270	10.6299	73	2.8740	0.098	6.417	10.118	0.098
	2232	160	6.2992	290	11.4173	80	3.1496	0.098	6.811	10.906	0.098
	2234	170	6.6929	310	12.2047	86	3.3858	0.118	7.323	11.575	0.118
	2236	180	7.0866	320	12.5984	86	3.3858	0.118	7.717	11.969	0.118
	2238	190	7.4803	340	13.3858	92	3.6220	0.118	8.110	12.756	0.118
	2240	200	7.8740	360	14.1732	98	3.8583	0.118	8.504	13.543	0.118
	2244	220	8.6614	400	15.7480	108	4.2520	0.118	--	15.118	0.118
	2248	240	9.4488	440	17.3228	120	4.7244	0.118	--	16.693	0.118
	2252	260	10.2362	480	18.8976	130	5.1181	0.157	--	18.110	0.157

*Maximum fillet which corner radius of bearing will clear.

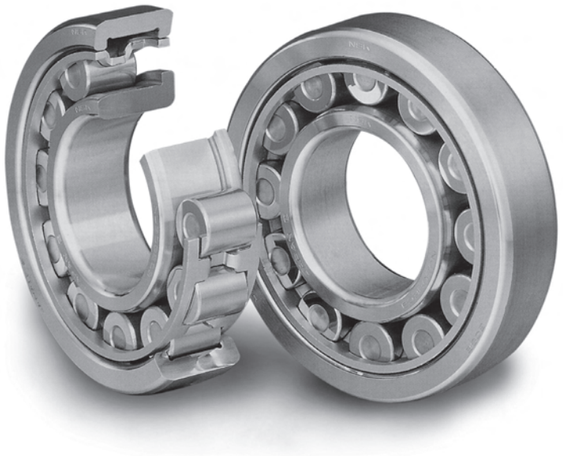
Bearing Number		Preferred Shoulder Diameters (for shoulders that contact unflanged rings)		Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)	Stabilizing Ring
		d_b (in)	D_b (in)						
Prefix	Series	min		C_r	C_{or}	Grease	Oil	lbs	
ADD PREFIX NU, NJ, NUP, OR NH FOR REQUIRED STYLE	2205	1.142	This series is not available with unflanged outer rings, so only D_a is required	5300	5130	12.0	14.0	0.4	HJ2205
	2206	1.339		7370	7480	10.0	12.0	0.6	HJ2206
	2207	1.535		11000	11600	8.5	10.0	0.9	HJ2207
	2208	1.831		13100	13900	7.5	9.0	1.1	HJ2208
	2209	2.028		13800	15200	7.1	8.5	1.2	HJ2209
	2210	2.224		14400	16500	6.3	8.0	1.3	HJ2210
	2211	2.421		16900	19600	6.0	7.1	1.7	HJ2211
	2212	2.677		21600	26000	5.3	6.3	2.4	HJ2212
	2213	2.874		26800	33400	4.8	6.0	3.2	HJ2213
	2214	3.071		26800	33900	4.5	5.6	3.3	HJ2214
	2215	3.268		29000	36300	4.3	5.3	3.4	HJ2215
	2216	3.504		33000	41800	4.0	5.0	4.3	HJ2216
	2217	3.701		38100	48800	3.8	4.5	5.5	HJ2217
	2218	3.898		46400	59400	3.6	4.3	7.0	HJ2218
	2219	4.173		51700	67100	3.4	4.0	8.5	HJ2219
	2220	4.370		55200	71500	3.2	3.8	10.0	HJ2220
	2222	4.764		71500	92400	2.8	3.4	15.0	HJ2222
	2224	5.157		78100	103000	2.6	3.2	18.0	HJ2224
	2226	5.630		119000	165000	2.4	3.0	23.0	HJ2226
	2228	6.024		100000	142000	2.2	2.8	29.0	HJ2228
	2230	6.417		112000	160000	2.0	2.6	37.0	HJ2230
	2232	6.811		142000	211000	1.9	2.4	63.0	HJ2232
	2234	7.323		161000	242000	1.8	2.2	64.0	HJ2234
	2236	7.717		167000	257000	1.7	2.0	67.0	HJ2236
	2238	8.110		186000	288000	1.6	2.0	81.0	HJ2238
	2240	8.504		316778	323000	1.5	1.8	98.0	HJ2240
	2244	9.291		296006	405000	1.3	1.6	136.0	HJ2244
	2248	10.079		321000	519000	1.2	1.5	186.0	HJ2248
	2252	11.024		385000	623000	1.1	1.3	242.0	HJ2252

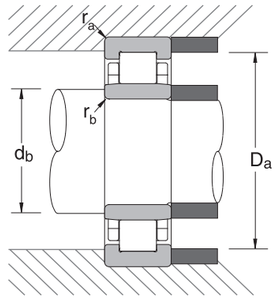
C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

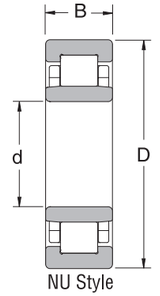
*Maximum fillet which corner radius of bearing will clear.

Cylindrical Roller Bearing: 2300 Series

NU, NJ, NUP, NH and HJ Stabilizing Ring







NU Style

COMMON OPTIONS	
M	Machined Brass Cage
W	Pressed Steel Cage
ET	High Capacity Polyamide Cage
CO*	Normal Internal Clearance
C3	Greater than Normal Internal Clearance
E	Electric Motor Quality

*Not shown in part number

Bearing Number		Nominal Bearing Dimensions						Preferred Shoulder Diameters (for shoulders that contact flanged rings)			
		d		D		B		r_a* (in)	da (in)	Da (in)	r_b* (in)
Prefix	Series	mm	inch	mm	inch	mm	inch	max	min	max	max
ADD PREFIX NU, NJ, NUP, OR NH FOR REQUIRED STYLE	2305	25	0.9843	62	2.4409	24	0.9449	0.039	1.240	2.185	0.039
	2306	30	1.1811	72	2.8346	27	1.0630	0.039	1.437	2.579	0.039
	2307	35	1.3780	80	3.1496	31	1.2205	0.059	1.693	2.835	0.039
	2308	40	1.5748	90	3.5433	33	1.2992	0.059	1.890	3.228	0.059
	2309	45	1.7717	100	3.9370	36	1.4173	0.059	2.087	3.622	0.059
	2310	50	1.9685	110	4.3307	40	1.5748	0.079	2.323	3.976	0.079
	2311	55	2.1654	120	4.7244	43	1.6929	0.079	2.520	4.370	0.079
	2312	60	2.3622	130	5.1181	46	1.8110	0.079	2.795	4.685	0.079
	2313	65	2.5591	140	5.5118	48	1.8898	0.079	2.992	5.079	0.079
	2314	70	2.7559	150	5.9055	51	2.0079	0.079	3.189	5.472	0.079
	2315	75	2.9528	160	6.2992	55	2.1654	0.079	3.386	5.866	0.079
	2316	80	3.1496	170	6.6929	58	2.2835	0.079	3.583	6.260	0.079
	2317	85	3.3465	180	7.0866	60	2.3622	0.098	3.858	6.575	0.098
	2318	90	3.5433	190	7.4803	64	2.5197	0.098	4.055	6.969	0.098
	2320	100	3.9370	215	8.4646	73	2.8740	0.098	4.449	7.953	0.098
	2322	110	4.3307	240	9.4488	80	3.1496	0.098	4.843	8.937	0.098
	2324	120	4.7244	260	10.2362	86	3.3858	0.098	5.236	9.724	0.098
	2326	130	5.1181	280	11.0236	93	3.6614	0.118	5.748	10.394	0.118
	2328	140	5.5118	300	11.8110	102	4.0157	0.118	6.142	11.181	0.118
	2330	150	5.9055	320	12.5984	108	4.2520	0.118	6.535	11.969	0.118
	2332	160	6.2992	340	13.3858	114	4.4882	0.118	6.929	12.756	0.118
	2334	170	6.6929	360	14.1732	120	4.7244	0.118	7.323	13.543	0.118
	2336	180	7.0866	380	14.9606	126	4.9606	0.118	--	11.969	0.118
	2338	190	7.4803	400	15.7480	132	5.1969	0.157	--	14.961	0.157
	2340	200	7.8740	420	16.5354	138	5.4331	0.157	--	15.748	0.157

*Maximum fillet which corner radius of bearing will clear.

Bearing Number		Preferred Shoulder Diameters (for shoulders that contact unflanged rings)		Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)	Stabilizing Ring
		d_b (in)	D_b (in)	C_r	C_{or}	Grease	Oil	lbs	
Prefix	Series	min							
ADD PREFIX NU, NJ, NUP, OR NH FOR REQUIRED STYLE	2305	1.240	This series is not available with unflanged outer rings, so only D_a is required	9570	9240	9.0	11.0	0.8	HJ2305
	2306	1.437		11600	11400	7.5	9.5	1.1	HJ2306
	2307	1.634		13500	13500	7.1	8.5	1.5	HJ2307
	2308	1.890		18500	19700	6.0	7.5	2.1	HJ2308
	2309	2.087		22200	23300	5.6	6.7	2.7	HJ2309
	2310	2.323		27100	29500	5.0	6.3	3.7	HJ2310
	2311	2.520		33200	36300	4.5	5.6	4.7	HJ2311
	2312	2.795		37800	42200	4.3	5.3	5.8	HJ2312
	2313	2.992		42000	47700	3.8	4.8	7.1	HJ2313
	2314	3.189		49900	58700	3.6	4.5	8.8	HJ2314
	2315	3.386		57900	68200	3.4	4.3	11.0	HJ2315
	2316	3.583		61400	74800	3.2	4.0	14.0	HJ2316
	2317	3.858		70400	85800	3.0	3.8	15.0	HJ2317
	2318	4.055		73700	88000	2.8	3.6	18.0	HJ2318
	2320	4.449		92400	113000	2.4	3.2	26.0	HJ2320
	2322	4.843		128000	164000	2.2	2.8	41.0	HJ2322
	2324	5.236		160000	206000	2.0	2.6	52.0	HJ2324
	2326	5.748		188000	253000	1.9	2.4	64.0	HJ2326
	2328	6.142		207000	280000	1.7	2.2	81.0	HJ2328
	2330	6.535		229000	315000	1.6	2.0	98.0	HJ2330
	2332	6.929		240000	341000	1.5	1.9	116.0	HJ2332
	2334	7.323		275000	394000	1.4	1.8	139.0	HJ2334
	2336	7.717		310000	447000	1.3	1.7	160.0	HJ2336
	2338	8.268		341000	497000	1.3	1.6	186.0	HJ2338
	2340	8.661		339000	504000	1.2	1.5	212.0	HJ2340

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

*Maximum fillet which corner radius of bearing will clear.

Notes

Table of Contents

Spherical Roller Bearings

Material Prefix
- **TL:** Tough and Long Life
- **HTF:** High Tough
- **STF:** Super Tough
- **Blank:** Standard Materials

Bore Size
(multiply last two numbers by 5 to get bore in mm)
- **20:** 100 mm
- **32:** 160 mm
- **48:** 240 mm
- **96:** 480 mm

500 millimeters and larger written as:
- **/500:** 500 mm
- **/630:** 630 mm
- **/710:** 710 mm
- **/1000:** 1000 mm

Bore Type
- **Blank:** Cylindrical Bore
- **K:** 1:12 Tapered Bore
- **K30:** 1:30 Tapered Bore

Internal Clearance
- **C2:** Tight
- **Blank:** Normal
- **C3:** Greater than Normal Clearance
- **C4:** Greater than C3 Clearance

TL	230	72	CAM	K	E4	C3	P55S11

Basic Type
- **213xx:** Spherical Roller, Extra Heavy
- **222xx:** Spherical Roller, Medium
- **223xx:** Spherical Roller, Heavy
- **230xx:** Spherical Roller, Very Light
- **231xx:** Spherical Roller, Light
- **232xx:** Spherical Roller, Medium, Wide
- **239xx:** Spherical Roller, Extra Light
- **240xx:** Spherical Roller, Very Light, Wide
- **241xx:** Spherical Roller, Light, Wide

Cage Options
- **CAM:** One Piece Brass, Guide Ring
- **C,CD:** Two Piece Steel, Guide Ring
- **EA:** High Capacity Steel
- **H:** Two Piece Polyamide
- **M:** Two Piece Brass, Integral Guide Flange

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 Relubriction Feature

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
- **VE:** Vibrating Equipment
- **W507:** S11, E4, Special Pkg.
- **W509:** S11, E7, Special Pkg.

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

Interchange

Description		Interchange			
		NSK	SKF	TORR/TIMKEN	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*	222xx	222xx	222xx
	Heavy, Wide	232xx*	232xx	232xx	232xx
	Extra Heavy	213xx*	213xx	213xx	213xx
	Extra Heavy, Wide	223xx*	223xx	223xx	223xx
Part Number Suffix	Brass Cage, One Piece, Guide Ring	CAM, AM	CA, CACM	YM	M, MB, MA
	Brass Cage, Two Piece, Guide Flange	M	MC	BR	--
	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 Face 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	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 with 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
	Greater than Normal Clearance	C3	C3	C3	C3
	Greater than C3 Clearance	C4	C4	C4	C4

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.

* Indicates NSK **HPS** High Performance Standard Bearing

Applications

Provided below are a few common applications for spherical roller bearings. The spherical roller bearing is designed to handle very heavy loads, even under misalignment or shaft deflection conditions. The spherical shape of the outer ring raceway allows the inner ring to tilt slightly relative to the outer ring without significant loss in bearing life. Spherical roller bearings can also handle axial loading in either direction and heavy shock loads.

› Continuous Casters (Support Roll, Guide Roll, Pinch Roll, Table Roll) › Other Metal Mill Equipment
› Shaker Screens and Other Vibratory Equipment › Paper Making Equipment (Calender Rolls, Dryer Rolls, Fourdrinier)
› Mining Equipment (Drag Lines, Gyratory Crushers, Continuous Miners, Jaw Crushers) › Blowers and Fans
› Rubber and Plastic Forming Equipment (Extruders, Granulators) › Pumps and Compressors (Deep Well, Slurry)
› Gears, Drives and Reducers › Construction Equipment › Oil Field Equipment (Pump Jacks, Compounders, Derricks, Hoists)
› Overhead Cranes, Crane Hooks, Hoists › Metal Forming Equipment › Railroad Generators and Alternators

Spherical Roller Bearings Radial Internal Clearances

Radial Internal Clearances in Spherical Roller Bearings with Cylindrical Bores

Units: inch

Nominal Bore Diameter d (mm)		Radial Internal Clearance							
		C2		C0		C3		C4	
over	incl.	low	high	low	high	low	high	low	high
24	30	+.0006	+.0010	+.0010	+.0016	+.0016	+.0022	+.0022	+.0030
30	40	+.0006	+.0012	+.0012	+.0018	+.0018	+.0024	+.0024	+.0031
40	50	+.0008	+.0014	+.0014	+.0022	+.0022	+.0030	+.0030	+.0039
50	65	+.0008	+.0016	+.0016	+.0026	+.0026	+.0035	+.0035	+.0047
65	80	+.0012	+.0020	+.0020	+.0031	+.0031	+.0043	+.0043	+.0057
80	100	+.0014	+.0024	+.0024	+.0039	+.0039	+.0053	+.0053	+.0071
100	120	+.0016	+.0030	+.0030	+.0047	+.0047	+.0063	+.0063	+.0083
120	140	+.0020	+.0037	+.0037	+.0057	+.0057	+.0075	+.0075	+.0094
140	160	+.0024	+.0043	+.0043	+.0067	+.0067	+.0087	+.0087	+.0110
160	180	+.0026	+.0047	+.0047	+.0071	+.0071	+.0094	+.0094	+.0122
180	200	+.0028	+.0051	+.0051	+.0079	+.0079	+.0102	+.0102	+.0134
200	225	+.0031	+.0055	+.0055	+.0087	+.0087	+.0114	+.0114	+.0150
225	250	+.0035	+.0059	+.0059	+.0094	+.0094	+.0126	+.0126	+.0165
250	280	+.0039	+.0067	+.0067	+.0102	+.0102	+.0138	+.0138	+.0181
280	315	+.0043	+.0075	+.0075	+.0110	+.0110	+.0146	+.0146	+.0197
315	355	+.0047	+.0079	+.0079	+.0122	+.0122	+.0161	+.0161	+.0217
355	400	+.0051	+.0087	+.0087	+.0134	+.0134	+.0177	+.0177	+.0236
400	450	+.0055	+.0094	+.0094	+.0146	+.0146	+.0197	+.0197	+.0260
450	500	+.0055	+.0102	+.0102	+.0161	+.0161	+.0217	+.0217	+.0283
500	560	+.0059	+.0110	+.0110	+.0173	+.0173	+.0236	+.0236	+.0307
560	630	+.0067	+.0122	+.0122	+.0189	+.0189	+.0256	+.0256	+.0335
630	710	+.0075	+.0138	+.0138	+.0209	+.0209	+.0276	+.0276	+.0362
710	800	+.0083	+.0154	+.0154	+.0228	+.0228	+.0303	+.0303	+.0398
800	900	+.0091	+.0169	+.0169	+.0256	+.0256	+.0339	+.0339	+.0441
900	1000	+.0102	+.0189	+.0189	+.0280	+.0280	+.0366	+.0366	+.0480

Radial Internal Clearances in Spherical Roller Bearings with Tapered Bores

Units: inch

Nominal Bore Diameter d (mm)		Radial Internal Clearance							
		C2		C0		C3		C4	
over	incl.	low	high	low	high	low	high	low	high
24	30	+.0008	+.0012	+.0012	+.0016	+.0016	+.0022	+.0022	+.0030
30	40	+.0010	+.0014	+.0014	+.0020	+.0020	+.0026	+.0026	+.0033
40	50	+.0012	+.0018	+.0018	+.0024	+.0024	+.0031	+.0031	+.0039
50	65	+.0016	+.0022	+.0022	+.0030	+.0030	+.0037	+.0037	+.0047
65	80	+.0020	+.0028	+.0028	+.0037	+.0037	+.0047	+.0047	+.0059
80	100	+.0022	+.0031	+.0031	+.0043	+.0043	+.0055	+.0055	+.0071
100	120	+.0026	+.0039	+.0039	+.0053	+.0053	+.0067	+.0067	+.0087
120	140	+.0031	+.0047	+.0047	+.0063	+.0063	+.0079	+.0079	+.0102
140	160	+.0035	+.0051	+.0051	+.0071	+.0071	+.0091	+.0091	+.0118
160	180	+.0039	+.0055	+.0055	+.0079	+.0079	+.0102	+.0102	+.0134
180	200	+.0043	+.0063	+.0063	+.0087	+.0087	+.0114	+.0114	+.0146
200	225	+.0047	+.0071	+.0071	+.0098	+.0098	+.0126	+.0126	+.0161
225	250	+.0055	+.0079	+.0079	+.0106	+.0106	+.0138	+.0138	+.0177
250	280	+.0059	+.0087	+.0087	+.0118	+.0118	+.0154	+.0154	+.0193
280	315	+.0067	+.0094	+.0094	+.0130	+.0130	+.0169	+.0169	+.0213
315	355	+.0075	+.0106	+.0106	+.0142	+.0142	+.0185	+.0185	+.0232
355	400	+.0083	+.0118	+.0118	+.0157	+.0157	+.0205	+.0205	+.0256
400	450	+.0091	+.0130	+.0130	+.0173	+.0173	+.0224	+.0224	+.0283
450	500	+.0102	+.0146	+.0146	+.0193	+.0193	+.0248	+.0248	+.0311
500	560	+.0114	+.0161	+.0161	+.0213	+.0213	+.0268	+.0268	+.0343
560	630	+.0126	+.0181	+.0181	+.0236	+.0236	+.0299	+.0299	+.0386
630	710	+.0138	+.0201	+.0201	+.0264	+.0264	+.0335	+.0335	+.0429
710	800	+.0154	+.0224	+.0224	+.0295	+.0295	+.0378	+.0378	+.0480
800	900	+.0173	+.0252	+.0252	+.0331	+.0331	+.0421	+.0421	+.0539
900	1000	+.0193	+.0280	+.0280	+.0366	+.0366	+.0469	+.0469	+.0598

Reduction of Radial Clearance for Spherical Roller Bearings with Tapered Bores

Units: inch

Nominal Bore Diameter (mm)		Radial Internal Clearance (Inch)						Reduction in Radial Clearance		Axial Displacement*			
		CN		C3		C4				Taper 1:12		Taper 1:30	
over	incl	min	max	min	max	min	max	min	max	min	max	min	max
30	40	0.0014	0.0020	0.0020	0.0026	0.0026	0.0033	0.0010	0.0012	0.016	0.018	-	-
40	50	0.0018	0.0024	0.0024	0.0031	0.0031	0.0039	0.0012	0.0014	0.018	0.022	-	-
50	65	0.0022	0.0030	0.0030	0.0037	0.0037	0.0047	0.0012	0.0014	0.018	0.022	-	-
65	80	0.0028	0.0037	0.0037	0.0047	0.0047	0.0059	0.0016	0.0018	0.024	0.028	-	-
80	100	0.0031	0.0043	0.0043	0.0055	0.0055	0.0071	0.0018	0.0022	0.028	0.034	0.069	0.085
100	120	0.0039	0.0053	0.0053	0.0067	0.0067	0.0087	0.0020	0.0024	0.030	0.035	0.075	0.089
120	140	0.0047	0.0063	0.0063	0.0079	0.0079	0.0102	0.0024	0.0028	0.035	0.043	0.089	0.108
140	160	0.0051	0.0071	0.0071	0.0091	0.0091	0.0118	0.0026	0.0031	0.039	0.051	0.098	0.128
160	180	0.0055	0.0079	0.0079	0.0102	0.0102	0.0134	0.0028	0.0035	0.043	0.055	0.108	0.138
180	200	0.0063	0.0087	0.0087	0.0114	0.0114	0.0146	0.0031	0.0039	0.051	0.063	0.128	0.157
200	225	0.0071	0.0098	0.0098	0.0126	0.0126	0.0161	0.0035	0.0043	0.055	0.067	0.138	0.167
225	250	0.0079	0.0106	0.0106	0.0138	0.0138	0.0177	0.0039	0.0047	0.063	0.075	0.157	0.187
250	280	0.0087	0.0118	0.0118	0.0154	0.0154	0.0193	0.0043	0.0055	0.067	0.087	0.167	0.217
280	315	0.0094	0.0130	0.0130	0.0169	0.0169	0.0213	0.0047	0.0059	0.075	0.095	0.187	0.236
315	355	0.0106	0.0142	0.0142	0.0185	0.0185	0.0232	0.0055	0.0067	0.087	0.106	0.217	0.266
355	400	0.0118	0.0157	0.0157	0.0205	0.0205	0.0256	0.0059	0.0075	0.095	0.118	0.236	0.295
400	450	0.0130	0.0173	0.0173	0.0224	0.0224	0.0283	0.0067	0.0083	0.106	0.130	0.266	0.325
450	500	0.0146	0.0193	0.0193	0.0248	0.0248	0.0311	0.0075	0.0094	0.118	0.146	0.295	0.364
500	560	0.0161	0.0213	0.0213	0.0268	0.0268	0.0343	0.0083	0.0106	0.134	0.169	0.335	0.433
560	630	0.0181	0.0236	0.0236	0.0299	0.0299	0.0386	0.0091	0.0118	0.146	0.189	0.364	0.472
630	710	0.0201	0.0264	0.0264	0.0335	0.0335	0.0429	0.0102	0.0130	0.165	0.209	0.413	0.512
710	800	0.0224	0.0295	0.0295	0.0378	0.0378	0.0480	0.0110	0.0146	0.177	0.232	0.453	0.591
800	900	0.0252	0.0331	0.0331	0.0421	0.0421	0.0539	0.0122	0.0161	0.197	0.260	0.492	0.650
900	1000	0.0280	0.0366	0.0366	0.0469	0.0469	0.0598	0.0134	0.0181	0.217	0.291	0.551	0.728

*Axial displacement values apply only to solid steel shafts or hollow steel shafts where the bore is equal to or less than one-half of the outside diameter. If the material is other than steel, or if thin walled shafting is used, please consult NSK.

1:12 Taper applies to Series 222, 223, 230, 231, 232, 233 and 239.
1:30 Taper applies to Series 240, 241 and 242.
For Pe less than 0.13Cr, use the lower half of the reduction range. For heavier loads or Pe greater than 0.13Cr, carburized or TL inner rings should be specified and the upper half of the reduction range can be used.

Mounting a Bearing Using Radial Clearance Reduction

Example: The bearing to be mounted is a 22340CAMKE4C3 [200mm bore (40 x 5) with C3 clearance].

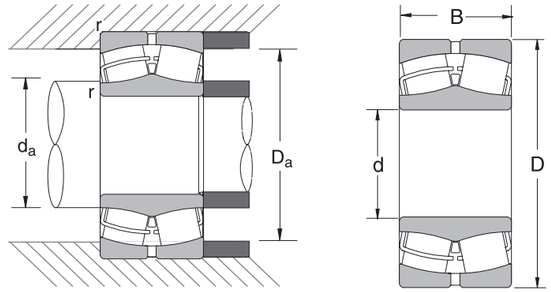
1. Using feeler gauges, the clearance in the bearing measures .0090".
2. From the "Reduction in Radial Clearance" column in the chart, the reduction in clearance is .0031" to .0039". Subtract these numbers from the measured clearance.

Measured Clearance	.0090"	.0090"
Reduction	.0031"	.0039"
Mounted Clearance	.0059"	.0051"

3. Bearing is installed by one of the recommended methods until the clearance in the bearing is within the mounted clearance range. For best results, mount bearing at the middle of the range.

Spherical Roller Bearings: 21300 Series

Bore Diameter 20 – 110 mm, 0.7874 – 4.3307 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
21304CDE4	20	0.7874	52	2.0472	15	0.5906	0.0394	1.0630	1.1024	1.7717	1.6535
21305CDE4	25	0.9843	62	2.4409	17	0.6693	0.0394	1.2598	1.3386	2.1654	2.0079
21306CDE4	30	1.1811	72	2.8346	19	0.7480	0.0394	1.4567	1.5748	2.5591	2.3228
21307CDE4	35	1.3780	80	3.1496	21	0.8268	0.0591	1.7323	1.8504	2.7953	2.6378
21308EAE4*	40	1.5748	90	3.5433	23	0.9055	0.0591	1.9291	2.2441	3.1890	2.9528
21309EAE4*	45	1.7717	100	3.9370	25	0.9843	0.0591	2.1260	2.6378	3.5827	3.5039
21310EAE4*	50	1.9685	110	4.3307	27	1.0630	0.0787	2.3622	2.8346	3.9370	3.8583
21311EAE4*	55	1.9685	120	4.7244	29	1.1417	0.0787	2.5591	2.8346	4.3307	3.8583
21312EAE4*	60	2.3622	130	5.1181	31	1.2205	0.0787	2.8346	3.4252	4.6457	4.6063
21313EAE4*	65	2.5591	140	5.5118	33	1.2992	0.0787	3.0315	3.7008	5.0394	4.9606
21314EAE4*	70	2.7559	150	5.9055	35	1.3780	0.0787	3.2283	3.9764	5.4331	5.3150
21315EAE4*	75	2.9528	160	6.2992	37	1.4567	0.0787	3.4252	3.9764	5.8268	5.2756
21316EAE4*	80	3.1496	170	6.6929	39	1.5354	0.0787	3.6220	4.2913	6.2205	5.7480
21317EAE4*	85	3.3465	180	7.0866	41	1.6142	0.0984	3.8976	4.2520	6.5354	5.5905
21318EAE4*	90	3.5433	190	7.4803	43	1.6929	0.0984	4.0945	4.5276	6.9291	5.9842
21319CE4*	95	3.7402	200	7.8740	45	1.7717	0.0984	4.2913	5.0000	7.3228	6.7716
21320CE4*	100	3.9370	215	8.4646	47	1.8504	0.0984	4.4882	5.2362	8.2677	7.2441
21322CAME4*	110	4.3307	240	9.4488	50	1.9685	0.0984	4.8819	5.4803	8.8976	8.1102

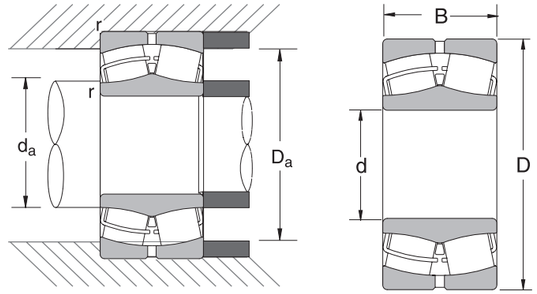
*Indicates NSK (HPS) High Performance Standard bearing.
**Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
21304CDE4	6600	6050	6300	8200	0.37
21305CDE4	9650	9150	5300	6700	0.57
21306CDE4	12300	12200	4500	6000	0.86
21307CDE4	16000	17100	4000	5300	1.17
21308EAE4*	26500	25000	6000	7500	1.61
21309EAE4*	33500	32500	5000	6300	2.12
21310EAE4*	40000	39000	4500	5600	2.67
21311EAE4*	40000	39000	4500	5600	3.48
21312EAE4*	53500	55000	3800	4800	4.37
21313EAE4*	59500	61500	3600	4500	5.40
21314EAE4*	70000	73500	3200	4000	6.61
21315EAE4*	70000	73500	3200	4000	8.02
21316EAE4*	80000	84000	3000	3800	9.52
21317EAE4*	81000	88500	3000	4000	11.46
21318EAE4*	93000	101000	2800	3600	13.45
21319CE4*	96668	98000	1500	2000	15.25
21320CE4*	111280	109000	1400	1900	18.65
21322CAME4*	127017	123000	1300	1700	24.69

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 22200 Series

Bore Diameter 30 – 90 mm, 1.1811 – 3.5433 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
22206CE4	30	1.1811	62	2.4409	20	0.7874	0.039	1.42	1.45	2.11	2.20
22207CE4	35	1.3780	72	2.8346	23	0.9055	0.039	1.65	1.69	2.46	2.56
22208EAE4*	40	1.5748	80	3.1496	23	0.9055	0.039	1.85	1.95	2.71	2.87
22209EAE4*	45	1.7717	85	3.3465	23	0.9055	0.039	2.05	2.15	2.92	3.07
22210EAE4*	50	1.9685	90	3.5433	23	0.9055	0.039	2.24	2.37	3.14	3.27
22210CAME4	50	1.9685	90	3.5433	23	0.9055	0.039	2.24	2.33	3.12	3.27
22211EAE4*	55	2.1654	100	3.9370	25	0.9843	0.059	2.52	2.59	3.47	3.58
22211CAME4	55	2.1654	100	3.9370	25	0.9843	0.059	2.52	2.60	3.47	3.58
22212EAE4*	60	2.3622	110	4.3307	28	1.1024	0.059	2.72	2.87	3.83	3.98
22212CAME4	60	2.3622	110	4.3307	28	1.1024	0.059	2.72	2.86	3.81	3.98
22213EAE4*	65	2.5590	120	4.7244	31	1.2204	0.059	2.91	3.15	4.21	4.37
22213CAME4	65	2.5591	120	4.7244	31	1.2205	0.059	2.91	3.12	4.14	4.37
22214EAE4*	70	2.7559	125	4.9213	31	1.2205	0.059	3.11	3.30	4.35	4.57
22214CAME4	70	2.7559	125	4.9213	31	1.2205	0.059	3.11	3.28	4.35	4.57
22215EAE4*	75	2.9528	130	5.1181	31	1.2205	0.059	3.31	3.46	4.57	4.76
22215CAME4	75	2.9528	130	5.1181	31	1.2205	0.059	3.31	3.52	4.55	4.76
22216EAE4*	80	3.1496	140	5.5118	33	1.2992	0.078	3.54	3.73	4.91	5.12
22216CAME4	80	3.1496	140	5.5118	33	1.2992	0.078	3.54	3.72	4.86	5.12
22217EAE4*	85	3.3465	150	5.9055	36	1.4173	0.078	3.74	3.99	5.27	5.51
22217CAME4	85	3.3465	150	5.9055	36	1.41730	0.078	3.74	3.98	5.24	5.51
22218EAE4*	90	3.5433	160	6.2992	40	1.57480	0.078	3.94	4.25	5.57	5.91
22218CAME4	90	3.5433	160	6.2992	40	1.57480	0.078	3.94	4.24	5.56	5.91

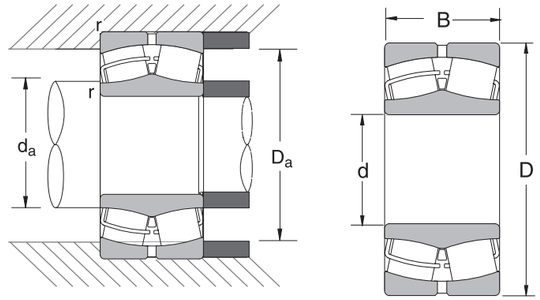
*Indicates NSK (HPS) High Performance Standard bearing.
**Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
22206CE4	11300	11200	6000	7500	0.59
22207CE4	15500	15900	5300	6700	0.93
22208EAE4*	27800	22300	5600	7100	1.16
22209EAE4*	26500	25000	6000	7500	1.25
22210EAE4*	27800	26700	5600	7100	1.34
22210CAME4	18500	20900	4000	5000	1.28
22211EAE4*	33500	32500	5300	6700	1.78
22211CAME4	23400	27600	3600	4500	1.79
22212EAE4*	40000	39000	4800	6000	2.42
22212CAME4	28500	34500	3200	4000	2.48
22213EAE4*	49500	52000	4300	5300	3.32
22213CAME4	34000	42500	3000	3800	3.34
22214EAE4*	50500	52000	4000	5300	3.48
22214CAME4	36500	46000	2800	3600	3.49
22215EAE4*	53500	55000	4000	5000	3.61
22215CAME4	36500	47500	2800	3400	3.73
22216EAE4*	59500	61500	3600	4500	4.42
22216CAME4	41000	52000	2600	3200	4.47
22217EAE4*	70000	73500	3400	4300	5.59
22217CAME4	48500	62000	2400	3000	5.62
22218EAE4*	81000	88500	3200	4000	7.26
22218CAME4	57500	76500	2200	2800	7.33

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 22200 Series (cont.)

Bore Diameter 95 – 320 mm, 3.7402 – 12.5984 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P5S	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
22219EAE4*	95	3.7402	170	6.6929	43	1.6929	0.078	4.21	4.52	5.95	6.22
22219CAME4	95	3.7402	170	6.6929	43	1.6929	0.078	4.21	4.47	5.90	6.22
22220EAE4*	100	3.9370	180	7.0866	46	1.8110	0.078	4.41	4.71	6.25	6.61
22220CAME4	100	3.9370	180	7.0866	46	1.8110	0.078	4.41	4.75	6.24	6.61
22222EAE4	110	4.3307	200	7.8740	53	2.0866	0.078	4.80	5.11	6.95	7.40
22222CAME4	110	4.3307	200	7.8740	53	2.0866	0.078	4.80	5.26	6.91	7.40
22224EAE4*	120	4.7244	215	8.4646	58	2.2835	0.078	5.20	5.60	7.46	7.99
22224CAME4	120	4.7244	215	8.4646	58	2.2835	0.078	5.20	5.65	7.42	7.99
22226EAE4*	130	5.1181	230	9.0551	64	2.5197	0.098	5.67	6.02	8.00	8.50
22226CAME4	130	5.1181	230	9.0551	64	2.5197	0.098	5.67	6.14	7.99	8.50
22228CDE4	140	5.5118	250	9.8425	68	2.6772	0.098	6.06	6.59	8.61	9.29
22228CAME4*	140	5.5118	250	9.8425	68	2.6772	0.098	6.06	6.55	8.69	9.29
22230CDE4	150	5.9055	270	10.6299	73	2.8740	0.098	6.46	7.07	9.28	10.08
22230CAME4*	150	5.9055	270	10.6299	73	2.8740	0.098	6.46	7.08	9.28	10.08
22232CDE4	160	6.2992	290	11.4173	80	3.1496	0.098	6.85	7.51	10.02	10.87
22232CAME4*	160	6.2992	290	11.4173	80	3.1496	0.098	6.85	7.53	10.02	10.87
22234CDE4	170	6.6929	310	12.2047	86	3.3858	0.118	7.40	8.12	10.62	11.50
22234CAME4*	170	6.6929	310	12.2047	86	3.3858	0.118	7.40	8.14	10.62	11.50
22236CDE4	180	7.0866	320	12.5984	86	3.3858	0.118	7.80	8.37	10.95	11.89
22236CAME4*	180	7.0866	320	12.5984	86	3.3858	0.118	7.80	8.39	10.95	11.89
22238CAME4*	190	7.4803	340	13.3858	92	3.6220	0.118	8.19	8.91	11.63	12.68
22240CAME4*	200	7.8740	360	14.1732	98	3.8583	0.118	8.58	9.47	12.37	13.46
22244CAME4*	220	8.6614	400	15.7480	108	4.2520	0.118	9.37	10.41	13.69	15.04
22248CAME4	240	9.4488	440	17.3228	120	4.7244	0.118	10.16	11.39	15.07	16.61
22252CAME4	260	10.2362	480	18.8976	130	5.1181	0.157	11.10	12.39	16.45	18.03
22256CAME4	280	11.0236	500	19.6850	130	5.1181	0.157	11.89	13.21	17.26	18.82
22260CAME4	300	11.8110	540	21.2598	140	5.5118	0.157	12.68	14.28	18.63	20.39
22264CAME4	320	12.5984	580	22.8346	150	5.9055	0.157	13.46	15.25	19.99	21.97

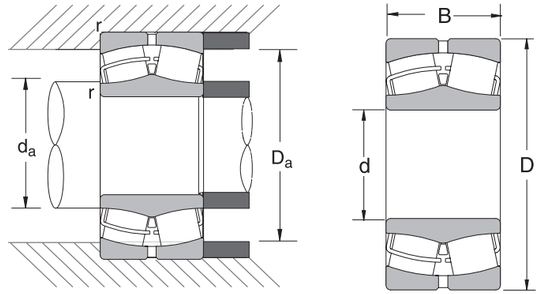
*Indicates NSK (HPS) High Performance Standard bearing.
**Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
22219EAE4*	93000	101000	3000	3800	8.89
22219CAME4	66500	88500	2000	2600	8.80
22220EAE4*	102000	110000	2800	3600	10.65
22220CAME4	74000	99000	2000	2400	10.80
22222EAE4	136000	145000	2800	3600	15.38
22222CAME4	95500	132000	1800	2200	15.54
22224EAE4*	154000	172000	2400	3000	19.36
22224CAME4	110000	155000	1600	2000	19.42
22226EAE4*	184000	211000	2200	2600	24.20
22226CAME4	127000	183000	1500	1900	24.04
22228CDE4	187715	209000	1400	1700	31.58
22228CAME4*	187715	213000	1400	1700	30.47
22230CDE4	214692	252000	1300	1600	40.22
22230CAME4*	214692	252000	1300	1600	39.68
22232CDE4	256282	297000	1200	1500	50.56
22232CAME4*	256282	297000	1200	1500	49.20
22234CDE4	278763	335000	1100	1400	62.89
22234CAME4*	278763	335000	1100	1400	61.35
22236CDE4	287755	345000	1100	1300	65.86
22236CAME4*	287755	345000	1100	1300	63.97
22238CAME4*	319229	390000	1000	1200	77.49
22240CAME4*	364190	450000	950	1200	93.10
22244CAME4*	440625	545000	850	1000	128.88
22248CAME4	485554	650000	750	950	175.32
22252CAME4	566046	760000	670	850	226.56
22256CAME4	515000	820000	630	800	238.79
22260CAME4	677698	950000	600	750	303.92
22264CAME4	675000	1100000	530	670	379.55

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 22300 Series

Bore Diameter 40 - 95 mm, 1.5748 - 3.7402 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P5S	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
22308EAE4*	40	1.5748	90	3.5433	33	1.2992	0.059	1.93	1.95	2.96	3.19
22308CAME4	40	1.5748	90	3.5433	33	1.2992	0.059	1.93	1.96	2.96	3.19
22309EAE4*	45	1.7717	100	3.9370	36	1.4173	0.059	2.13	2.28	3.33	3.58
22309CAME4	45	1.7717	100	3.9370	36	1.4173	0.059	2.13	2.30	3.33	3.58
22310EAE4*	50	1.9685	110	4.3307	40	1.5748	0.078	2.36	2.55	3.62	3.94
22310CAME4	50	1.9685	110	4.3307	40	1.5748	0.078	2.36	2.46	3.63	3.94
22311EAE4*	55	2.1654	120	4.7244	43	1.6929	0.078	2.56	2.88	3.99	4.33
22311CAME4	55	2.1654	120	4.7244	43	1.6929	0.078	2.56	2.74	3.97	4.33
22312EAE4*	60	2.3622	130	5.1181	46	1.8110	0.078	2.83	3.11	4.32	4.65
22312CAME4	60	2.3622	130	5.1181	46	1.8110	0.078	2.83	2.97	4.30	4.65
22313EAE4*	65	2.5591	140	5.5118	48	1.8898	0.078	3.03	3.33	4.64	5.04
22313CAME4	65	2.5591	140	5.5118	48	1.8898	0.078	3.03	3.24	4.61	5.04
22314EAE4*	70	2.7559	150	5.9055	51	2.0079	0.078	3.23	3.59	5.01	5.43
22314CAME4	70	2.7559	150	5.9055	51	2.0079	0.078	3.23	3.48	4.96	5.43
22315EAE4*	75	2.9528	160	6.2992	55	2.1654	0.078	3.43	3.83	5.33	5.83
22315CAME4	75	2.9528	160	6.2992	55	2.1654	0.078	3.43	3.71	5.29	5.83
22316EAE4*	80	3.1496	170	6.6929	58	2.2835	0.078	3.62	4.07	5.66	6.22
22316CAME4	80	3.1496	170	6.6929	58	2.2835	0.078	3.62	3.94	5.64	6.22
22317EAE4*	85	3.3465	180	7.0866	60	2.3622	0.098	3.90	4.34	6.06	6.54
22317CAME4	85	3.3465	180	7.0866	60	2.3622	0.098	3.90	4.22	6.03	6.54
22318EAE4*	90	3.5433	190	7.4803	64	2.5197	0.098	4.09	4.56	6.38	6.93
22318CAME4	90	3.5433	190	7.4803	64	2.5197	0.098	4.09	4.34	6.27	6.93
22319EAE4*	95	3.7402	200	7.8740	67	2.6378	0.098	4.29	4.78	6.72	7.32
22319CAME4	95	3.7402	200	7.8740	67	2.6378	0.098	4.29	4.70	6.66	7.32

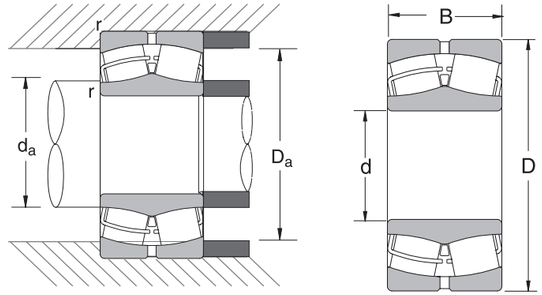
*Indicates NSK (HPS) High Performance Standard bearing.
**Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
22308EAE4*	38000	34500	5300	6700	2.24
22308CAME4	27400	29100	4300	5300	2.17
22309EAE4*	46500	44000	4500	5600	3.05
22309CAME4	33000	37500	3800	4800	2.97
22310EAE4*	55500	52500	4300	5300	3.92
22310CAME4	41500	47500	3600	4300	3.87
22311EAE4*	65500	65500	3800	4800	5.06
22311CAME4	47000	54500	3200	4000	4.93
22312EAE4*	76000	77000	3600	4500	6.36
22312CAME4	55500	65000	3000	3600	6.28
22313EAE4*	84000	85500	3200	4000	7.74
22313CAME4	59500	71500	2800	3400	7.58
22314EAE4*	95500	97500	3000	3800	9.42
22314CAME4	69000	83500	2600	3200	9.24
22315EAE4*	109000	113000	2800	3600	11.57
22315CAME4	76500	93000	2400	3000	11.31
22316EAE4*	122000	128000	2600	3400	13.71
22316CAME4	87500	107000	2200	2800	13.46
22317EAE4*	134000	141000	2400	3200	15.91
22317CAME4	93500	114000	2000	2600	15.55
22318EAE4*	150000	158000	2400	3000	18.83
22318CAME4	109000	134000	2000	2400	18.50
22319EAE4*	165000	175000	2200	2800	21.80
22319CAME4	118000	151000	1900	2400	21.82

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 22300 Series (cont.)

Bore Diameter 100 - 320 mm, 3.9370 – 12.5984 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
22320EAE4*	100	3.9370	215	8.4646	73	2.8740	0.098	4.49	5.12	7.20	7.91
22320CAME4	100	3.9370	215	8.4646	73	2.8740	0.098	4.49	5.11	7.19	7.91
22322EAE4*	110	4.3307	240	9.4488	80	3.1496	0.098	4.88	5.74	8.04	8.90
22322CAME4	110	4.3307	240	9.4488	80	3.1496	0.098	4.88	5.65	7.96	8.90
22324EAE4*	120	4.7244	260	10.2362	86	3.3858	0.098	5.28	6.20	8.70	9.69
22324CAME4	120	4.7244	260	10.2362	86	3.3858	0.098	5.28	6.09	8.61	9.69
22326CE4*	130	5.1181	280	11.0236	93	3.6614	0.118	5.83	6.54	9.28	10.31
22326CAME4*	130	5.1181	280	11.0236	93	3.6614	0.118	5.83	6.57	9.28	10.31
22328CE4*	140	5.5118	300	11.8110	102	4.0157	0.118	6.22	7.00	9.94	11.10
22328CAME4*	140	5.5118	300	11.8110	102	4.0157	0.118	6.22	7.03	9.94	11.10
22330CAME4*	150	5.9055	320	12.5984	108	4.2520	0.118	6.61	7.56	10.61	11.89
22332CAME4*	160	6.2992	340	13.3858	114	4.4882	0.118	7.01	8.05	11.28	12.68
22334CAME4*	170	6.6929	360	14.1732	120	4.7244	0.118	7.40	8.20	11.95	13.46
22336CAME4*	180	7.0866	380	14.9606	126	4.9606	0.118	7.80	8.69	12.66	14.25
22338CAME4*	190	7.4803	400	15.7480	132	5.1969	0.157	8.35	9.17	13.30	14.88
22340CAME4	200	7.8740	420	16.5354	138	5.4331	0.157	8.74	10.12	13.85	15.67
22344CAME4	220	8.6614	460	18.1102	145	5.7087	0.157	9.53	10.90	15.38	17.24
22348CAME4	240	9.4488	500	19.6850	155	6.1024	0.157	10.31	11.91	16.63	18.82
22352CAME4	260	10.2362	540	21.2598	165	6.4961	0.196	11.34	12.89	18.17	20.16
22356CAME4	280	11.0236	580	22.8346	175	6.8898	0.196	12.13	13.88	19.53	21.73
22360CAME4	300	11.8110	620	24.4094	185	7.2835	0.236	13.23	14.85	20.97	22.99
22364CAME4	320	12.5984	670	26.3780	200	7.8740	0.236	14.02	16.01	22.59	24.96

*Indicates NSK (HPS) High Performance Standard bearing.

**Maximum fillet which corner radius of bearing will clear.

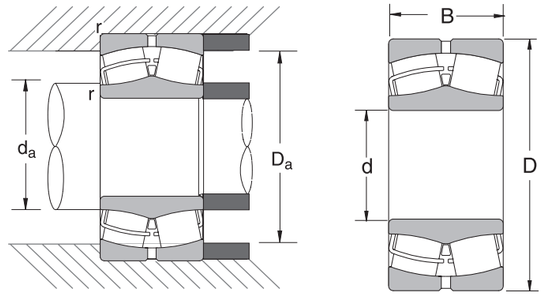
Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
22320EAE4*	194000	209000	2000	2600	27.94
22320CAME4	135000	176000	1700	2200	27.52
22322EAE4*	231000	253000	1900	2400	38.72
22322CAME4	166000	221000	1600	1900	38.40
22324EAE4*	268000	296000	1700	2200	48.84
22324CAME4	190000	252000	1400	1800	48.30
22326CE4*	278763	305000	1300	1600	61.46
22326CAME4*	278763	305000	1300	1600	60.72
22328CE4*	325973	360000	1200	1500	77.35
22328CAME4*	325973	360000	1200	1500	75.74
22330CAME4*	343958	380000	1100	1400	90.48
22332CAME4*	382175	425000	1100	1300	107.65
22334CAME4*	442874	475000	1000	1200	126.51
22336CAME4*	487835	525000	950	1200	146.03
22338CAME4*	532797	580000	900	1100	169.29
22340CAME4	519309	670000	850	1000	201.82
22344CAME4	610188	760000	750	950	253.13
22348CAME4	675101	855000	670	850	320.25
22352CAME4	804928	1030000	630	800	396.54
22356CAME4	780000	1160000	560	710	481.94
22360CAME4	885000	1320000	530	670	579.80
22364CAME4	1020000	1540000	480	600	741.39

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 23000 Series

Bore Diameter 100 - 480 mm, 3.9370 – 18.8976 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P5S	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
23020CDE4	100	3.9370	150	5.9055	37	1.4567	0.059	4.29	4.42	5.34	5.55
23022CDE4	110	4.3307	170	6.6929	45	1.7717	0.078	4.72	4.90	5.99	6.30
23022CAME4	110	4.3307	170	6.6929	45	1.7717	0.078	4.72	4.90	5.99	6.30
23024CDE4	120	4.7244	180	7.0866	46	1.8110	0.078	5.12	5.30	6.39	6.69
23024CAME4*	120	4.7244	180	7.0866	46	1.8110	0.078	5.12	5.30	6.39	6.69
23026CDE4	130	5.1181	200	7.8740	52	2.0472	0.078	5.51	5.78	7.06	7.48
23026CAME4*	130	5.1181	200	7.8740	52	2.0472	0.078	5.51	5.79	7.06	7.48
23028CDE4	140	5.5118	210	8.2677	53	2.0866	0.078	5.91	6.18	7.46	7.87
23028CAME4*	140	5.5118	210	8.2677	53	2.0866	0.078	5.91	6.18	7.46	7.87
23030CDE4	150	5.9055	225	8.8583	56	2.2047	0.078	6.38	6.65	8.00	8.39
23030CAME4*	150	5.9055	225	8.8583	56	2.2047	0.078	6.38	6.65	8.00	8.39
23032CDE4	160	6.2992	240	9.4488	60	2.3622	0.078	6.77	7.06	8.49	8.98
23032CAME4*	160	6.2992	240	9.4488	60	2.3622	0.078	6.77	7.07	8.49	8.98
23034CDE4	170	6.6929	260	10.2362	67	2.6378	0.078	7.17	7.55	9.18	9.76
23034CAME4*	170	6.6929	260	10.2362	67	2.6378	0.078	7.17	7.55	9.18	9.76
23036CDE4	180	7.0866	280	11.0236	74	2.9134	0.078	7.56	7.96	9.78	10.55
23036CAME4*	180	7.0866	280	11.0236	74	2.9134	0.078	7.56	7.97	9.78	10.55
23038CAME4*	190	7.4803	290	11.4173	75	2.9528	0.078	7.95	8.43	10.25	10.94
23040CAME4*	200	7.8740	310	12.2047	82	3.2283	0.078	8.35	9.02	10.95	11.73
23044CAME4*	220	8.6614	340	13.3858	90	3.5433	0.098	9.21	9.79	11.89	12.83
23048CAME4*	240	9.4488	360	14.1732	92	3.6220	0.098	10.00	10.53	12.74	13.62
23052CAME4	260	10.2362	400	15.7480	104	4.0945	0.118	10.94	11.44	13.98	15.04
23056CAME4	280	11.0236	420	16.5354	106	4.1732	0.118	11.73	12.33	14.85	15.83
23060CAME4	300	11.8110	460	18.1102	118	4.6457	0.118	12.52	13.40	16.24	17.40
23064CAME4	320	12.5984	480	18.8976	121	4.7638	0.118	13.31	14.15	16.99	18.19
23068CAME4	340	13.3858	520	20.4724	133	5.2362	0.157	14.25	15.10	18.28	19.61
23072CAME4	360	14.1732	540	21.2598	134	5.2756	0.157	15.04	15.84	19.09	20.39
23076CAME4	380	14.9606	560	22.0472	135	5.3150	0.157	15.83	16.69	19.90	21.18
23080CAME4	400	15.7480	600	23.6220	148	5.8268	0.157	16.61	17.59	21.23	22.76
23084CAME4	420	16.5354	620	24.4094	150	5.9055	0.157	17.40	18.43	22.10	23.54
23088CAME4	440	17.3228	650	25.5906	157	6.1811	0.196	18.43	19.27	23.08	24.49
23092CAME4	460	18.1102	680	26.7717	163	6.4173	0.196	19.21	20.20	24.18	25.67
23096CAME4	480	18.8976	700	27.5591	165	6.4961	0.196	20.00	20.91	24.93	26.46

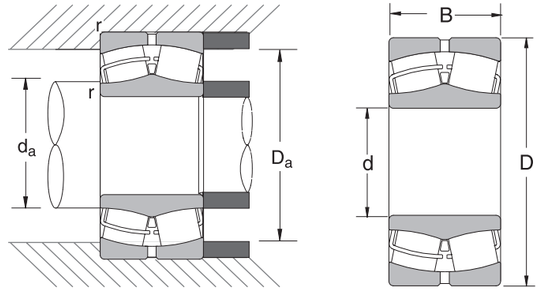
*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
23020CDE4	47500	75500	2200	2800	5.02
23022CDE4	66000	105000	2000	2400	8.18
23022CAME4	66000	105000	2000	2400	7.82
23024CDE4	88800	118000	1800	2200	8.95
23024CAME4*	88800	118000	1800	2200	8.65
23026CDE4	112404	148000	1700	2000	13.00
23026CAME4*	112404	148000	1700	2000	12.65
23028CDE4	118025	161000	1600	1900	14.11
23028CAME4*	118025	161000	1600	1900	13.69
23030CDE4	132637	183000	1400	1800	17.19
23030CAME4*	132637	183000	1400	1800	16.67
23032CDE4	151746	215000	1300	1700	21.05
23032CAME4*	151746	215000	1300	1700	20.53
23034CDE4	178723	246000	1200	1600	28.29
23034CAME4*	178723	246000	1200	1600	27.21
23036CDE4	210196	285000	1200	1400	37.24
23036CAME4*	210196	285000	1200	1400	36.18
23038CAME4*	218065	305000	1100	1400	38.45
23040CAME4*	265275	385000	1000	1300	48.94
23044CAME4*	305740	445000	950	1200	64.70
23048CAME4*	325973	480000	850	1100	71.12
23052CAME4	371306	580000	800	950	101.63
23056CAME4	399868	665000	710	900	110.15
23060CAME4	498536	830000	670	850	154.02
23064CAME4	508922	865000	630	800	164.73
23068CAME4	592012	985000	560	710	220.55
23072CAME4	620574	1060000	530	670	230.81
23076CAME4	649136	1150000	530	630	246.15
23080CAME4	771173	1330000	480	600	318.84
23084CAME4	755594	1310000	450	560	329.35
23088CAME4	817911	1430000	430	530	378.44
23092CAME4	895807	1590000	400	500	438.48
23096CAME4	986686	1790000	400	480	461.25

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 23000 Series (cont.)

Bore Diameter 500 - 1250 mm, 19.6850 – 49.2126 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r* (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
230/500CAME4	500	19.6850	720	28.3465	167	6.5748	0.196	20.79	21.78	25.77	27.24
230/530CAME4	530	20.8661	780	30.7087	185	7.2835	0.196	21.97	23.25	27.78	29.61
230/560CAME4	560	22.0472	820	32.2835	195	7.6772	0.196	23.15	24.46	29.19	31.18
230/600CAME4	600	23.6220	870	34.2520	200	7.8740	0.196	24.72	26.43	31.24	33.15
230/630CAME4	630	24.8031	920	36.2205	212	8.3465	0.236	26.22	27.55	32.85	34.80
230/670CAME4	670	26.3780	980	38.5827	230	9.0551	0.236	27.80	29.39	35.08	37.17
230/710CAME4	710	27.9528	1030	40.5512	236	9.2913	0.236	29.37	31.05	36.84	39.13
230/750CAME4	750	29.5276	1090	42.9134	250	9.8425	0.236	30.94	32.78	38.97	41.50
230/800CAME4	800	31.4961	1150	45.2756	258	10.1575	0.236	32.91	34.86	41.13	43.86
230/850CAME4	850	33.4646	1220	48.0315	272	10.7087	0.236	34.88	37.03	43.65	46.61
230/900CAME4	900	35.4331	1280	50.3937	280	11.0236	0.236	36.85	39.09	46.02	48.98
230/950CAME4	950	37.4016	1360	53.5433	300	11.8110	0.236	38.82	41.37	48.83	52.13
230/1000CAME4	1000	39.3701	1420	55.9055	308	12.1260	0.236	40.79	43.42	51.10	54.49
230/1060CAME4	1060	41.7323	1500	59.0551	325	12.7953	0.314	43.46	45.95	53.84	57.32
230/1120CAME4	1120	44.0945	1580	62.2047	345	13.5827	0.314	45.83	48.46	56.83	60.47
230/1250CAME4	1250	49.2126	1750	68.8976	375	14.7638	0.314	50.94	54.11	62.94	67.17

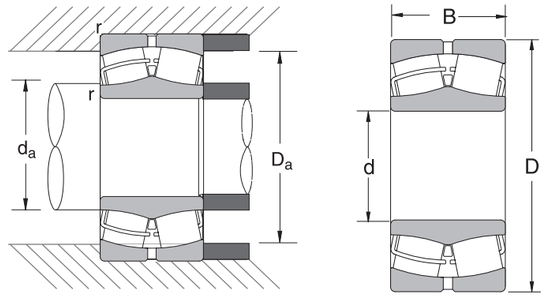
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
230/500CAME4	973704	1820000	380	480	481
230/530CAME4	1142479	2070000	340	430	652
230/560CAME4	1298271	2400000	320	400	757
230/600CAME4	1415116	2730000	300	360	856
230/630CAME4	1531960	2870000	280	340	1029
230/670CAME4	1778632	3350000	240	320	1256
230/710CAME4	1590000	3550000	240	280	1424
230/750CAME4	2012321	3850000	220	260	1689
230/800CAME4	1870000	4300000	200	240	1913
230/850CAME4	2414785	4800000	180	220	2237
230/900CAME4	2220000	5150000	160	200	2545
230/950CAME4	2934093	5950000	150	190	3091
230/1000CAME4	2680000	6300000	140	170	3440
230/1060CAME4	2930000	7050000	120	160	3928
230/1120CAME4	3450000	8550000	110	140	4674
230/1250CAME4	3900000	9950000	90	110	6086

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Spherical Roller Bearings: 23100 Series

Bore Diameter 100 - 380 mm, 3.9370 – 14.9606 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
23120CE4	100	3.9370	165	6.4961	52	2.0472	0.078	4.33	4.48	5.66	6.10
23120CAME4	100	3.9370	165	6.4961	52	2.0472	0.078	4.33	4.49	5.66	6.10
23122CE4*	110	4.3307	180	7.0866	56	2.2047	0.078	4.72	5.02	6.19	6.69
23122CAME4*	110	4.3307	180	7.0866	56	2.2047	0.078	4.72	5.03	6.19	6.69
23124CE4*	120	4.7244	200	7.8740	62	2.4409	0.078	5.12	5.43	6.86	7.48
23124CAME4*	120	4.7244	200	7.8740	62	2.4409	0.078	5.12	5.44	6.86	7.48
23126CE4*	130	5.1181	210	8.2677	64	2.5197	0.078	5.51	5.87	7.25	7.87
23126CAME4*	130	5.1181	210	8.2677	64	2.5197	0.078	5.51	5.88	7.25	7.87
23128CE4*	140	5.5118	225	8.8583	68	2.6772	0.078	5.98	6.24	7.79	8.39
23128CAME4*	140	5.5118	225	8.8583	68	2.6772	0.078	5.98	6.25	7.79	8.39
23130CE4*	150	5.9055	250	9.8425	80	3.1496	0.078	6.38	6.85	8.57	9.37
23130CAME4*	150	5.9055	250	9.8425	80	3.1496	0.078	6.38	6.86	8.57	9.37
23132CE4*	160	6.2992	270	10.6299	86	3.3858	0.078	6.77	7.30	9.21	10.16
23132CAME4*	160	6.2992	270	10.6299	86	3.3858	0.078	6.77	7.32	9.21	10.16
23134CE4*	170	6.6929	280	11.0236	88	3.4646	0.078	7.17	7.66	9.63	10.55
23134CAME4*	170	6.6929	280	11.0236	88	3.4646	0.078	7.17	7.67	9.63	10.55
23136CE4*	180	7.0866	300	11.8110	96	3.7795	0.098	7.64	8.13	10.24	11.26
23136CAME4*	180	7.0866	300	11.8110	96	3.7795	0.098	7.64	8.13	10.24	11.26
23138CE4*	190	7.4803	320	12.5984	104	4.0945	0.098	8.03	8.64	10.84	12.05
23138CAME4*	190	7.4803	320	12.5984	104	4.0945	0.098	8.03	8.64	10.84	12.05
23140CE4*	200	7.8740	340	13.3858	112	4.4094	0.098	8.43	9.15	11.52	12.83
23140CAME4*	200	7.8740	340	13.3858	112	4.4094	0.098	8.43	9.15	11.52	12.83
23144CE4*	220	8.6614	370	14.5669	120	4.7244	0.118	9.37	10.00	12.58	13.86
23144CAME4*	220	8.6614	370	14.5669	120	4.7244	0.118	9.37	9.99	12.58	13.86
23148CE4*	240	9.4488	400	15.7480	128	5.0394	0.118	10.16	10.83	13.64	15.04
23148CAME4*	240	9.4488	400	15.7480	128	5.0394	0.118	10.16	10.84	13.64	15.04
23152CAME4	260	10.2362	440	17.3228	144	5.6693	0.118	10.94	11.77	14.93	16.61
23156CAME4	280	11.0236	460	18.1102	146	5.7480	0.157	11.89	12.59	15.73	17.24
23160CAME4	300	11.8110	500	19.6850	160	6.2992	0.157	12.68	13.56	17.05	18.82
23164CAME4	320	12.5984	540	21.2598	176	6.9291	0.157	13.46	14.50	18.35	20.39
23168CAME4	340	13.3858	580	22.8346	190	7.4803	0.157	14.25	15.54	19.62	21.97
23172CAME4	360	14.1732	600	23.6220	192	7.5591	0.157	15.04	16.24	20.45	22.76
23176CAME4	380	14.9606	620	24.4094	194	7.6378	0.157	15.83	17.04	21.26	23.54

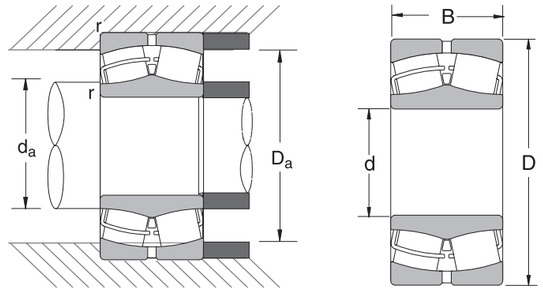
*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
23120CE4	78000	119000	1700	2200	9.52
23120CAME4	78000	119000	1700	2200	9.25
23122CE4*	107908	141000	1600	2000	12.40
23122CAME4*	107908	141000	1600	2000	12.03
23124CE4*	130389	162000	1400	1800	17.10
23124CAME4*	130389	162000	1400	1800	16.83
23126CE4*	141630	186000	1300	1700	18.94
23126CAME4*	141630	186000	1300	1700	18.52
23128CE4*	162986	212000	1200	1600	22.92
23128CAME4*	162986	212000	1200	1600	21.92
23130CE4*	203452	266000	1100	1400	34.60
23130CAME4*	203452	266000	1100	1400	33.83
23132CE4*	240546	315000	1000	1300	44.31
23132CAME4*	240546	315000	1000	1300	43.67
23134CE4*	265275	355000	1000	1300	47.52
23134CAME4*	265275	355000	1000	1300	45.73
23136CE4*	296748	395000	900	1200	60.12
23136CAME4*	296748	395000	900	1200	58.80
23138CE4*	332717	455000	850	1100	75.24
23138CAME4*	332717	455000	850	1100	74.15
23140CE4*	382175	525000	800	1000	93.13
23140CAME4*	382175	525000	800	1000	91.18
23144CE4*	440625	610000	710	950	115.82
23144CAME4*	440625	610000	710	950	113.64
23148CE4*	501324	700000	670	850	141.82
23148CAME4*	501324	700000	670	850	139.15
23152CAME4	604286	850000	600	800	192.63
23156CAME4	579029	900000	560	750	205.91
23160CAME4	693277	1080000	500	670	273.31
23164CAME4	791946	1230000	480	600	353.16
23168CAME4	934755	1480000	430	560	450.19
23172CAME4	986686	1590000	400	530	473.33
23176CAME4	1038617	1700000	400	500	499.20

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 23100 Series (cont.)

Bore Diameter 400 - 900 mm, 15.7480 – 35.4331 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number

See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r* (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
23180CAME4	400	15.7480	650	25.5906	200	7.8740	0.196	16.85	18.00	22.37	24.49
23184CAME4	420	16.5354	700	27.5591	224	8.8189	0.196	17.64	18.98	23.89	26.46
23188CAME4	440	17.3228	720	28.3465	226	8.8976	0.196	18.43	19.75	24.67	27.24
23192CAME4	460	18.1102	760	29.9213	240	9.4488	0.236	19.53	20.72	26.01	28.50
23196CAME4	480	18.8976	790	31.1024	248	9.7638	0.236	20.31	21.58	27.07	29.69
231/500CAME4	500	19.6850	830	32.6772	264	10.3937	0.236	21.10	22.53	28.35	31.26
231/530CAME4	530	20.8661	870	34.2520	272	10.7087	0.236	22.28	23.84	29.82	32.83
231/560CAME4	560	22.0472	920	36.2205	280	11.0236	0.236	23.46	25.23	31.63	34.80
231/600CAME4	600	23.6220	980	38.5827	300	11.8110	0.236	25.04	26.97	33.69	37.17
231/630CAME4	630	24.8031	1030	40.5512	315	12.4016	0.236	26.22	28.33	35.40	39.13
231/670CAME4	670	26.3780	1090	42.9134	336	13.2283	0.236	27.80	30.03	37.45	41.50
231/710CAME4	710	27.9528	1150	45.2756	345	13.5827	0.314	29.69	31.85	39.67	43.54
231/750CAME4	750	29.5276	1220	48.0315	365	14.3701	0.314	31.26	33.81	42.07	46.30
231/800CAME4	800	31.4961	1280	50.3937	375	14.7638	0.314	33.23	35.79	44.34	48.66
231/850CAME4	850	33.4646	1360	53.5433	400	15.7480	0.393	35.59	38.13	47.08	51.42
231/900CAME4	900	35.4331	1420	55.9055	412	16.2205	0.393	37.56	39.90	49.33	53.78

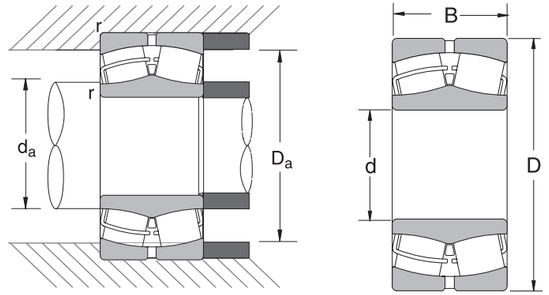
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
23180CAME4	1077565	1780000	380	480	562
23184CAME4	1298271	2110000	340	450	745
23188CAME4	1376168	2330000	320	430	788
23192CAME4	1480029	2450000	300	400	925
23196CAME4	1570908	2640000	300	380	1039
231/500CAME4	1778632	3000000	280	360	1241
231/530CAME4	1856528	3150000	260	340	1381
231/560CAME4	2038286	3500000	240	320	1600
231/600CAME4	1970000	3950000	220	280	1976
231/630CAME4	2160000	4350000	200	260	2296
231/670CAME4	2390000	4850000	190	240	2715
231/710CAME4	2660000	5500000	170	220	3114
231/750CAME4	2940000	6150000	160	200	3732
231/800CAME4	3100000	6550000	150	190	4121
231/850CAME4	3550000	7700000	130	170	4979
231/900CAME4	3850000	8300000	120	160	5469

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Spherical Roller Bearings: 23200 Series

Bore Diameter 70 - 280 mm, 2.7559 – 11.0236 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P5S	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
23214CAME4	70	2.7559	125	4.9213	39.7	1.5630	0.059	3.11	3.26	4.24	4.57
23218CE4	90	3.5433	160	6.2992	52.4	2.0630	0.078	3.94	4.15	5.40	5.91
23218CAME4	90	3.5433	160	6.2992	52.4	2.0630	0.078	3.94	4.16	5.40	5.91
23219CAME4	95	3.7402	170	6.6929	55.6	2.1890	0.078	4.21	4.37	5.74	6.22
23220CE4*	100	3.9370	180	7.0866	60.3	2.3740	0.078	4.41	4.67	6.09	6.61
23220CAME4*	100	3.9370	180	7.0866	60.3	2.3740	0.078	4.41	4.66	6.09	6.61
23222CE4*	110	4.3307	200	7.8740	69.8	2.7480	0.078	4.80	5.12	6.66	7.40
23222CAME4*	110	4.3307	200	7.8740	69.8	2.7480	0.078	4.80	5.13	6.66	7.40
23224CE4*	120	4.7244	215	8.4646	76	2.9921	0.078	5.20	5.52	7.16	7.99
23224CAME4*	120	4.7244	215	8.4646	76	2.9921	0.078	5.20	5.54	7.16	7.99
23226CE4*	130	5.1181	230	9.0551	80	3.1496	0.098	5.67	5.93	7.69	8.50
23226CAME4*	130	5.1181	230	9.0551	80	3.1496	0.098	5.67	5.95	7.69	8.50
23228CE4*	140	5.5118	250	9.8425	88	3.4646	0.098	6.06	6.44	8.38	9.29
23228CAME4*	140	5.5118	250	9.8425	88	3.4646	0.098	6.06	6.46	8.38	9.29
23230CE4*	150	5.9055	270	10.6299	96	3.7795	0.098	6.46	6.96	9.02	10.08
23230CAME4*	150	5.9055	270	10.6299	96	3.7795	0.098	6.46	6.98	9.02	10.08
23232CE4*	160	6.2992	290	11.4173	104	4.0945	0.098	6.85	7.44	9.62	10.87
23232CAME4*	160	6.2992	290	11.4173	104	4.0945	0.098	6.85	7.47	9.62	10.87
23234CE4*	170	6.6929	310	12.2047	110	4.3307	0.118	7.40	7.93	10.28	11.50
23234CAME4*	170	6.6929	310	12.2047	110	4.3307	0.118	7.40	7.94	10.28	11.50
23236CE4*	180	7.0866	320	12.5984	112	4.4094	0.118	7.80	8.33	10.76	11.89
23236CAME4*	180	7.0866	320	12.5984	112	4.4094	0.118	7.80	8.31	10.76	11.89
23238CE4*	190	7.4803	340	13.3858	120	4.7244	0.118	8.19	8.74	11.32	12.68
23238CAME4*	190	7.4803	340	13.3858	120	4.7244	0.118	8.19	8.75	11.32	12.68
23240CE4*	200	7.8740	360	14.1732	128	5.0394	0.118	8.58	9.34	12.08	13.46
23240CAME4*	200	7.8740	360	14.1732	128	5.0394	0.118	8.58	9.35	12.08	13.46
23244CE4*	220	8.6614	400	15.7480	144	5.6693	0.118	9.37	10.25	13.25	15.04
23244CAME4*	220	8.6614	400	15.7480	144	5.6693	0.118	9.37	10.23	13.25	15.04
23248CAME4	240	9.4488	440	17.3228	160	6.2992	0.118	10.16	11.13	14.65	16.61
23252CAME4	260	10.2362	480	18.8976	174	6.8504	0.157	11.10	12.13	15.95	18.03
23256CAME4	280	11.0236	500	19.6850	176	6.9291	0.157	11.89	12.91	16.73	18.82

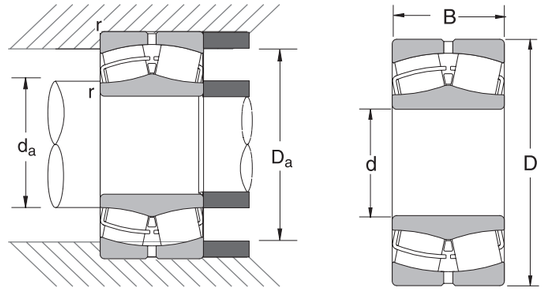
*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
23214CAME4	45500	62500	2400	3000	4.50
23218CE4	76500	110000	1800	2400	9.80
23218CAME4	76500	110000	1800	2400	9.66
23219CAME4	83000	118000	1700	2200	11.73
23220CE4*	118025	135000	1600	2200	14.39
23220CAME4*	118025	135000	1600	2200	14.11
23222CE4*	145002	171000	1500	1900	20.78
23222CAME4*	145002	171000	1500	1900	20.54
23224CE4*	177599	218000	1300	1700	26.32
23224CAME4*	177599	218000	1300	1700	25.67
23226CE4*	196708	243000	1200	1600	31.26
23226CAME4*	196708	243000	1200	1600	30.56
23228CE4*	233801	292000	1100	1500	41.01
23228CAME4*	233801	292000	1100	1500	40.12
23230CE4*	274267	350000	1100	1400	52.72
23230CAME4*	274267	350000	1100	1400	51.84
23232CE4*	307988	395000	1000	1300	66.42
23232CAME4*	307988	395000	1000	1300	65.57
23234CE4*	337213	430000	900	1200	79.49
23234CAME4*	337213	430000	900	1200	78.49
23236CE4*	364190	475000	850	1100	84.97
23236CAME4*	364190	475000	850	1100	81.70
23238CE4*	404656	530000	800	1100	104.03
23238CAME4*	404656	530000	800	1100	101.74
23240CE4*	465354	620000	750	1000	124.47
23240CAME4*	465354	620000	750	1000	121.20
23244CE4*	566518	765000	670	900	175.45
23244CAME4*	566518	765000	670	900	172.23
23248CAME4	633556	910000	630	800	231.56
23252CAME4	711453	1020000	560	750	298.14
23256CAME4	747804	1110000	530	670	319.60

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 23200 Series (cont.)

Bore Diameter 300 - 950 mm, 11.8110 – 37.4016 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r* (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
23260CAME4	300	11.8110	540	21.2598	192	7.5591	0.157	12.68	13.87	18.00	20.39
23264CAME4	320	12.5984	580	22.8346	208	8.1890	0.157	13.46	14.88	19.21	21.97
23268CAME4	340	13.3858	620	24.4094	224	8.8189	0.196	14.49	15.83	20.49	23.31
23272CAME4	360	14.1732	650	25.5906	232	9.1339	0.196	15.28	16.62	21.59	24.49
23276CAME4	380	14.9606	680	26.7717	240	9.4488	0.196	16.06	17.55	22.74	25.67
23280CAME4	400	15.7480	720	28.3465	256	10.0787	0.196	16.85	18.45	23.99	27.24
23284CAME4	420	16.5354	760	29.9213	272	10.7087	0.236	17.95	19.48	25.34	28.50
23288CAME4	440	17.3228	790	31.1024	280	11.0236	0.236	18.74	20.34	26.31	29.69
23292CAME4	460	18.1102	830	32.6772	296	11.6535	0.236	19.53	21.45	27.63	31.26
23296CAME4	480	18.8976	870	34.2520	310	12.2047	0.236	20.31	22.19	28.86	32.83
232/500CAME4	500	19.6850	920	36.2205	336	13.2283	0.236	21.10	23.36	30.44	34.80
232/530CAME4	530	20.8661	980	38.5827	355	13.9764	0.314	22.60	24.81	32.41	36.85
232/560CAME4	560	22.0472	1030	40.5512	365	14.3701	0.314	23.78	26.29	34.23	38.82
232/600CAME4	600	23.6220	1090	42.9134	388	15.2756	0.314	25.35	28.07	36.32	41.18
232/630CAME4	630	24.8031	1150	45.2756	412	16.2205	0.393	26.93	29.36	38.19	43.15
232/670CAME4	670	26.3780	1220	48.0315	438	17.2441	0.393	28.50	30.94	40.32	45.91
232/710CAME4	710	27.9528	1280	50.3937	450	17.7165	0.393	30.08	32.83	42.51	48.27
232/750CAME4	750	29.5276	1360	53.5433	475	18.7008	0.472	32.05	35.14	45.17	51.02
232/800CAME4	800	31.4961	1420	55.9055	488	19.2126	0.472	34.02	36.70	47.55	53.39
232/850CAME4	850	33.4646	1500	59.0551	515	20.2756	0.472	35.98	38.86	50.16	56.54
232/950CAME4	950	37.4016	1660	65.3543	530	20.8661	0.472	39.92	43.71	56.22	62.83

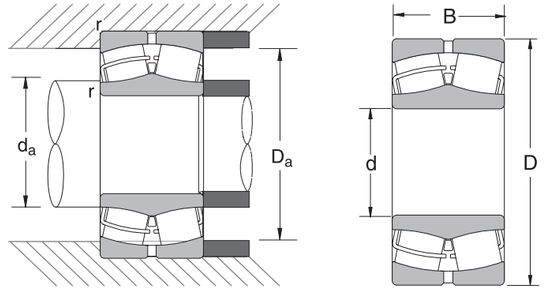
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
23260CAME4	882825	1330000	480	630	413
23264CAME4	1012652	1550000	450	600	522
23268CAME4	1142479	1760000	400	530	643
23272CAME4	1246341	1920000	380	500	725
23276CAME4	1337220	2070000	360	480	812
23280CAME4	1300000	2340000	340	450	981
23284CAME4	1674770	2630000	320	430	1168
23288CAME4	1791615	2870000	300	400	1296
23292CAME4	1908459	3100000	280	380	1512
23296CAME4	2038286	3250000	260	360	1742
232/500CAME4	2336889	3750000	260	320	2132
232/530CAME4	2622508	4250000	240	300	2565
232/560CAME4	2830232	4600000	220	280	2911
232/600CAME4	2870000	5600000	200	260	3498
232/630CAME4	3000000	5750000	180	240	4065
232/670CAME4	3350000	6450000	170	220	4857
232/710CAME4	3500000	6850000	160	200	5440
232/750CAME4	3950000	7950000	140	190	6564
232/800CAME4	4550000	9200000	130	170	7156
232/850CAME4	5000000	10200000	120	160	8558
232/950CAME4	5550000	11300000	100	130	10568

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Spherical Roller Bearings: 23900 Series

Bore Diameter 130 - 750 mm, 5.1181 – 29.5276 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P5S	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
23926CAME4	130	5.1181	180	7.0866	37	1.4567	0.059	5.47	5.58	6.51	6.73
23932CAME4*	160	6.2992	220	8.6614	45	1.7717	0.078	6.69	6.86	7.98	8.27
23934BCAME4*	170	6.6929	230	9.0551	45	1.7717	0.078	7.09	7.26	8.38	8.66
23936CAME4*	180	7.0866	250	9.8425	52	2.0472	0.078	7.48	7.75	9.05	9.45
23938CAME4*	190	7.4803	260	10.2362	52	2.0472	0.078	7.87	8.14	9.45	9.84
23940CAME4*	200	7.8740	280	11.0236	60	2.3622	0.078	8.35	8.66	10.15	10.55
23944CAME4*	220	8.6614	300	11.8110	60	2.3622	0.078	9.13	9.42	10.91	11.34
23948CAME4*	240	9.4488	320	12.5984	60	2.3622	0.078	9.92	10.22	11.71	12.13
23952CAME4*	260	10.2362	360	14.1732	75	2.9528	0.078	10.71	11.23	13.09	13.70
23956CAME4	280	11.0236	380	14.9606	75	2.9528	0.078	11.50	12.03	13.80	14.49
23960CAME4	300	11.8110	420	16.5354	90	3.5433	0.098	12.36	13.00	15.17	15.98
23964CAME4	320	12.5984	440	17.3228	90	3.5433	0.098	13.15	13.83	15.98	16.77
23968CAME4	340	13.3858	460	18.1102	90	3.5433	0.098	13.94	14.55	16.78	17.56
23972CAME4	360	14.1732	480	18.8976	90	3.5433	0.098	14.72	15.39	17.58	18.35
23976CAME4	380	14.9606	520	20.4724	106	4.1732	0.118	15.67	16.39	18.95	19.76
23980CAME4	400	15.7480	540	21.2598	106	4.1732	0.118	16.46	17.15	19.71	20.55
23984CAME4	420	16.5354	560	22.0472	106	4.1732	0.118	17.24	17.95	20.52	21.34
23988CAME4	440	17.3228	600	23.6220	118	4.6457	0.118	18.03	18.90	21.83	22.91
23992CAME4	460	18.1102	620	24.4094	118	4.6457	0.118	18.82	19.70	22.63	23.70
23996CAME4	480	18.8976	650	25.5906	128	5.0394	0.157	19.76	20.56	23.68	24.72
239/500CAME4	500	19.6850	670	26.3780	128	5.0394	0.157	20.55	21.37	24.49	25.51
239/530CAME4	530	20.8661	710	27.9528	136	5.3543	0.157	21.73	22.65	25.95	27.09
239/560CAME4	560	22.0472	750	29.5276	140	5.5118	0.157	22.91	23.95	27.44	28.66
239/600CAME4	600	23.6220	800	31.4961	150	5.9055	0.157	24.49	25.60	29.30	30.63
239/630CAME4	630	24.8031	850	33.4646	165	6.4961	0.196	25.91	26.93	30.95	32.36
239/670CAME4	670	26.3780	900	35.4331	170	6.6929	0.196	27.48	28.66	32.92	34.33
239/710CAME4	710	27.9528	950	37.4016	180	7.0866	0.196	29.06	30.45	34.77	36.30
239/750CAME4	750	29.5276	1000	39.3701	185	7.2835	0.196	30.63	32.03	36.65	38.27

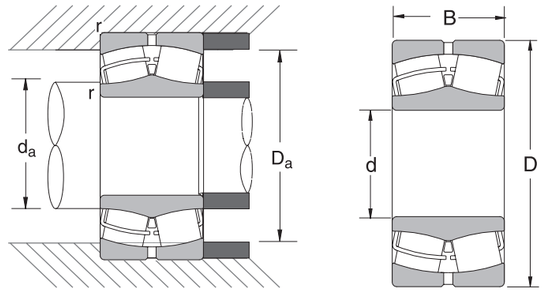
*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
23926CAME4	54000	95000	1800	2200	6.04
23932CAME4*	101164	152000	1400	1800	10.78
23934BCAME4*	98916	148000	1300	1700	11.69
23936CAME4*	132637	200000	1200	1600	16.61
23938CAME4*	119441	197000	1200	1500	17.46
23940CAME4*	159614	239000	1100	1400	23.96
23944CAME4*	176475	278000	1000	1300	26.57
23948CAME4*	178723	292000	950	1200	28.90
23952CAME4*	263026	420000	850	1000	50.13
23956CAME4	240180	440000	800	950	53.35
23960CAME4	319375	560000	710	900	83.46
23964CAME4	337551	620000	670	850	89.98
23968CAME4	345340	635000	630	800	92.66
23972CAME4	360919	690000	600	750	97.61
23976CAME4	485554	925000	530	670	142.8
23980CAME4	490747	955000	530	630	151.00
23984CAME4	485554	955000	500	600	156.40
23988CAME4	568643	1080000	450	560	211.80
23992CAME4	576433	1110000	430	530	219.20
23996CAME4	669908	1310000	400	500	263.30
239/500CAME4	550000	1250000	400	500	270.90
239/530CAME4	760787	1530000	360	450	326.30
239/560CAME4	804928	1630000	340	430	374.90
239/600CAME4	895807	1830000	320	400	451.20
239/630CAME4	1038617	2100000	300	360	570.40
239/670CAME4	1129496	2320000	260	340	661.00
239/710CAME4	1246341	2640000	240	300	775.00
239/750CAME4	1363185	2880000	220	280	876.40

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 23900 Series (cont.)

Bore Diameter 800 - 1400 mm, 31.4961 – 55.1181 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K	1:12 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r* (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
239/800CAME4	800	31.4961	1060	41.7323	195	7.6772	0.196	32.60	34.05	38.86	40.63
239/850CAME4	850	33.4646	1120	44.0945	200	7.8740	0.196	34.57	36.14	41.15	42.99
239/900CAME4	900	35.4331	1180	46.4567	206	8.1102	0.196	36.54	38.23	43.43	45.35
239/950CAME4	950	37.4016	1250	49.2126	224	8.8189	0.236	38.82	40.63	45.99	47.80
239/1000CAME4	1000	39.3701	1320	51.9685	236	9.2913	0.236	40.79	42.82	48.39	50.55
239/1060CAME4	1060	41.7323	1400	55.1181	250	9.8425	0.236	43.15	45.12	51.26	53.70
239/1120CAME4	1120	44.0945	1460	57.4803	250	9.8425	0.236	45.51	47.76	53.73	56.06
239/1180CAME4	1180	46.4567	1540	60.6299	272	10.7087	0.236	47.87	50.11	56.46	59.21
239/1250CAME4	1250	49.2126	1630	64.1732	280	11.0236	0.236	50.63	53.21	60.08	62.76
239/1400CAME4	1400	55.1181	1820	71.6535	315	12.4016	0.314	56.85	59.58	67.04	69.92

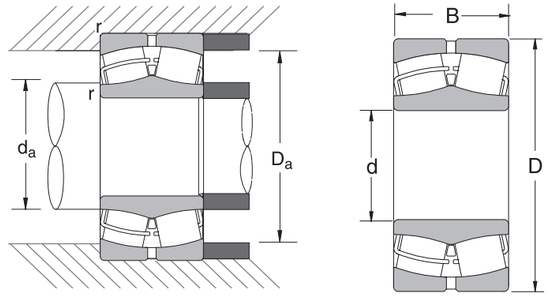
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
239/800CAME4	1260000	3100000	220	260	1017.00
239/850CAME4	1583891	3400000	190	240	1151.00
239/900CAME4	1480000	3750000	180	220	1299.00
239/950CAME4	1710000	4500000	160	200	1609.00
239/1000CAME4	1840000	4900000	150	190	1937.00
239/1060CAME4	2090000	5500000	130	170	2263.00
239/1120CAME4	2130000	5850000	120	150	2430.00
239/1180CAME4	2380000	6550000	110	140	2879.00
239/1250CAME4	2600000	7050000	100	120	3355.00
239/1400CAME4	3200000	9100000	80	100	4709.00

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Spherical Roller Bearings: 24000 Series

Bore Diameter 100 - 420 mm, 3.9370 – 16.5354 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K30	1:30 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
24020CE4	100	3.9370	150	5.9055	50	1.9685	0.059	4.29	4.33	5.20	5.55
24022CE4	110	4.3307	170	6.6929	60	2.3622	0.078	4.72	4.78	5.82	6.30
24024CE4*	120	4.7244	180	7.0866	60	2.3622	0.078	5.12	5.17	6.21	6.69
24024CAME4*	120	4.7244	180	7.0866	60	2.3622	0.078	5.12	5.18	6.21	6.69
24026CE4*	130	5.1181	200	7.8740	69	2.7165	0.078	5.51	5.66	6.87	7.48
24026CAME4*	130	5.1181	200	7.8740	69	2.7165	0.078	5.51	5.66	6.87	7.48
24028CE4*	140	5.5118	210	8.2677	69	2.7165	0.078	5.91	6.07	7.29	7.87
24028CAME4*	140	5.5118	210	8.2677	69	2.7165	0.078	5.91	6.05	7.26	7.87
24030CE4*	150	5.9055	225	8.8583	75	2.9528	0.078	6.38	6.52	7.80	8.39
24030CAME4*	150	5.9055	225	8.8583	75	2.9528	0.078	6.38	6.53	7.80	8.39
24032CE4*	160	6.2992	240	9.4488	80	3.1496	0.078	6.77	6.97	8.33	8.98
24032CAME4*	160	6.2992	240	9.4488	80	3.1496	0.078	6.77	6.98	8.33	8.98
24034CE4*	170	6.6929	260	10.2362	90	3.5433	0.078	7.17	7.43	8.95	9.76
24034CAME4*	170	6.6929	260	10.2362	90	3.5433	0.078	7.17	7.44	8.95	9.76
24036CE4*	180	7.0866	280	11.0236	100	3.9370	0.078	7.56	7.88	9.63	10.55
24036CAME4*	180	7.0866	280	11.0236	100	3.9370	0.078	7.56	7.90	9.63	10.55
24038CE4*	190	7.4803	290	11.4173	100	3.9370	0.078	7.95	8.29	9.95	10.94
24038CAME4*	190	7.4803	290	11.4173	100	3.9370	0.078	7.95	8.28	9.95	10.94
24040CE4*	200	7.8740	310	12.2047	109	4.2913	0.078	8.35	8.78	10.66	11.73
24040CAME4*	200	7.8740	310	12.2047	109	4.2913	0.078	8.35	8.79	10.66	11.73
24044CE4*	220	8.6614	340	13.3858	118	4.6457	0.098	9.21	9.63	11.65	12.83
24044CAME4*	220	8.6614	340	13.3858	118	4.6457	0.098	9.21	9.64	11.65	12.83
24048CE4*	240	9.4488	360	14.1732	118	4.6457	0.098	10.00	10.45	12.49	13.62
24048CAME4*	240	9.4488	360	14.1732	118	4.6457	0.098	10.00	10.45	12.49	13.62
24052CAME4	260	10.2362	400	15.7480	140	5.5118	0.118	10.94	11.32	13.70	15.04
24056CAME4	280	11.0236	420	16.5354	140	5.5118	0.118	11.73	12.17	14.50	15.83
24060CAME4	300	11.8110	460	18.1102	160	6.2992	0.118	12.52	13.08	15.75	17.40
24064CAME4	320	12.5984	480	18.8976	160	6.2992	0.118	13.31	13.90	16.60	18.19
24068CAME4	340	13.3858	520	20.4724	180	7.0866	0.157	14.25	14.90	17.87	19.61
24072CAME4	360	14.1732	540	21.2598	180	7.0866	0.157	15.04	15.67	18.73	20.39
24076CAME4	380	14.9606	560	22.0472	180	7.0866	0.157	15.83	16.46	19.51	21.18
24080CAME4	400	15.7480	600	23.6220	200	7.8740	0.157	16.61	17.33	20.72	22.76
24084CAME4	420	16.5354	620	24.4094	200	7.8740	0.157	17.40	18.18	21.58	23.54

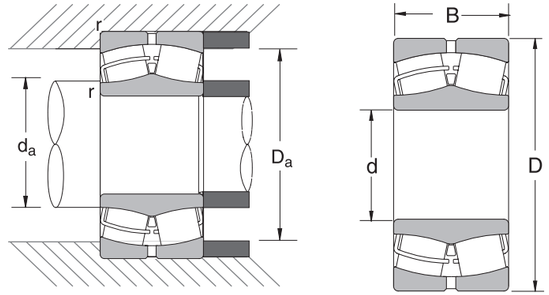
*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
24020CE4	62000	106000	1800	2400	6.72
24022CE4	85000	145000	1600	2200	10.80
24024CE4*	107908	158000	1500	2000	11.62
24024CAME4*	107908	152000	1500	2000	10.92
24026CE4*	139382	194000	1400	1800	17.05
24026CAME4*	139382	194000	1400	1800	16.46
24028CE4*	142754	213000	1300	1700	18.21
24028CAME4*	142754	204000	1300	1700	17.27
24030CE4*	166359	245000	1200	1500	22.83
24030CAME4*	166359	245000	1200	1500	22.29
24032CE4*	189964	283000	1100	1400	27.62
24032CAME4*	189964	283000	1100	1400	26.95
24034CE4*	231553	340000	1000	1300	37.75
24034CAME4*	231553	340000	1000	1300	36.85
24036CE4*	272019	395000	950	1200	49.51
24036CAME4*	272019	395000	950	1200	48.46
24038CE4*	274267	415000	900	1200	52.32
24038CAME4*	274267	415000	900	1200	50.39
24040CE4*	296006	475000	850	1100	66.32
24040CAME4*	296006	475000	850	1100	63.88
24044CE4*	368687	585000	750	1000	86.66
24044CAME4*	368687	560000	750	1000	83.84
24048CE4*	388919	615000	710	950	92.41
24048CAME4*	388919	615000	710	950	89.81
24052CAME4	469974	790000	630	850	136.50
24056CAME4	488150	855000	600	800	144.80
24060CAME4	599801	1040000	530	710	204.30
24064CAME4	550000	1130000	500	670	217.80
24068CAME4	758190	1360000	480	600	294.80
24072CAME4	660000	1370000	450	600	303.60
24076CAME4	690000	1480000	430	560	323.20
24080CAME4	810000	1710000	400	500	422.60
24084CAME4	973704	1820000	380	480	434.10

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 24000 Series (cont.)

Bore Diameter 440 - 1400 mm, 17.3228 – 55.1181 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K30	1:30 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r* (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
24088CAME4	440	17.3228	650	25.5906	212	8.3465	0.196	18.43	19.07	22.67	24.49
24092CAME4	460	18.1102	680	26.7717	218	8.5827	0.196	19.21	20.01	23.75	25.67
24096CAME4	480	18.8976	700	27.5591	218	8.5827	0.196	20.00	20.71	24.59	26.46
240/500CAME4	500	19.6850	720	28.3465	218	8.5827	0.196	20.79	21.42	25.3	27.24
240/530CAME4	530	20.8661	780	30.7087	250	9.8425	0.196	21.97	22.83	27.17	29.61
240/560CAME4	560	22.0472	820	32.2835	258	10.1575	0.196	23.15	24.18	28.71	31.18
240/600CAME4	600	23.6220	870	34.2520	272	10.7087	0.196	24.72	25.72	30.38	33.15
240/630CAME4	630	24.8031	920	36.2205	290	11.4173	0.236	26.22	27.19	32.08	34.80
240/670CAME4	670	26.3780	980	38.5827	308	12.1260	0.236	27.80	28.8	34.15	37.17
240/710CAME4	710	27.9528	1030	40.5512	315	12.4016	0.236	29.37	30.5	36.06	39.13
240/800CAME4	800	31.4961	1150	45.2756	345	13.5827	0.236	32.91	34.45	40.5	43.86
240/850CAME4	850	33.4646	1220	48.0315	365	14.3701	0.236	34.88	36.64	43.03	46.61
240/950CAME4	950	37.4016	1360	53.5433	412	16.2205	0.236	38.82	40.85	47.97	52.13
240/1000CAME4	1000	39.3701	1420	55.9055	412	16.2205	0.236	40.79	42.84	50.19	54.49
240/1120CAME4	1120	44.0945	1580	62.2047	462	18.1890	0.314	45.83	48.14	55.92	60.47
240/1250CAME4	1250	49.2126	1750	68.8976	500	19.6850	0.314	50.94	54.35	62.15	67.17
240/1320CAME4	1320	51.9685	1850	72.8346	530	20.8661	0.393	54.09	57.16	65.17	70.71
240/1400CAME4	1400	55.1181	1950	76.7717	545	21.4567	0.393	57.24	59.77	69.57	74.65

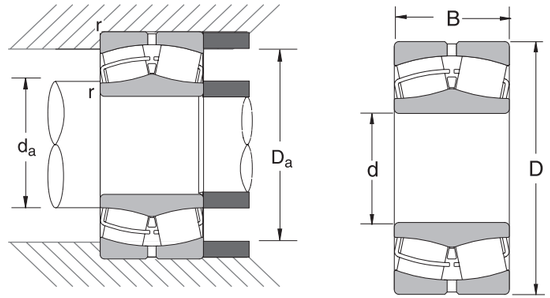
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
24088CAME4	940000	2050000	360	450	503.3
24092CAME4	1010000	2240000	340	430	579.7
24096CAME4	1040000	2290000	320	430	590.0
240/500CAME4	995000	2220000	300	400	607.6
240/530CAME4	1210000	2660000	280	360	857.2
240/560CAME4	1340000	3000000	260	340	969.1
240/600CAME4	1480000	3400000	240	320	1164.0
240/630CAME4	1700000	4000000	220	300	1400.0
240/670CAME4	1900000	4400000	200	260	1701.0
240/710CAME4	1990000	4650000	190	240	1894.0
240/800CAME4	2440000	5900000	160	200	2480.0
240/850CAME4	2610000	6350000	150	190	2965.0
240/950CAME4	3250000	8150000	120	160	4146.0
240/1000CAME4	3450000	8700000	110	150	4421.0
240/1120CAME4	4200000	11100000	95	120	6143.0
240/1250CAME4	4700000	13400000	75	100	8136.0
240/1320CAME4	5100000	14300000	67	85	9673.0
240/1400CAME4	5500000	14600000	60	75	10772.0

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Spherical Roller Bearings: 24100 Series

Bore Diameter 100 - 320 mm, 3.9370 – 12.5984 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K30	1:30 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r** (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
24120CAME4	100	3.9370	165	6.4961	65	2.5591	0.078	4.33	4.50	5.62	6.10
24122CE4*	110	4.3307	180	7.0866	69	2.7165	0.078	4.72	4.86	6.04	6.69
24122CAME4*	110	4.3307	180	7.0866	69	2.7165	0.078	4.72	4.87	6.04	6.69
24124CE4*	120	4.7244	200	7.8740	80	3.1496	0.078	5.12	5.36	6.72	7.48
24124CAME4*	120	4.7244	200	7.8740	80	3.1496	0.078	5.12	5.36	6.72	7.48
24126CE4*	130	5.1181	210	8.2677	80	3.1496	0.078	5.51	5.77	7.09	7.87
24126CAME4*	130	5.1181	210	8.2677	80	3.1496	0.078	5.51	5.75	7.09	7.87
24128CE4*	140	5.5118	225	8.8583	85	3.3465	0.078	5.98	6.15	7.57	8.39
24128CAME4*	140	5.5118	225	8.8583	85	3.3465	0.078	5.98	6.12	7.53	8.39
24130CE4*	150	5.9055	250	9.8425	100	3.9370	0.078	6.38	6.65	8.33	9.37
24130CAME4*	150	5.9055	250	9.8425	100	3.9370	0.078	6.38	6.68	8.33	9.37
24132CE4*	160	6.2992	270	10.6299	109	4.2913	0.078	6.77	7.07	8.99	10.16
24132CAME4*	160	6.2992	270	10.6299	109	4.2913	0.078	6.77	7.14	8.99	10.16
24134CE4*	170	6.6929	280	11.0236	109	4.2913	0.078	7.17	7.49	9.39	10.55
24134CAME4*	170	6.6929	280	11.0236	109	4.2913	0.078	7.17	7.54	9.39	10.55
24136CE4*	180	7.0866	300	11.8110	118	4.6457	0.098	7.64	7.98	10.04	11.26
24136CAME4*	180	7.0866	300	11.8110	118	4.6457	0.098	7.64	7.99	10.04	11.26
24138CE4*	190	7.4803	320	12.5984	128	5.0394	0.098	8.03	8.31	10.58	12.05
24138CAME4*	190	7.4803	320	12.5984	128	5.0394	0.098	8.03	8.41	10.57	12.05
24140CE4*	200	7.8740	340	13.3858	140	5.5118	0.098	8.43	8.90	11.39	12.83
24140CAME4*	200	7.8740	340	13.3858	140	5.5118	0.098	8.43	8.92	11.39	12.83
24144CE4*	220	8.6614	370	14.5669	150	5.9055	0.118	9.37	9.78	12.30	13.86
24144CAME4*	220	8.6614	370	14.5669	150	5.9055	0.118	9.37	9.82	12.30	13.86
24148CE4*	240	9.4488	400	15.7480	160	6.2992	0.118	10.16	10.55	13.42	15.04
24148CAME4*	240	9.4488	400	15.7480	160	6.2992	0.118	10.16	10.59	13.42	15.04
24152CE4	260	10.2362	440	17.3228	180	7.0866	0.118	10.94	11.60	14.60	16.61
24152CAME4	260	10.2362	440	17.3228	180	7.0866	0.118	10.94	11.65	14.60	16.61
24156CXE4	280	11.0236	460	18.1102	180	7.0866	0.157	11.89	12.39	15.42	17.24
24156CAME4	280	11.0236	460	18.1102	180	7.0866	0.157	11.89	12.43	15.42	17.24
24160CXE4	300	11.8110	500	19.6850	200	7.8740	0.157	12.68	13.27	16.62	18.82
24160CAME4	300	11.8110	500	19.6850	200	7.8740	0.157	12.68	13.33	16.62	18.82
24164CE4	320	12.5984	540	21.2598	218	8.5827	0.157	13.46	14.25	17.95	20.39
24164CAME4	320	12.5984	540	21.2598	218	8.5827	0.157	13.46	14.32	17.95	20.39

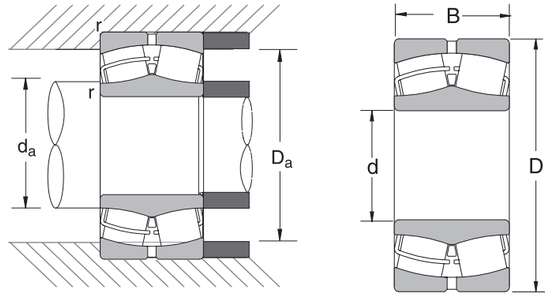
*Indicates NSK (HPS) High Performance Standard bearing. **Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
24120CAME4	77500	121000	1700	2200	11.80
24122CE4*	129265	168000	1600	2000	14.90
24122CAME4*	129265	168000	1600	2000	14.40
24124CE4*	156242	213000	1400	1800	21.90
24124CAME4*	156242	203000	1400	1800	20.80
24126CE4*	165235	228000	1300	1700	23.30
24126CAME4*	165235	227000	1300	1700	22.10
24128CE4*	187715	261000	1200	1600	28.30
24128CAME4*	187715	260000	1200	1600	27.00
24130CE4*	240546	345000	1100	1400	43.20
24130CAME4*	240546	325000	1100	1400	41.10
24132CE4*	278763	395000	1000	1300	55.40
24132CAME4*	278763	375000	1000	1300	53.50
24134CE4*	287755	420000	1000	1300	58.00
24134CAME4*	287755	400000	1000	1300	55.70
24136CE4*	334965	460000	900	1200	72.30
24136CAME4*	334965	460000	900	1200	70.80
24138CE4*	366439	525000	850	1100	90.30
24138CAME4*	366439	505000	850	1100	88.10
24140CE4*	440625	600000	800	1000	111.90
24140CAME4*	440625	600000	800	1000	109.20
24144CE4*	505820	720000	710	950	146.70
24144CAME4*	505820	720000	710	950	137.70
24148CE4*	597992	850000	670	850	173.70
24148CAME4*	597992	850000	670	850	172.20
24152CE4	664715	1050000	600	800	242.00
24152CAME4	664715	1050000	600	800	237.40
24156CXE4	685487	1010000	560	750	251.70
24156CAME4	685487	1120000	560	750	250.50
24160CXE4	804928	1240000	500	670	339.80
24160CAME4	804928	1310000	500	670	332.70
24164CE4	921773	1490000	480	600	440.00
24164CAME4	921773	1490000	480	600	427.20

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating
*Indicates NSK (HPS) High Performance Standard bearing.

Spherical Roller Bearings: 24100 Series (cont.)

Bore Diameter 340 - 670 mm, 13.3858 – 26.3780 inch



COMMON OPTIONS	
TL	Tough & Long Life
HTF	High Tough
STF	Super Tough
CAM	One Piece Brass Cage
C,CD	Two Piece Steel Cage
EA	High Capacity Steel Cage
H	Two Piece Polyamide Cage
K30	1:30 Tapered Bore
G3	Inner Ring Carburized
E4	Lube Groove/Holes, Outer Ring
CO*	Normal Internal Clearance
C2	Tight Internal Clearance
C3	Greater than Normal Internal Clearance
P55	High Running Accuracy Both Rings
S11	Heat Stabilized to 200°C
VE	Vibrating Equipment

*Not shown in part number
See page D-1 for additional options.

Bearing Number	Nominal Bearing Dimensions						Preferred Shoulder Diameters				
	d		D		B		r* (in)	da (in)		Da (in)	
	mm	inch	mm	inch	mm	inch	max	min	max	min	max
24168CXE4	340	13.3858	580	22.8346	243	9.5669	0.157	14.25	15.12	19.23	21.97
24168CAME4	340	13.3858	580	22.8346	243	9.5669	0.157	14.25	15.19	19.23	21.97
24172CAME4	360	14.1732	600	23.6220	243	9.5669	0.157	15.04	15.95	19.95	22.76
24176CXE4	380	14.9606	620	24.4094	243	9.5669	0.157	15.83	16.69	20.72	23.54
24176CAME4	380	14.9606	620	24.4094	243	9.5669	0.157	15.83	16.77	20.80	23.54
24180CAME4	400	15.7480	650	25.5906	250	9.8425	0.196	16.85	17.65	21.69	24.49
24184CAME4	420	16.5354	700	27.5591	280	11.0236	0.196	17.64	18.84	23.51	26.46
24188CAME4	440	17.3228	720	28.3465	280	11.0236	0.196	18.43	19.64	24.27	27.24
24192CAME4	460	18.1102	760	29.9213	300	11.8110	0.236	19.53	20.40	25.43	28.50
24196CAME4	480	18.8976	790	31.1024	308	12.1260	0.236	20.31	21.25	26.38	29.69
241/500CAME4	500	19.6850	830	32.6772	325	12.7953	0.236	21.10	22.02	27.68	31.26
241/560CAME4	560	22.0472	920	36.2205	355	13.9764	0.236	23.46	24.79	30.76	34.80
241/600CAME4	600	23.6220	980	38.5827	375	14.7638	0.236	25.04	26.53	32.88	37.17
241/630CAME4	630	24.8031	1030	40.5512	400	15.7480	0.236	26.22	27.80	34.47	39.13
241/670CAME4	670	26.3780	1090	42.9134	412	16.2205	0.236	27.80	29.72	36.74	41.50

*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	lbs
24168CXE4	915000	1690000	430	560	561.5
24168CAME4	955000	1780000	430	560	560.2
24172CAME4	945000	1800000	400	530	576.0
24176CXE4	945000	1820000	400	500	612.9
24176CAME4	975000	1900000	400	500	600.5
24180CAME4	1285289	2260000	380	480	691.5
24184CAME4	1350000	2690000	340	450	919.5
24188CAME4	1340000	2710000	320	430	947.5
24192CAME4	1635822	2800000	300	400	1121.0
24196CAME4	1610000	3300000	300	380	1248.0
241/500CAME4	1800000	3600000	280	360	1465.0
241/560CAME4	2120000	4400000	240	320	1948.0
241/600CAME4	2340000	4900000	220	280	2310.0
241/630CAME4	2460000	5150000	200	260	2739.0
241/670CAME4	2790000	5950000	190	240	3175.0

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Shaker Screen Bearings

Spherical Bearing

2

23

Bearing Series

Bore Diameter Number

20

CAM

CAM:
Machined Brass Cage

Oil Groove & Holes in Outer Ring

E4

C4

Internal Clearance Specification

Vibrating Equipment Specification

VE

- Higher Precision Bore & OD Tolerances
- Special Radial Internal Clearance Range
- Unique Combination of Geometry & Finishes Optimize Performance

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

Radial Internal Clearance (inches)

Bearing Bore (mm)	Unmounted				Mounted			
	C3		C4		C3		C4	
	min	max	min	max	min	max	min	max
40	0.0020	0.0024	0.0026	0.0031	0.0006	0.0019	0.0012	0.0026
45-50	0.0024	0.0031	0.0033	0.0039	0.0010	0.0026	0.0019	0.0034
55	0.0029	0.0035	0.0039	0.0047	0.0015	0.0030	0.0025	0.0042
60-65	0.0029	0.0035	0.0039	0.0047	0.0012	0.0038	0.0022	0.0040
70	0.0035	0.0043	0.0047	0.0057	0.0018	0.0036	0.0030	0.0050
75-80	0.0035	0.0043	0.0047	0.0057	0.0018	0.0038	0.0030	0.0052
85	0.0043	0.0053	0.0059	0.0071	0.0026	0.0048	0.0042	0.0066
90-100	0.0043	0.0053	0.0059	0.0071	0.0025	0.0048	0.0041	0.0066
110	0.0053	0.0063	0.0070	0.0083	0.0036	0.0058	0.0052	0.0078
120	0.0053	0.0063	0.0070	0.0083	0.0032	0.0055	0.0049	0.0075
130-140	0.0063	0.0075	0.0081	0.0094	0.0042	0.0067	0.0060	0.0086
150-160	0.0075	0.0087	0.0094	0.0110	0.0053	0.0080	0.0072	0.0103
170-180	0.0079	0.0094	0.0104	0.0122	0.0057	0.0087	0.0082	0.0115
190	0.0087	0.0102	0.0113	0.0134	0.0065	0.0095	0.0091	0.0127
200	0.0087	0.0102	0.0113	0.0134	0.0063	0.0094	0.0089	0.0126

Interchange

NSK	TORR/TIMKEN	SKF	FAG*
22308CAME4C4VE	22308YMW33W800C4	452308CM2/W502	22308ASMAC4F80
22309CAME4C4VE	22309YMW33W800C4	452309CM2/W502	22309ASMAC4F80
22310CAME4C4VE	22310YMW33W800C4	452310CM2/W502	22310ASMAC4F80
22311CAME4C4VE	22311YMW33W800C4	452311CM2/W502	22311ASMAC4F80
22312CAME4C4VE	22312YMW33W800C4	452312CM2/W502	22312ASMAC4F80
22313CAME4C4VE	22313YMW33W800C4	452313CM2/W502	22313ASMAC4F80
22314CAME4C4VE	22314YMW33W800C4	452314CM2/W502	22314ASMAC4F80
22315CAME4C4VE	22315YMW33W800C4	452315CM2/W502	22315ASMAC4F80
22316CAME4C4VE	22316YMW33W800C4	452316CM2/W502	22316ASMAC4F80
22317CAME4C4VE	22317YMW33W800C4	452317CM2/W502	22317ASMAC4F80
22318CAME4C4VE	22318YMW33W800C4	452318CM2/W502	22318ASMAC4F80
22319CAME4C4VE	22319YMW33W800C4	452319CM2/W502	22319ASMAC4F80
22320CAME4C4VE	22320YMW33W800C4	452320CM2/W502	22320ASMAC4F80
22322CAME4C4VE	22322YMW33W800C4	452322CM2/W502	22322ASMAC4F80
22324CAME4C4VE	22324YMW33W800C4	452324CM2/W502	22324ASMAC4F80
22326CAME4C4VE	22326YMW33W800C4	452326CM2/W502	22326ASMAC4F80
22328CAME4C4VE	22328YMW33W800C4	452328CM2/W502	22328ASMAC4F80
22330CAME4C4VE	22330YMW33W800C4	452330CM2/W502	22330AMAC4F80
22332CAME4C4VE	22332YMW33W800C4	452332CM2/W502	22332AMAC4F80
22334CAME4C4VE	22334W33W800C4	452334CM2/W502	22334AMAC4F80
22336CAME4C4VE	22336W33W800C4	452336CM2/W502	22336AMAC4F80
22338CAME4C4VE	22338W33W800C4	452338CM2/W502	22338AMAC4F80
22340CAME4C4VE	22340W33W800C4	452340CM2/W502	22340AMAC4F80
23322CAME4C4VE	23322W33W800C4	453322CM2/W502	23322ASMAC4F80
23324CAME4C4VE	23324W33W800C4	453324CM2/W502	23324ASMAC4F80
23326CAME4C4VE	23326W33W800C4	453326CM2/W502	23326ASMAC4F80
23328CAME4C4VE	23328W33W800C4	453328CM2/W502	23328ASMAC4F80
23330CAME4C4VE	23330W33W800C4	453330CM2/W502	23330ASMAC4F80
23332CAME4C4VE	23332W33W800C4	453332CM2/W502	23332ASMAC4F80
23338CAME4C4VE	23338W33W22BRC4	453338CM2/W502	23338ASMAC4F80
23340CAME4C4VE	23340W33W22BRC4	–	23340ASMAC4F80

* NSK bearings with "CAME4C4VE" suffix may also be used in place of bearings with FAG suffix "T41A", "T41B", "T41".

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.

Shaker Screen Bearings: 22300/23300 Series

223 Series

Bearing Number	Bearing Dimensions						CAM Design			
	Bore		O.D.		Width		Capacity		Limiting Speeds (RPM)	
	mm	inch	mm	inch	mm	inch	Cr (lbf)	Cr (N)	Grease	Oil
22308	40	1.5748	90	3.5433	33	1.2992	34000	152000	4300	5300
22309	45	1.7717	100	3.9370	36	1.4173	41000	185000	3800	4800
22310	50	1.9685	110	4.3307	40	1.5748	52000	232000	3600	4300
22311	55	2.1654	120	4.7244	43	1.6929	58000	261000	3200	4000
22312	60	2.3622	130	5.1181	46	1.8110	68000	305000	3000	3600
22313	65	2.5591	140	5.5118	48	1.8898	73000	330000	2800	3400
22314	70	2.7559	150	5.9055	51	2.0079	84000	380000	2600	3200
22315	75	2.9528	160	6.2992	55	2.1654	94000	425000	2400	3000
22316	80	3.1496	170	6.6929	58	2.2835	108000	485000	2200	2800
22317	85	3.3465	180	7.0866	60	2.3622	116000	520000	2000	2600
22318	90	3.5433	190	7.4803	64	2.5197	134000	605000	2000	2400
22319	95	3.7402	200	7.8740	67	2.6378	146000	655000	1900	2400
22320	100	3.9370	215	8.4646	73	2.8740	167000	750000	1700	2200
22322	110	4.3307	240	9.4488	80	3.1496	206000	925000	1600	1900
22324	120	4.7244	260	10.2362	86	3.3858	236000	1060000	1400	1800
22326	130	5.1181	280	11.0236	93	3.6614	276000	1240000	1300	1600
22328	140	5.5118	300	11.8110	102	4.0157	322000	1450000	1200	1500
22330	150	5.9055	320	12.5984	108	4.2520	340000	1530000	1100	1400
22332	160	6.2992	340	13.3858	114	4.4882	378000	1700000	1100	1300
22334	170	6.6929	360	14.1732	120	4.7244	438000	1970000	1000	1200
22336	180	7.0866	380	14.9606	126	4.9606	482000	2170000	950	1200
22338	190	7.4803	400	15.7480	132	5.1969	527000	2370000	900	1100
233 Series										
23322	110	4.3307	240	9.4488	92	3.6220	173000	780000	1700	2200
23324	120	4.7244	260	10.2362	106	4.1732	213000	960000	1500	1900
23326	130	5.1181	280	11.0236	112	4.4094	231000	1040000	1400	1800
23328	140	5.5118	300	11.8110	118	4.6457	276000	1240000	1300	1700
23330	150	5.9055	320	12.5984	128	5.0394	311000	1400000	1200	1500
23332	160	6.2992	340	13.3858	136	5.3543	344000	1550000	1100	1400
23338	190	7.4803	400	15.7480	155	6.1024	462000	2080000	950	1200
23340	200	7.8740	420	16.5354	165	6.4961	520000	2340000	900	1100
23344	220	8.6614	460	18.1102	180	7.0866	622000	2800000	800	1000

Shaker Screen Bearings: 22300/23300 Series

Fitting Recommendations

223 Series

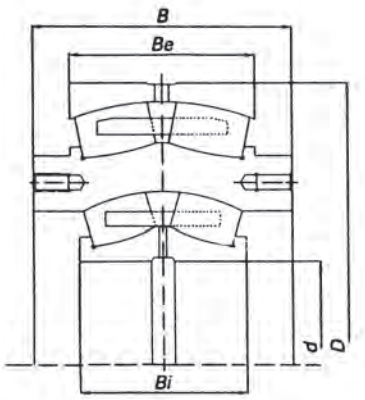
Bearing Number	Shaft Diameter (in)			Housing Bore Diameter (in)		
	max	min	fit	min	max	fit
22308	1.5741	1.5738	.0003L-.0010L	3.5416	3.5422	.0006T-.0015T
22309	1.7710	1.7707	.0003L-.0010L	3.9353	3.9359	.0006T-.0015T
22310	1.9678	1.9675	.0003L-.0010L	4.3290	4.3296	.0006T-.0015T
22311	2.1650	2.1643	.0004L-.0011L	4.7227	4.7233	.0006T-.0015T
22312	2.3614	2.3611	.0004L-.0011L	5.1161	5.1168	.0008T-.0018T
22313	2.5583	2.5580	.0004L-.0011L	5.5098	5.5105	.0008T-.0018T
22314	2.7551	2.7548	.0004L-.0011L	5.9035	5.9042	.0008T-.0018T
22315	2.9520	2.9517	.0004L-.0011L	6.2966	6.2971	.0014T-.0024T
22316	3.1488	3.1485	.0004L-.0011L	6.6903	6.6908	.0014T-.0024T
22317	3.3446	3.3442	.0014L-.0023L	7.0840	7.0845	.0014T-.0024T
22318	3.5414	3.5410	.0014L-.0023L	7.4772	7.4778	.0016T-.0028T
22319	3.7383	3.7379	.0014L-.0023L	7.8709	7.8715	.0016T-.0028T
22320	3.9351	3.9347	.0014L-.0023L	8.4614	8.4620	.0016T-.0028T
22322	4.3288	4.3284	.0014L-.0023L	9.4457	9.4463	.0016T-.0028T
22324	4.7225	4.7221	.0014L-.0023L	10.2327	10.2335	.0018T-.0031T
22326	5.1158	5.1154	.0017L-.0027L	11.0201	11.0209	.0018T-.0031T
22328	5.5095	5.5091	.0017L-.0027L	11.8075	11.8083	.0018T-.0031T
22330	5.9032	5.9028	.0017L-.0027L	12.5945	12.5953	.0020T-.0034T
22332	6.2969	6.2965	.0017L-.0027L	13.3819	13.3827	.0020T-.0034T
22334	6.6906	6.6902	.0017L-.0027L	14.1693	14.1701	.0020T-.0034T
22336	7.0843	7.0839	.0017L-.0027L	14.9567	14.9575	.0020T-.0034T
22338	7.4776	7.4772	.0020L-.0031L	15.7441	15.7449	.0020T-.0034T
233 Series						
23322	4.3288	4.3284	.0014L-.0023L	9.4457	9.4463	.0016T-.0028T
23324	4.7225	4.7221	.0014L-.0023L	10.2327	10.2335	.0018T-.0031T
23326	5.1158	5.1154	.0017L-.0027L	11.0201	11.0209	.0018T-.0031T
23328	5.5095	5.5091	.0017L-.0027L	11.8075	11.8083	.0018T-.0031T
23330	5.9032	5.9028	.0017L-.0027L	12.5945	12.5953	.0020T-.0034T
23332	6.2969	6.2965	.0017L-.0027L	13.3819	13.3827	.0020T-.0034T
23338	6.6906	6.6902	.0017L-.0027L	14.1693	14.1701	.0020T-.0034T
23340	7.0843	7.0839	.0017L-.0027L	14.9567	14.9575	.0020T-.0034T
23344	7.4776	7.4772	.0020L-.0031L	15.7441	15.7449	.0020T-.0034T

Triple Ring Bearings

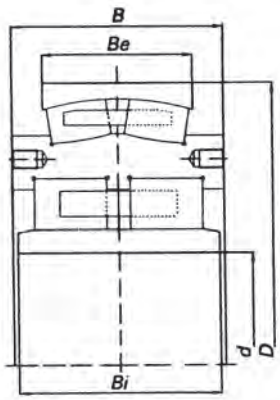
Interchange

NSK	SKF	FAG	TORR/TIMKEN
2SL180-2UPA	462825	525349	B9483G
2SL200-2UPA	462826	531033	B9484G
2SL220-2UPA	462827	527870	B9485G
2SL240-2UPA	462828	531040	B9486G
2SL260-2UPA	462606	522933	B9362G (B7362G)
2SL280-2UPA	462829	525350	B9417G
2SL300-2UPA	461619	522401	B9193G (B7193G)
2SL320-2UPA	461902	525351	B9194G
2SL340-2UPA	460924	522400	B9094G (B7094G)

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.



2SL



2PSL

Bearing Number	Boundary Dimensions					Mass	
	d	D	B_i	B_e	B	kg	lbs
2SL180-2UPA	180	480	140	160	215.9	165	364
2SL200-2UPA	200	520	160	180	241.3	230	507
2SL220-2UPA	220	600	180	200	279.4	330	728
2SL240-2UPA	240	620	200	200	279.4	410	904
2PSL240-1UPA	240	600	205	160	225.0	285	628
2SL260-2UPA	260	680	218	218	317.5	490	1080
2SL280-2UPA	280	720	218	218	317.5	525	1157
2SL300-2UPA	300	780	243	250	342.9	735	1620
2SL320-2UPA	320	820	258	258	368.3	840	1851
2SL340-2UPA	340	870	280	272	393.7	1050	2314

Notes

Table of Contents

Metric Tapered Roller Bearings

Inch Tapered Roller Bearings

Metric Tapered Roller Bearings

Prefix
HR: High Capacity
Blank: Normal Capacity

Bore Size
(04 and up: multiply last two numbers by 5 to get bore in mm)
02: 12 mm **08:** 40 mm
03: 17 mm **10:** 50 mm
04: 20 mm **20:** 100 mm
Special bore sizes are as follows:
/22: 22 mm **/32:** 32 mm
/28: 28 mm

Interchangeability
J: Cup Angle and Raceway Diameter Conform to ISO 355
X: Dimension Series 32000 and 32900 the Major Dimensions Conform to ISO 355

HR	322	10	C	J

Series

30200	32200
30300	32300
31300	32900
32000	33000
	33100
	33200

Contact Angle
Blank: Standard Angle = 15° to 17°
C: Medium Angle = 17° to 24°
D: Steep Angle= 24° and more

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	B
	Steep Contact Angle	D	--	--	--
	Modified Internal Design	X	X	X	X
	Conforms to ISO 355	J	--	--	A

*HR313xx is directly equal to HR303xxD.

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

Applications

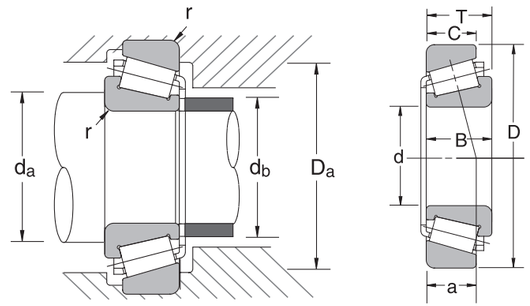
Shown below are some common applications utilizing a tapered roller bearing design. The design allows for combinations of heavy radial and thrust loads with low to moderate speeds. This section covers only single row tapers although NSK manufactures a full line of two and four row tapers as well. For more details on multiple row tapered roller bearings, please contact an NSK representative.

Metric designs function the same as their inch series cousins, the difference lies in the units of measure. NSK metric tapers are standardly supplied with cup and cone together, while inch series bearing are available by the cup, cone, or cup and cone. The applications shown below are for either metric or inch bearings, with the equipment manufacturer choosing the preference of dimensional measurements. Metric tapers are usually found in equipment designed in Europe or Asia.

› Guide Boxes in Bar and Rod Mills › Pumps and Compressors › Cranes and Hoists › Gears and Drives › Stamping Presses › Machine Tool Spindles › Bow Thrusts on Ships › Speed Reducers › Transmissions › Sheaves › Conveyor and Transfer Equipment › Construction Equipment › Mining Equipment › Oil Field Equipment › Automotive Front and Rear Axles › Plastic Forming Equipment › Agriculture Equipment › Motorcycle Wheels › Pinion Shafts of Differential Gears › Drum Shafts › Crankshafts › Crushers

Tapered Roller Bearings: 30200 Metric Series

Bore Diameter 15 – 320 mm, 0.5906 – 12.5984 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
30202	15	0.5906	35	1.3780	11.75	0.4626	11	0.4331	10	0.3937	0.02	0.906	0.748	1.181
30203J	17	0.6693	40	1.5748	13.25	0.5217	12	0.4724	11	0.4331	0.04	1.024	0.906	1.339
30204J	20	0.7874	47	1.8504	15.25	0.6004	14	0.5512	12	0.4724	0.04	1.142	1.063	1.614
30205J	25	0.9843	52	2.0472	16.25	0.6398	15	0.5906	13	0.5118	0.04	1.339	1.220	1.811
30206J	30	1.1811	62	2.4409	17.25	0.6791	16	0.6299	14	0.5512	0.04	1.535	1.457	2.205
30207J	35	1.3780	72	2.8346	18.25	0.7185	17	0.6693	15	0.5906	0.06	1.811	1.693	2.480
30208J	40	1.5748	80	3.1496	19.75	0.7776	18	0.7087	16	0.6299	0.06	2.008	1.890	2.795
30209J	45	1.7717	85	3.3465	20.75	0.8169	19	0.7480	16	0.6299	0.06	2.205	2.087	2.992
30210J	50	1.9685	90	3.5433	21.75	0.8563	20	0.7874	17	0.6693	0.06	2.402	2.283	3.189
30211J	55	2.1654	100	3.9370	22.75	0.8957	21	0.8268	18	0.7087	0.06	2.638	2.520	3.583
30212J	60	2.3622	110	4.3307	23.75	0.9350	22	0.8661	19	0.7480	0.06	2.835	2.717	3.976
30213J	65	2.5591	120	4.7244	24.75	0.9744	23	0.9055	20	0.7874	0.06	3.031	3.071	4.370
30214J	70	2.7559	125	4.9213	26.25	1.0335	24	0.9449	21	0.8268	0.06	3.228	3.189	4.567
30215J	75	2.9528	130	5.1181	27.25	1.0728	25	0.9843	22	0.8661	0.06	3.425	3.346	4.764
30216J	80	3.1496	140	5.5118	28.25	1.1122	26	1.0236	22	0.8661	0.08	3.740	3.583	5.118
30217J	85	3.3465	150	5.9055	30.50	1.2008	28	1.1024	24	0.9449	0.08	3.937	3.819	5.512
30218J	90	3.5433	160	6.2992	32.50	1.2795	30	1.1811	26	1.0236	0.08	4.134	4.055	5.906
30219J	95	3.7402	170	6.6929	34.50	1.3583	32	1.2598	27	1.0630	0.08	4.449	4.331	6.220
30220J	100	3.9370	180	7.0866	37.00	1.4567	34	1.3386	29	1.1417	0.08	4.646	4.567	6.614
30221J	105	4.1339	190	7.4803	39.00	1.5354	36	1.4173	30	1.1811	0.08	4.843	4.843	7.008
30222J	110	4.3307	200	7.8740	41.00	1.6142	38	1.4961	32	1.2598	0.08	5.039	5.079	7.402
30224J	120	4.7244	215	8.4646	43.50	1.7126	40	1.5748	34	1.3386	0.08	5.433	5.551	7.992
30226J	130	5.1181	230	9.0551	43.75	1.7224	40	1.5748	34	1.3386	0.10	5.945	5.945	8.504
30228J	140	5.5118	250	9.8425	45.75	1.8012	42	1.6535	36	1.4173	0.10	6.339	6.457	9.291
30230	150	5.9055	270	10.6299	49.00	1.9291	45	1.7717	38	1.4961	0.10	6.732	6.929	10.079
30232	160	6.2992	290	11.4173	52.00	2.0472	48	1.8898	40	1.5748	0.10	7.126	7.559	10.866
30234	170	6.6929	310	12.2047	57.00	2.2441	52	2.0472	43	1.6929	0.12	7.756	7.992	11.496
30236	180	7.0866	320	12.5984	57.00	2.2441	52	2.0472	43	1.6929	0.12	8.150	8.386	11.890
30238	190	7.4803	340	13.3858	60.00	2.3622	55	2.1654	46	1.8110	0.12	8.543	8.976	12.677
30240	200	7.8740	360	14.1732	64.00	2.5197	58	2.2835	48	1.8898	0.12	8.937	9.528	13.465
30244	220	8.6614	400	15.7480	72.00	2.8346	68	2.6772	54	2.1260	0.12	9.724	10.512	15.039
30248	240	9.4488	440	17.3228	79.00	3.1102	72	2.8346	60	2.3622	0.12	10.512	11.339	16.614
30252	260	10.2362	480	18.8976	89.00	3.5039	80	3.1496	67	2.6378	0.16	11.535	12.441	18.031
30256	280	11.0236	500	19.6850	89.00	3.5039	80	3.1496	67	2.6378	0.16	12.323	13.346	18.819
30260	300	11.8110	540	21.2598	96.00	3.7795	85	3.3465	71	2.7953	0.16	13.110	13.976	20.394
30264	320	12.5984	580	22.8346	104.00	4.0945	92	3.6220	75	2.9528	0.16	13.898	15.000	21.969

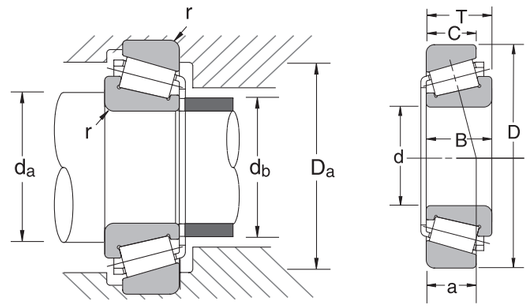
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
30202	3530	3210	11.00	15.00	0.32	0.12
30203J	4520	4470	9.50	13.00	0.38	0.17
30204J	6270	6410	8.00	11.00	0.43	0.28
30205J	7190	7870	7.10	10.00	0.50	0.35
30206J	9670	10700	6.00	8.00	0.55	0.52
30207J	12100	13400	5.30	7.10	0.59	0.75
30208J	14300	15700	4.80	6.30	0.65	0.97
30209J	15400	17900	4.30	6.00	0.72	1.08
30210J	17100	20600	4.00	5.30	0.77	1.23
30211J	21200	25400	3.60	5.00	0.82	1.62
30212J	23400	27700	3.40	4.50	0.87	2.05
30213J	27400	33900	3.00	4.00	0.94	2.60
30214J	29700	36600	2.80	4.00	1.01	2.87
30215J	32100	40900	2.80	3.80	1.06	3.15
30216J	35300	43800	2.60	3.40	1.11	3.73
30217J	41400	52400	2.40	3.20	1.19	4.67
30218J	45200	57600	2.20	3.00	1.25	5.73
30219J	50100	64300	2.20	2.80	1.33	6.90
30220J	57300	74200	2.00	2.60	1.42	8.33
30221J	62900	82100	1.90	2.60	1.50	9.94
30222J	70800	94400	1.80	2.40	1.58	11.64
30224J	75300	101000	1.60	2.20	1.75	13.85
30226J	84300	114000	1.50	2.00	1.80	15.99
30228J	87700	116000	1.40	1.90	1.93	19.27
30230	109032	128000	1.30	1.70	1.98	23.59
30232	119149	137000	1.20	1.60	2.17	28.89
30234	141630	155000	1.10	1.50	2.35	35.50
30236	146126	156000	1.10	1.40	2.44	36.60
30238	160738	178000	1.00	1.30	2.47	44.32
30240	178723	200000	0.90	1.30	2.58	52.48
30244	182000	259000	0.85	1.10	2.94	74.09
30248	223000	315000	0.75	1.00	3.35	99.67
30252	268000	382000	0.67	0.90	3.72	133.84
30256	279000	427000	0.63	0.85	3.88	146.19
30260	324000	472000	0.60	0.80	4.14	177.72
30264	369000	544000	0.53	0.75	4.48	218.96

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: 30300 Metric Series

Bore Diameter 15 – 260 mm, 0.5906 – 10.2362 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
30302J	15	0.5906	42	1.6535	14.25	0.5610	13	0.5118	11	0.4331	0.04	0.945	0.866	1.417
30303J	17	0.6693	47	1.8504	15.25	0.6004	14	0.5512	12	0.4724	0.04	1.024	0.945	1.614
30304J	20	0.7874	52	2.0472	16.25	0.6398	15	0.5906	13	0.5118	0.06	1.220	1.063	1.732
303/22	22	0.8661	56	2.2047	17.25	0.6791	16	0.6299	14	0.5512	0.06	1.280	1.197	1.850
30305J	25	0.9843	62	2.4409	18.25	0.7185	17	0.6693	15	0.5906	0.06	1.417	1.339	2.126
303/28	28	1.1024	68	2.6772	19.75	0.7776	18	0.7087	15	0.5906	0.06	1.535	1.457	2.323
30306J	30	1.1811	72	2.8346	20.75	0.8169	19	0.7480	16	0.6299	0.06	1.614	1.575	2.480
303/32	32	1.2598	75	2.9528	21.75	0.8563	20	0.7874	17	0.6693	0.06	1.693	1.654	2.598
30307J	35	1.3780	80	3.1496	22.75	0.8957	21	0.8268	18	0.7087	0.06	1.850	1.772	2.795
30308J	40	1.5748	90	3.5433	25.25	0.9941	23	0.9055	20	0.7874	0.06	2.047	2.047	3.189
30309J	45	1.7717	100	3.9370	27.25	1.0728	25	0.9843	22	0.8661	0.06	2.244	2.283	3.583
30310J	50	1.9685	110	4.3307	29.25	1.1516	27	1.0630	23	0.9055	0.08	2.559	2.559	3.937
30311J	55	2.1654	120	4.7244	31.50	1.2402	29	1.1417	25	0.9843	0.08	2.756	2.795	4.331
30312J	60	2.3622	130	5.1181	33.50	1.3189	31	1.2205	26	1.0236	0.10	3.071	3.031	4.646
30313J	65	2.5591	140	5.5118	36.00	1.4173	33	1.2992	28	1.1024	0.10	3.268	3.268	5.039
30314J	70	2.7559	150	5.9055	38.00	1.4961	35	1.3780	30	1.1811	0.10	3.465	3.504	5.433
30315J	75	2.9528	160	6.2992	40.00	1.5748	37	1.4567	31	1.2205	0.10	3.661	3.740	5.827
30316J	80	3.1496	170	6.6929	42.50	1.6732	39	1.5354	33	1.2992	0.10	3.858	4.016	6.220
30317J	85	3.3465	180	7.0866	44.50	1.7520	41	1.6142	34	1.3386	0.10	4.173	4.252	6.535
30318J	90	3.5433	190	7.4803	46.50	1.8307	43	1.6929	36	1.4173	0.10	4.252	4.500	7.087
30319J	95	3.7402	200	7.8740	49.50	1.9488	45	1.7717	38	1.4961	0.10	4.449	4.685	7.480
30320J	100	3.9370	215	8.4646	51.50	2.0276	47	1.8504	39	1.5354	0.10	4.646	5.039	7.913
30321J	105	4.1339	225	8.8583	53.50	2.1063	49	1.9291	41	1.6142	0.10	4.843	5.272	8.307
30322J	110	4.3307	240	9.4488	54.50	2.1457	50	1.9685	42	1.6535	0.10	5.039	5.638	8.898
30324J	120	4.7244	260	10.2362	59.50	2.3425	55	2.1654	46	1.8110	0.10	5.433	6.067	9.685
30326	130	5.1181	280	11.0236	63.75	2.5098	58	2.2835	49	1.9291	0.12	6.181	6.614	10.315
30328	140	5.5118	300	11.8110	67.75	2.6673	62	2.4409	53	2.0866	0.12	6.575	7.087	11.102
30330	150	5.9055	320	12.5984	72.00	2.8346	65	2.5591	55	2.1654	0.12	6.969	7.598	11.890
30332	160	6.2992	340	13.3858	75.00	2.9528	68	2.6772	58	2.2835	0.12	7.362	8.071	12.677
30334	170	6.6929	360	14.1732	80.00	3.1496	72	2.8346	62	2.4409	0.12	7.756	8.701	13.465
30336	180	7.0866	380	14.9606	83.00	3.2677	75	2.9528	64	2.5197	0.12	8.150	9.173	14.252
30338	190	7.4803	400	15.7480	86.00	3.3858	78	3.0709	65	2.5591	0.16	8.780	9.764	14.882
30340	200	7.8740	420	16.5354	89.00	3.5039	80	3.1496	67	2.6378	0.16	9.173	9.961	15.669
30344	220	8.6614	460	18.1102	97.00	3.8189	88	3.4646	73	2.8740	0.16	9.961	11.142	17.244
30348	240	9.4488	500	19.6850	105.00	4.1339	95	3.7402	80	3.1496	0.16	10.748	12.126	18.819
30352	260	10.2362	540	21.2598	113.00	4.4488	102	4.0157	85	3.3465	0.16	11.299	13.228	20.394

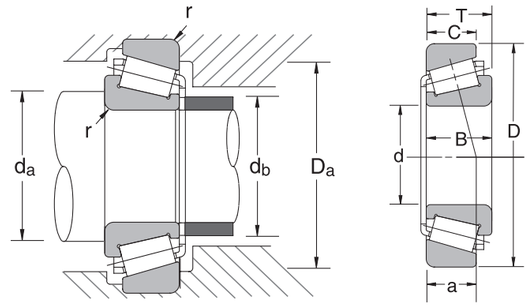
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
30302J	5310	4740	9.50	13.00	0.37	0.22
30303J	6560	6000	8.50	12.00	0.41	0.30
30304J	7870	7530	7.50	10.00	0.46	0.38
303/22	8320	8210	7.16	9.71	0.49	0.46
30305J	10700	10300	6.30	8.50	0.52	0.59
303/28	12400	12500	6.00	8.00	0.57	0.75
30306J	13400	13500	5.30	7.50	0.59	0.89
303/32	14600	15600	5.30	7.10	0.63	0.98
30307J	17100	17800	4.80	6.70	0.66	1.19
30308J	20300	22700	4.30	5.60	0.77	1.67
30309J	25200	28600	3.80	5.30	0.83	2.23
30310J	29200	33300	3.40	4.80	0.91	2.82
30311J	33700	38400	3.20	4.30	0.97	3.59
30312J	39100	45200	3.00	4.00	1.02	4.48
30313J	45000	52400	2.60	3.60	1.10	5.53
30314J	51000	60200	2.40	3.40	1.17	6.68
30315J	56900	67400	2.40	3.20	1.25	8.00
30316J	62000	74200	2.20	3.00	1.34	9.42
30317J	69700	84300	2.00	2.80	1.41	11.20
30318J	77600	95500	1.94	2.64	1.47	13.04
30319J	83200	102000	1.86	2.53	1.52	15.25
30320J	95500	118000	1.72	2.34	1.63	18.54
30321J	102000	127000	1.64	2.23	1.70	21.00
30322J	109000	134000	1.53	2.08	1.77	24.29
30324J	120000	147000	1.41	1.92	1.97	30.69
30326	123000	152000	1.30	1.80	2.12	36.60
30328	135000	166000	1.20	1.60	2.26	44.32
30330	155000	193000	1.10	1.50	2.42	53.36
30332	172000	216000	1.00	1.40	2.54	62.62
30334	190000	243000	0.95	1.30	2.76	73.87
30336	210000	277000	0.90	1.30	2.85	86.66
30338	227000	301000	0.85	1.20	3.00	101.43
30340	232000	312000	0.85	1.20	3.20	115.32
30344	321000	447000	0.75	1.00	3.36	159.64
30348	373000	526000	0.67	0.95	3.65	204.18
30352	420000	593000	0.62	0.84	4.00	251.98

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: 31300 Metric Series

Bore Diameter 25 - 150 mm, 0.9843 - 5.9055 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
31305J	25	0.9843	62	2.4409	18.25	0.7185	17	0.6693	13	0.5118	0.06	1.398	1.346	2.087
31306J	30	1.1811	72	2.8346	20.75	0.8169	19	0.7480	14	0.5512	0.06	1.594	1.575	2.480
31307J	35	1.3780	80	3.1496	22.75	0.8957	21	0.8268	15	0.5906	0.06	1.791	1.764	2.795
31308J	40	1.5748	90	3.5433	25.25	0.9941	23	0.9055	17	0.6693	0.06	1.988	2.000	3.189
31309J	45	1.7717	100	3.9370	27.25	1.0728	25	0.9843	18	0.7087	0.06	2.185	2.244	3.583
31310J	50	1.9685	110	4.3307	29.25	1.1516	27	1.0630	19	0.7480	0.08	2.441	2.465	3.937
31311J	55	2.1654	120	4.7244	31.50	1.2402	29	1.1417	21	0.8268	0.08	2.638	2.657	4.331
31312J	60	2.3622	130	5.1181	33.50	1.3189	31	1.2205	22	0.8661	0.08	2.953	2.929	4.646
31313J	65	2.5591	140	5.5118	36.00	1.4173	33	1.2992	23	0.9055	0.08	3.150	3.157	5.039
31314J	70	2.7559	150	5.9055	38.00	1.4961	35	1.3780	25	0.9843	0.08	3.346	3.366	5.433
31315J	75	2.9528	160	6.2992	40.00	1.5748	37	1.4567	26	1.0236	0.08	3.543	3.618	5.827
31316J	80	3.1496	170	6.6929	42.50	1.6732	39	1.5354	27	1.0630	0.08	3.740	3.823	6.220
31317J	85	3.3465	180	7.0866	44.50	1.7520	41	1.6142	28	1.1024	0.10	4.055	4.055	6.535
31318J	90	3.5433	190	7.4803	46.50	1.8307	43	1.6929	30	1.1811	0.10	4.252	4.339	6.929
31319J	95	3.7402	200	7.8740	49.50	1.9488	45	1.7717	32	1.2598	0.10	4.449	4.528	7.323
31320J	100	3.9370	215	8.4646	51.50	2.0276	47	1.8504	34	1.3386	0.10	4.646	7.913	7.913
31321J	105	4.1339	225	8.8583	53.50	2.1063	49	1.9291	35	1.3780	0.10	4.843	8.307	8.307
31322J	110	4.3307	240	9.4488	54.50	2.1457	50	1.9685	36	1.4173	0.10	5.039	8.898	8.898
31324J	120	4.7244	260	10.2362	68.00	2.6771	62	2.4409	42	1.6535	0.10	5.433	9.685	9.685
31326J	130	5.1181	280	11.0236	63.75	2.5098	58	2.2835	39	1.5354	0.12	5.945	10.315	10.315
31328J	140	5.5118	300	11.8110	67.75	2.6673	62	2.4409	43	1.6929	0.12	6.339	11.102	11.102
31330J	150	5.9055	320	12.5984	72.00	2.8346	65	2.5591	45	1.7717	0.12	6.732	11.890	11.890

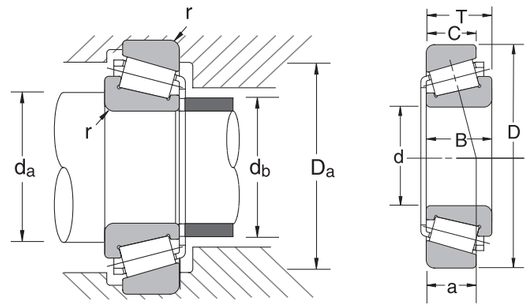
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
31305J	8540	9100	6.41	8.70	0.78	0.58
31306J	11000	11800	5.48	7.44	0.91	0.87
31307J	13900	15300	4.88	6.63	0.99	1.15
31308J	18000	20100	4.29	5.82	1.13	1.61
31309J	21500	24500	3.85	5.23	1.24	1.61
31310J	25600	29700	3.51	4.76	1.35	2.77
31311J	29400	34400	3.25	4.41	1.46	3.48
31312J	33900	39800	2.97	4.03	1.58	4.37
31313J	38900	46100	2.75	3.73	1.70	5.36
31314J	43200	51500	2.57	3.49	1.80	6.48
31315J	47400	56400	2.39	3.25	1.92	7.66
31316J	52800	63600	2.25	3.06	2.04	8.96
31317J	58700	70800	2.11	2.86	2.18	10.76
31318J	59300	70800	1.98	2.69	2.31	12.17
31319J	69700	84300	1.89	2.57	2.44	14.63
31320J	67200	114000	1.73	2.35	2.66	19.89
31321J	76400	121000	1.65	2.25	2.76	22.14
31322J	76400	136000	1.56	2.11	2.94	27.02
31324J	95500	164000	1.43	1.94	3.21	34.49
31326J	111300	184000	1.32	1.80	3.43	41.45
31328J	124800	215000	1.21	1.65	3.65	51.2
31330J	137100	247000	1.13	1.53	3.91	62.78

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: 32000 Metric Series

Bore Diameter 20 - 320 mm, 0.7874 – 12.5984 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
32004XJ	20	0.7874	42	1.6535	15	0.5906	15	0.5906	12.0	0.4724	0.02	1.102	0.945	1.457
320/22XJ	22	0.8661	44	1.7323	15	0.5906	15	0.5906	11.5	0.4528	0.02	1.182	1.064	1.537
32005XJ	25	0.9843	47	1.8504	15	0.5906	15	0.5906	11.5	0.4528	0.02	1.299	1.181	1.654
320/28XJ	28	1.1024	52	2.0472	16	0.6299	16	0.6299	12.0	0.4724	0.04	1.457	1.299	1.811
32006XJ	30	1.1811	55	2.1654	17	0.6693	17	0.6693	13.0	0.5118	0.04	1.535	1.378	1.929
320/32XJ	32	1.2598	58	2.2835	17	0.6693	17	0.6693	13.0	0.5118	0.04	1.614	1.457	2.047
32007XJ	35	1.3780	62	2.4409	18	0.7087	18	0.7087	14.0	0.5512	0.04	1.732	1.575	2.205
32008XJ	40	1.5748	68	2.6772	19	0.7480	19	0.7480	14.5	0.5709	0.04	1.929	1.772	2.441
32009XJ	45	1.7717	75	2.9528	20	0.7874	20	0.7874	15.5	0.6102	0.04	2.126	2.008	2.717
32010XJ	50	1.9685	80	3.1496	20	0.7874	20	0.7874	15.5	0.6102	0.04	2.323	2.205	2.913
32011XJ	55	2.1654	90	3.5433	23	0.9055	23	0.9055	17.5	0.6890	0.06	2.598	2.441	3.189
32012XJ	60	2.3622	95	3.7402	23	0.9055	23	0.9055	17.5	0.6890	0.06	2.795	2.598	3.386
32013XJ	65	2.5591	100	3.9370	23	0.9055	23	0.9055	17.5	0.6890	0.06	2.992	2.795	3.583
32014XJ	70	2.7559	110	4.3307	25	0.9843	25	0.9843	19.0	0.7480	0.06	3.189	3.031	3.976
32015XJ	75	2.9528	115	4.5276	25	0.9843	25	0.9843	19.0	0.7480	0.06	3.386	3.228	4.173
32016XJ	80	3.1496	125	4.9213	29	1.1417	29	1.1417	22.0	0.8661	0.06	3.583	3.504	4.567
32017XJ	85	3.3465	130	5.1181	29	1.1417	29	1.1417	22.0	0.8661	0.06	3.780	3.701	4.764
32018XJ	90	3.5433	140	5.5118	32	1.2598	32	1.2598	24.0	0.9449	0.06	4.016	3.898	5.157
32019XJ	95	3.7402	145	5.7087	32	1.2598	32	1.2598	24.0	0.9449	0.06	4.213	4.094	5.354
32020XJ	100	3.9370	150	5.9055	32	1.2598	32	1.2598	24.0	0.9449	0.06	4.409	4.291	5.551
32021XJ	105	4.1339	160	6.2992	35	1.3780	35	1.3780	26.0	1.0236	0.08	4.724	4.528	5.906
32022XJ	110	4.3307	170	6.6929	38	1.4961	38	1.4961	29.0	1.1417	0.08	4.921	4.764	6.299
32024XJ	120	4.7244	180	7.0866	38	1.4961	38	1.4961	29.0	1.1417	0.08	5.315	5.157	6.693
32026XJ	130	5.1181	200	7.8740	45	1.7717	45	1.7717	34.0	1.3386	0.08	5.709	5.669	7.480
32028XJ	140	5.5118	210	8.2677	45	1.7717	45	1.7717	34.0	1.3386	0.08	6.102	5.984	7.874
32030XJ	150	5.9055	225	8.8583	48	1.8898	48	1.8898	36.0	1.4173	0.08	6.614	6.457	8.386
32032XJ	160	6.2992	240	9.4488	51	2.0079	51	2.0079	38.0	1.4961	0.08	7.008	6.890	8.976
32034XJ	170	6.6929	260	10.2362	57	2.2441	57	2.2441	43.0	1.6929	0.08	7.402	7.362	9.764
32036XJ	180	7.0866	280	11.0236	64	2.5197	64	2.5197	48.0	1.8898	0.08	7.795	7.835	10.551
32038XJ	190	7.4803	290	11.4173	64	2.5197	64	2.5197	48.0	1.8898	0.08	8.189	8.228	10.945
32040XJ	200	7.8740	310	12.2047	70	2.7559	70	2.7559	53.0	2.0866	0.08	8.583	8.701	11.732
32044XJ	220	8.6614	340	13.3858	76	2.9921	76	2.9921	57.0	2.2441	0.12	9.488	9.606	12.835
32048XJ	240	9.4488	360	14.1732	76	2.9921	76	2.9921	57.0	2.2441	0.12	10.276	10.315	13.622
32052XJ	260	10.2362	400	15.7480	87	3.4252	87	3.4252	65.0	2.5591	0.12	11.299	11.299	15.039
32056XJ	280	11.0236	420	16.5354	87	3.4252	87	3.4252	65.0	2.5591	0.12	12.087	12.008	15.827
32060XJ	300	11.8110	460	18.1102	100	3.9370	100	3.9370	74.0	2.9134	0.12	12.874	12.992	17.402
32064XJ	320	12.5984	480	18.8976	100	3.9370	100	3.9370	74.0	2.9134	0.12	13.661	13.780	18.189

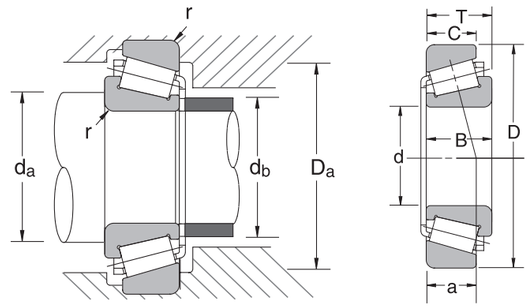
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
32004XJ	5530	6160	9.00	12.00	0.42	0.21
320/22XJ	5755	6610	8.50	11.00	0.44	0.23
32005XJ	6160	7420	8.00	11.00	0.46	0.26
320/28XJ	7194	8770	7.10	9.50	0.50	0.32
32006XJ	8093	10000	6.70	9.00	0.53	0.38
320/32XJ	8430	10600	6.30	8.50	0.56	0.42
32007XJ	9779	12500	5.60	8.00	0.59	0.51
32008XJ	11802	16000	5.30	7.10	0.59	0.62
32009XJ	13489	18700	4.50	6.30	0.65	0.78
32010XJ	13713	19600	4.30	6.00	0.70	0.84
32011XJ	18321	26300	3.80	5.30	0.78	1.25
32012XJ	19221	28600	3.60	5.00	0.82	1.34
32013XJ	19446	29700	3.40	4.50	0.88	1.42
32014XJ	23380	35500	3.20	4.30	0.93	1.92
32015XJ	24504	38400	3.00	4.00	0.99	2.04
32016XJ	31473	49900	2.80	3.60	1.06	2.91
32017XJ	32148	51900	2.60	3.60	1.11	3.04
32018XJ	38218	61400	2.40	3.20	1.17	3.92
32019XJ	38892	63600	2.40	3.20	1.23	4.15
32020XJ	39566	66100	2.20	3.00	1.28	4.30
32021XJ	45861	76400	2.00	2.80	1.35	5.47
32022XJ	53055	87700	2.00	2.60	1.41	6.81
32024XJ	54403	91000	1.80	2.40	1.56	7.21
32026XJ	71939	120000	1.60	2.20	1.73	11.16
32028XJ	73063	125000	1.60	2.20	1.83	11.73
32030XJ	84303	146000	1.40	2.00	1.96	14.55
32032XJ	95544	169000	1.30	1.80	2.09	17.49
32034XJ	113529	200000	1.20	1.70	2.23	23.37
32036XJ	143878	254000	1.20	1.60	2.38	31.53
32038XJ	146126	263000	1.10	1.50	2.49	32.85
32040XJ	170855	308000	1.00	1.40	2.65	41.67
32044XJ	198956	362000	0.95	1.30	2.90	53.80
32048XJ	206824	389000	0.85	1.20	3.11	57.77
32052XJ	260778	486000	0.80	1.10	3.40	84.89
32056XJ	265275	504000	0.71	1.00	3.61	89.52
32060XJ	323725	607000	0.67	0.90	3.87	124.80
32064XJ	339462	654000	0.63	0.85	4.11	132.30

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: 32200 Metric Series

Bore Diameter 17 - 320 mm, 0.6693 – 12.5984 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
32203J	17	0.6693	40	1.5748	17.25	0.6791	16	0.6299	14	0.5512	1.00	1.024	0.874	1.339
32204J	20	0.7874	47	1.8504	19.25	0.7579	18	0.7087	15	0.5906	1.00	1.142	0.996	1.614
322/22	22	0.8661	50	1.9685	19.25	0.7579	18	0.7087	15	0.5906	1.00	1.220	1.118	1.732
32205J	25	0.9843	52	2.0472	19.25	0.7579	18	0.7087	16	0.6299	1.00	1.339	1.213	1.811
322/28	28	1.1024	58	2.2835	20.25	0.7972	19	0.7480	16	0.6299	1.00	1.457	1.358	0.000
32206J	30	1.1811	62	2.4409	21.25	0.8366	20	0.7874	17	0.6693	1.00	1.535	1.449	2.205
322/32	32	1.2598	75	2.9528	21.75	0.8563	20	0.7874	17	0.6693	1.00	1.614	1.504	0.000
32207J	35	1.3780	72	2.8346	24.25	0.9547	23	0.9055	19	0.7480	1.50	1.791	1.685	2.480
32208J	40	1.5748	80	3.1496	24.75	0.9744	23	0.9055	19	0.7480	1.50	1.988	1.909	2.795
32209J	45	1.7717	85	3.3465	24.75	0.9744	23	0.9055	19	0.7480	1.50	2.185	2.106	2.992
32210J	50	1.9685	90	3.5433	24.75	0.9744	23	0.9055	19	0.7480	1.50	2.382	2.272	3.189
32211J	55	2.1654	100	3.9370	26.75	1.0531	25	0.9843	21	0.8268	1.50	2.579	2.496	3.583
32212J	60	2.3622	110	4.3307	29.75	1.1713	28	1.1024	24	0.9449	1.50	2.776	2.705	3.976
32213J	65	2.5591	120	4.7244	32.75	1.2894	31	1.2205	27	1.0630	1.50	2.972	2.953	4.370
32214J	70	2.7559	125	4.9213	33.25	1.3091	31	1.2205	27	1.0630	1.50	3.169	3.150	4.567
32215J	75	2.9528	130	5.1181	33.25	1.3091	31	1.2205	27	1.0630	1.50	3.366	3.307	4.764
32216J	80	3.1496	140	5.5118	35.25	1.3878	33	1.2992	28	1.1024	2.00	3.622	3.543	5.118
32217J	85	3.3465	150	5.9055	38.50	1.5157	36	1.4173	30	1.1811	2.00	3.819	3.780	5.512
32218J	90	3.5433	160	6.2992	42.50	1.6732	40	1.5748	34	1.3386	2.00	4.016	4.016	5.906
32219J	95	3.7402	170	6.6929	45.50	1.7913	43	1.6929	37	1.4567	2.00	4.331	4.252	6.220
32220J	100	3.9370	180	7.0866	49.00	1.9291	46	1.8110	39	1.5354	2.00	4.528	4.528	6.614
32221J	105	4.1339	190	7.4803	53.00	2.0866	50	1.9685	43	1.6929	2.00	4.724	4.724	7.008
32222J	110	4.3307	200	7.8740	56.00	2.2047	53	2.0866	46	1.8110	2.00	4.921	5.000	7.402
32224J	120	4.7244	215	8.4646	61.50	2.4213	58	2.2835	50	1.9685	2.00	5.315	5.394	7.992
32226J	130	5.1181	230	9.0551	67.75	2.6673	64	2.5197	54	2.1260	2.50	5.827	5.787	8.504
32228J	140	5.5118	250	9.8425	71.75	2.8248	68	2.6772	58	2.2835	2.50	6.220	6.260	9.291
32230J	150	5.9055	270	10.6299	77.00	3.0315	73	2.8740	60	2.3622	2.50	6.614	6.732	10.079
32232J	160	6.2992	290	11.4173	84.00	3.3071	80	3.1496	67	2.6378	2.50	7.008	7.252	10.866
32234J	170	6.6929	310	12.2047	91.00	3.5827	86	3.3858	71	2.7953	3.00	7.520	7.756	11.496
32236J	180	7.0866	320	12.5984	91.00	3.5827	86	3.3858	71	2.7953	3.00	7.913	8.091	11.890
32238J	190	7.4803	340	13.3858	97.00	3.8189	92	3.6220	75	2.9528	3.00	8.307	8.528	12.835
32240J	200	7.8740	360	14.1732	104.00	4.0945	98	3.8583	82	3.2283	3.00	8.701	9.075	13.465
32244J	220	8.6614	400	15.7480	114.00	4.4882	108	4.2520	90	3.5433	3.00	9.724	10.118	14.882
32248	240	9.4488	440	17.3228	127.00	5.0000	120	4.7244	100	3.9370	3.00	10.512	11.220	16.457
32252	260	10.2362	480	18.8976	137.00	5.3937	130	5.1181	106	4.1732	4.00	11.535	12.008	17.795
32256	280	11.0236	500	19.6850	137.00	5.3937	130	5.1181	106	4.1732	4.00	12.323	12.795	18.583
32260	300	11.8110	540	21.2598	149.00	5.8661	140	5.5118	115	4.5276	4.00	13.110	13.858	20.157
32264	320	12.5984	580	22.8346	159.00	6.2598	150	5.9055	125	4.9213	4.00	13.898	15.079	21.732

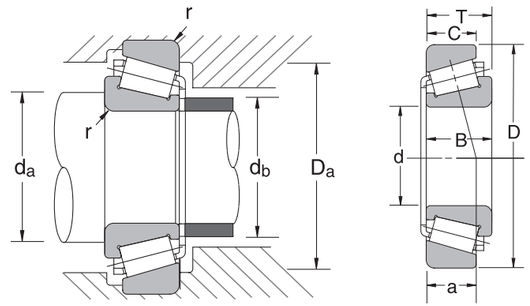
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
32203J	6090	6290	9.72	13.20	0.44	0.23
32204J	7980	8430	8.47	11.49	0.50	0.36
322/22	8210	9100	7.75	10.51	0.53	0.40
32205J	8990	10100	7.23	9.81	0.53	0.42
322/28	10700	12100	6.48	8.80	0.58	0.54
32206J	11700	13500	6.10	8.28	0.61	0.65
322/32	12600	14600	5.87	7.97	0.62	0.74
32207J	15800	18800	5.30	7.10	0.70	1.01
32208J	17300	20300	4.80	6.30	0.74	1.21
32209J	18700	22900	4.30	6.00	0.79	1.33
32210J	19700	24500	4.00	5.30	0.83	1.42
32211J	24700	30800	3.60	5.00	0.89	1.90
32212J	29400	37500	3.40	4.50	0.95	2.60
32213J	35300	45400	3.00	4.00	1.07	3.42
32214J	35300	46100	2.80	4.00	1.13	3.65
32215J	37100	49200	2.80	3.80	1.17	3.80
32216J	43200	57100	2.60	3.40	1.20	4.70
32217J	47200	62300	2.40	3.20	1.33	5.81
32218J	57600	78700	2.20	3.00	1.42	7.52
32219J	65000	89900	2.20	2.80	1.55	9.30
32220J	73100	101000	2.00	2.60	1.63	11.14
32221J	80900	115000	1.90	2.60	1.76	13.78
32222J	89900	127000	1.80	2.40	1.86	16.20
32224J	98900	143000	1.60	2.20	2.05	19.85
32226J	119000	178000	1.50	2.00	2.24	25.02
32228J	137000	206000	1.40	1.90	2.38	31.43
32230J	158000	243000	1.29	1.75	2.55	39.36
32232J	179000	274000	1.20	1.62	2.78	49.96
32234J	209000	326000	1.11	1.50	3.01	61.75
32236J	216000	346000	1.06	1.44	3.10	65.71
32238J	250000	398000	1.00	1.35	3.17	77.56
32240J	272000	432000	0.94	1.27	3.35	94.01
32244J	326000	526000	0.83	1.13	3.80	130.97
32248	366000	614000	0.74	1.01	4.03	172.07
32252	427000	742000	0.69	0.93	4.57	226.60
32256	438000	776000	0.65	0.88	4.84	240.82
32260	499000	832000	0.58	0.79	5.18	290.61
32264	643000	1140000	0.54	0.73	5.58	384.80

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: 32300 Metric Series

Bore Diameter 17 - 240 mm, 0.6693 – 9.4488 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
32303	17	0.6693	47	1.8504	20.25	0.7972	19	0.7480	16	0.6299	0.04	1.024	0.941	1.614
32304J	20	0.7874	52	2.0472	22.25	0.8760	21	0.8268	18	0.7087	0.06	1.201	1.024	1.693
32305J	25	0.9843	62	2.4409	25.25	0.9941	24	0.9449	20	0.7874	0.06	1.496	1.260	2.087
32306J	30	1.1811	72	2.8346	28.75	1.1319	27	1.0630	23	0.9055	0.06	1.693	1.496	2.480
32307J	35	1.3780	80	3.1496	32.75	1.2894	31	1.2205	25	0.9843	0.06	1.929	1.693	2.795
32308J	40	1.5748	90	3.5433	35.25	1.3878	33	1.2992	27	1.0630	0.06	2.126	1.969	3.189
32309J	45	1.7717	100	3.9370	38.25	1.5059	36	1.4173	30	1.1811	0.06	2.323	2.205	3.583
32310J	50	1.9685	110	4.3307	42.25	1.6634	40	1.5748	33	1.2992	0.08	2.677	2.441	3.937
32311J	55	2.1654	120	4.7244	45.50	1.7913	43	1.6929	35	1.3780	0.08	2.874	2.638	4.331
32312J	60	2.3622	130	5.1181	48.50	1.9094	46	1.8110	37	1.4567	0.10	3.189	2.913	4.646
32313J	65	2.5591	140	5.5118	51.00	2.0079	48	1.8898	39	1.5354	0.10	3.386	3.150	5.039
32314J	70	2.7559	150	5.9055	54.00	2.1260	51	2.0079	42	1.6535	0.10	3.583	3.386	5.433
32315J	75	2.9528	160	6.2992	58.00	2.2835	55	2.1654	45	1.7717	0.10	3.780	3.583	5.827
32316J	80	3.1496	170	6.6929	61.50	2.4213	58	2.2835	48	1.8898	0.10	3.976	3.858	6.220
32317J	85	3.3465	180	7.0866	63.50	2.5000	60	2.3622	49	1.9291	0.12	4.331	4.094	6.535
32318J	90	3.5433	190	7.4803	67.50	2.6575	64	2.5197	53	2.0866	0.12	4.528	4.291	6.929
32319J	95	3.7402	200	7.8740	71.50	2.8150	67	2.6378	55	2.1654	0.12	4.685	4.528	7.480
32320J	100	3.9370	215	8.4646	77.50	3.0512	73	2.8740	60	2.3622	0.12	4.925	4.925	7.913
32321J	105	4.1339	225	8.8583	81.50	3.2087	77	3.0315	63	2.4803	0.12	5.118	5.039	8.465
32322J	110	4.3307	240	9.4488	84.50	3.3268	80	3.1496	65	2.5591	0.12	5.319	5.477	8.898
32324J	120	4.7244	260	10.2362	90.50	3.5630	86	3.3858	69	2.7165	0.12	5.713	9.692	9.685
32326	130	5.1181	280	11.0236	98.75	3.8878	93	3.6614	78	3.0709	0.12	6.378	6.496	10.315
32328	140	5.5118	300	11.8110	107.75	4.2421	102	4.0157	85	3.3465	0.12	6.772	6.969	11.102
32330	150	5.9055	320	12.5984	114.00	4.4882	108	4.2520	90	3.5433	0.12	7.165	7.520	11.890
32332	160	6.2992	340	13.3858	121.00	4.7638	114	4.4882	95	3.7402	0.12	7.559	7.953	12.677
32334	170	6.6929	360	14.1732	127.00	5.0000	120	4.7244	100	3.9370	0.12	7.953	8.386	13.465
32336	180	7.0866	380	14.9606	134.00	5.2756	126	4.9606	106	4.1732	0.12	8.346	8.858	14.252
32340	200	7.8740	420	16.5354	146.00	5.7480	138	5.4331	115	4.5276	0.16	9.409	9.961	15.669
32344	220	8.6614	460	18.1102	154.00	6.0630	145	5.7087	122	4.8031	0.16	10.197	10.787	17.244
32348	240	9.4488	500	19.6850	165.00	6.4961	155	6.1024	132	5.1969	0.16	10.984	11.850	18.819

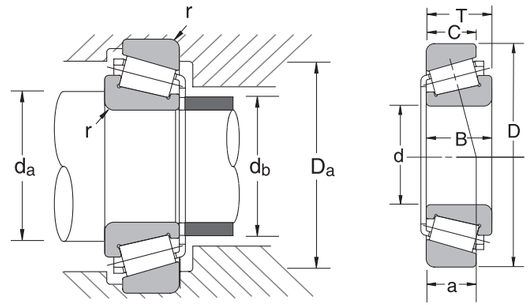
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
32303	7530	7190	8.74	11.86	0.49	0.39
32304J	10200	10700	8.00	11.00	0.55	0.53
32305J	14100	14800	6.30	8.50	0.61	0.83
32306J	18000	19900	5.60	7.50	0.71	1.26
32307J	22300	25000	5.00	6.70	0.81	1.69
32308J	27000	32600	4.30	6.00	0.92	2.32
32309J	32400	39800	3.80	5.30	0.98	3.13
32310J	39600	49500	3.60	4.80	1.10	4.15
32311J	45900	58000	3.20	4.30	1.18	5.27
32312J	52400	66300	3.00	4.00	1.24	6.53
32313J	60000	76400	2.80	3.80	1.34	7.94
32314J	67400	87700	2.60	3.40	1.42	9.59
32315J	76400	100000	2.40	3.20	1.53	11.71
32316J	86600	114000	2.20	3.00	1.63	14.00
32317J	92200	120000	2.00	2.80	1.71	16.12
32318J	101000	133000	2.00	2.60	1.83	18.96
32319J	111000	95000	1.90	2.60	1.93	22.00
32320J	127000	134000	1.70	2.40	2.09	28.00
32321J	151000	205000	1.70	2.20	2.17	32.00
32322J	152000	205000	1.50	2.00	2.30	38.50
32324J	173000	238000	1.40	1.90	2.46	48.00
32326	187000	259000	1.30	1.80	2.72	58.65
32328	221000	324000	1.20	1.60	3.01	74.75
32330	252000	382000	1.10	1.50	3.21	91.29
32332	272000	398000	1.00	1.40	3.43	106.50
32334	308000	461000	1.00	1.30	3.59	125.69
32336	342000	515000	0.95	1.30	3.80	147.29
32340	409000	645000	0.80	1.10	4.20	200.43
32344	454000	719000	0.75	1.00	4.52	251.37
32348	567000	922000	0.67	0.90	4.85	319.73

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: 32900 Metric Series

Bore Diameter 30 - 400 mm, 1.1811 – 15.7480 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
32906J	30	1.1811	47	1.8504	12	0.4724	12.0	0.4724	9.0	0.3543	0.01	1.339	0.053	1.732
32907J	35	1.3780	55	2.1654	14	0.5512	14.0	0.5512	11.5	0.4528	0.02	1.693	0.067	1.969
32908J	40	1.5748	62	2.4409	15	0.5906	15.0	0.5906	12.0	0.4724	0.02	1.890	0.074	2.244
32909J	45	1.7717	68	2.6772	15	0.5906	15.0	0.5906	12.0	0.4724	0.02	2.087	0.082	2.480
32910J	50	1.9685	72	2.8346	15	0.5906	15.0	0.5906	12.0	0.4724	0.02	2.283	0.090	2.638
32911J	55	2.1654	80	3.1496	17	0.6693	17.0	0.6693	14.0	0.5512	0.04	2.520	0.099	2.913
32912J	60	2.3622	85	3.3465	17	0.6693	17.0	0.6693	14.0	0.5512	0.04	2.717	0.107	3.110
32913J	65	2.5591	90	3.5433	17	0.6693	17.0	0.6693	14.0	0.5512	0.04	2.913	0.115	3.307
32914J	70	2.7559	100	3.9370	20	0.7874	20.0	0.7874	16.0	0.6299	0.04	3.110	0.122	3.701
32915J	75	2.9528	105	4.1339	20	0.7874	20.0	0.7874	16.0	0.6299	0.04	3.307	0.130	3.898
32916J	80	3.1496	110	4.3307	20	0.7874	20.0	0.7874	16.0	0.6299	0.04	3.504	0.138	4.094
32917J	85	3.3465	120	4.7244	23	0.9055	23.0	0.9055	18.0	0.7087	0.06	3.780	0.149	4.370
32918J	90	3.5433	125	4.9213	23	0.9055	23.0	0.9055	18.0	0.7087	0.06	3.976	0.157	4.567
32919J	95	3.7402	130	5.1181	23	0.9055	23.0	0.9055	18.0	0.7087	0.06	4.173	0.164	4.764
32920J	100	3.9370	140	5.5118	25	0.9843	25.0	0.9843	20.0	0.7874	0.06	4.409	0.174	5.197
32921J	105	4.1339	145	5.7087	25	0.9843	25.0	0.9843	20.0	0.7874	0.06	4.606	0.181	5.394
32922J	110	4.3307	150	5.9055	25	0.9843	25.0	0.9843	20.0	0.7874	0.06	4.803	0.189	5.591
32924J	120	4.7244	165	6.4961	29	1.1417	29.0	1.1417	23.0	0.9055	0.06	5.236	0.206	6.142
32926J	130	5.1181	180	7.0866	32	1.2598	32.0	1.2598	25.0	0.9843	0.06	5.709	0.225	6.850
32928J	140	5.5118	190	7.4803	32	1.2598	32.0	1.2598	25.0	0.9843	0.06	6.102	0.240	7.087
32930J	150	5.9055	210	8.2677	38	1.4961	38.0	1.4961	30.0	1.1811	0.08	6.614	0.260	7.874
32932J	160	6.2992	220	8.6614	38	1.4961	38.0	1.4961	30.0	1.1811	0.08	7.008	0.276	8.189
32934J	170	6.6929	230	9.0551	38	1.4961	38.0	1.4961	30.0	1.1811	0.08	7.362	0.290	8.701
32936J	180	7.0866	250	9.8425	45	1.7717	45.0	1.7717	34.0	1.3386	0.08	7.913	0.312	9.370
32938J	190	7.4803	260	10.2362	45	1.7717	45.0	1.7717	34.0	1.3386	0.08	8.268	0.326	9.764
32940J	200	7.8740	280	11.0236	51	2.0079	51.0	2.0079	39.0	1.5354	0.10	8.819	0.347	10.669
32944J	220	8.6614	300	11.8110	51	2.0079	51.0	2.0079	39.0	1.5354	0.10	9.567	0.377	11.339
32948J	240	9.4488	320	12.5984	51	2.0079	51.0	2.0079	39.0	1.5354	0.10	10.394	0.409	12.126
32952J	260	10.2362	360	14.1732	64	2.5000	63.5	2.5000	48.0	1.8898	0.10	11.299	0.445	13.701
32956J	280	11.0236	380	14.9606	64	2.5000	63.5	2.5000	48.0	1.8898	0.10	12.126	0.477	14.055
32960J	300	11.8110	420	16.5354	76	2.9921	76.0	2.9921	57.0	2.2441	0.12	13.189	0.519	15.512
32964	320	12.5984	440	17.3228	76	2.9921	72.0	2.8346	63.0	2.4803	0.10	13.940	13.190	16.220
32968J	340	13.3858	460	18.1102	76	2.9921	76.0	2.9921	57.0	2.2441	0.10	14.724	0.580	17.047
32972J	360	14.1732	480	18.8976	76	2.9921	76.0	2.9921	57.0	2.2441	0.10	15.512	0.611	17.795
32976	380	14.9606	520	20.4724	87	3.4252	82.0	3.2283	71.0	2.7953	0.12	16.024	16.024	19.764
32980	400	15.7480	540	21.2598	87	3.4252	82.0	3.2283	71.0	2.7953	0.12	16.811	16.850	20.551

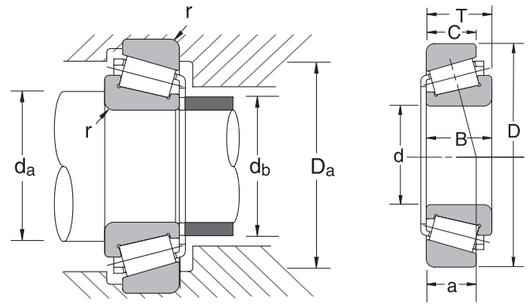
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
32906J	3960	5490	7.50	10.00	0.36	0.16
32907J	6160	8770	6.30	8.50	0.42	0.27
32908J	7640	10600	5.60	7.50	0.45	0.36
32909J	7760	11400	5.00	67.00	0.48	0.41
32910J	8090	12100	4.50	6.30	0.53	0.43
32911J	10200	16700	4.30	5.60	0.57	0.62
32912J	11000	19000	3.80	5.30	0.61	0.67
32913J	11000	19400	3.60	5.00	0.66	0.71
32914J	15700	25400	3.20	4.50	0.69	1.09
32915J	16300	27000	3.20	4.30	0.74	1.17
32916J	16900	28800	3.00	4.50	0.78	1.23
32917J	21000	35300	3.20	4.30	0.82	1.76
32918J	21800	37500	3.00	4.00	0.87	1.85
32919J	22000	38700	2.80	3.80	0.91	1.93
32920J	26300	46100	2.60	3.60	0.95	2.60
32921J	26800	47700	2.40	3.40	1.00	2.71
32922J	27700	50400	2.20	3.20	1.04	2.84
32924J	36200	63600	2.20	3.00	1.15	3.97
32926J	45000	82100	2.20	2.80	1.24	5.42
32928J	46300	87700	1.90	2.60	1.32	5.82
32930J	63200	117000	1.50	2.00	1.44	8.93
32932J	66500	128000	1.40	1.90	1.52	9.53
32934J	66100	126000	1.40	1.80	1.64	9.79
32936J	78700	154000	1.30	1.70	2.12	14.46
32938J	82100	161000	1.20	1.60	2.18	15.06
32940J	108000	210000	1.10	1.50	2.13	21.28
32944J	110000	223000	1.00	1.40	2.33	22.71
32948J	112000	234000	0.90	1.30	2.56	24.48
32952J	164000	326000	0.80	1.10	2.75	41.01
32956J	172000	355000	0.80	1.10	2.96	44.10
32960J	227000	472000	0.70	1.00	3.15	69.24
32964	202000	423000	0.70	0.90	3.32	70.56
32968J	234000	499000	0.60	0.80	3.58	75.63
32972J	243000	526000	0.60	0.80	3.81	79.60
32976	270000	569000	0.55	0.74	3.75	109.15
32980	279000	602000	0.52	0.70	3.97	116.20

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: 33000 Metric Series

Bore Diameter 25 - 120 mm, 0.9843 – 4.7244 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
33005J	25	0.9843	47	1.8504	17	0.6693	17	0.6693	14.0	0.5512	0.02	1.299	1.142	1.654
33006J	30	1.1811	55	2.1654	20	0.7874	20	0.7874	16.0	0.6299	0.04	1.535	1.378	1.929
33007J	35	1.3780	62	2.4409	21	0.8268	21	0.8268	17.0	0.6693	0.04	1.732	1.575	2.205
33008J	40	1.5748	68	2.6772	22	0.8661	22	0.8661	18.0	0.7087	0.04	1.929	1.772	2.441
33009J	45	1.7717	75	2.9528	24	0.9449	24	0.9449	19.0	0.7480	0.04	2.126	2.008	2.717
33010J	50	1.9685	80	3.1496	24	0.9449	24	0.9449	19.0	0.7480	0.04	2.323	2.165	2.913
33011J	55	2.1654	90	3.5433	27	1.0630	27	1.0630	21.0	0.8268	0.06	2.598	2.441	3.189
33012J	60	2.3622	95	3.7402	27	1.0630	27	1.0630	21.0	0.8268	0.06	2.795	2.598	3.386
33013J	65	2.5591	100	3.9370	27	1.0630	27	1.0630	21.0	0.8268	0.06	2.992	2.795	3.583
33014J	70	2.7559	110	4.3307	31	1.2205	31	1.2205	25.5	1.0039	0.06	3.189	3.071	3.976
33015J	75	2.9528	115	4.5276	31	1.2205	31	1.2205	25.5	1.0039	0.06	3.386	3.268	4.173
33016J	80	3.1496	125	4.9213	36	1.4173	36	1.4173	29.5	1.1614	0.06	3.583	3.465	4.567
33017J	85	3.3465	130	5.1181	36	1.4173	36	1.4173	29.5	1.1614	0.06	3.780	3.701	4.764
33018J	90	3.5433	140	5.5118	39	1.5354	39	1.5354	32.5	1.2795	0.06	4.016	3.898	5.157
33019J	95	3.7402	145	5.7087	39	1.5354	39	1.5354	32.5	1.2795	0.06	4.213	4.094	5.354
33020J	100	3.9370	150	5.9055	39	1.5354	39	1.5354	32.5	1.2795	0.06	4.409	4.213	5.551
33021J	105	4.1339	160	6.2992	43	1.6929	43	1.6929	34.0	1.3386	0.08	4.724	4.528	5.906
33022J	110	4.3307	170	6.6929	47	1.8504	47	1.8504	37.0	1.4567	0.08	4.921	4.764	6.299
33024J	120	4.7244	180	7.0866	48	1.8898	48	1.8898	38.0	1.4961	0.08	5.236	5.197	6.693

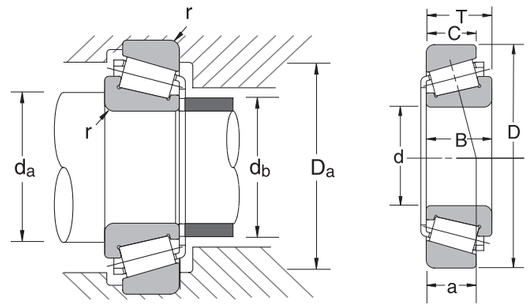
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
33005J	6970	8540	8.00	11.00	0.46	0.26
33006J	9440	12100	6.70	9.00	0.52	0.46
33007J	11000	14600	5.60	8.00	0.56	0.59
33008J	13300	18300	5.30	7.10	0.57	0.71
33009J	15100	21200	4.80	6.30	0.64	0.91
33010J	15800	23400	4.30	6.00	0.69	1.00
33011J	20600	31000	3.80	5.30	0.76	1.45
33012J	21600	33700	3.60	5.00	0.79	1.57
33013J	21900	35100	3.40	4.50	0.83	1.68
33014J	28600	45900	3.00	4.30	0.87	2.45
33015J	29900	49500	3.00	4.00	0.91	2.60
33016J	38700	63400	2.80	3.60	1.00	3.66
33017J	40500	68600	2.60	3.60	1.04	3.86
33018J	49500	80900	2.40	3.20	1.10	4.87
33019J	51900	87700	2.40	3.20	1.13	5.07
33020J	52800	91000	2.20	3.00	1.15	5.25
33021J	57600	97800	2.00	2.80	1.22	6.68
33022J	66100	116000	2.00	2.60	1.33	8.47
33024J	67400	121000	1.80	2.40	1.44	9.50

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: 33100 Metric Series

Bore Diameter 45 - 110 mm, 1.7717 – 4.3307 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
33109J	45	1.7717	80	3.1496	26	1.0236	26	1.0236	20.5	0.8071	0.06	2.205	2.008	2.795
33110J	50	1.9685	85	3.3465	26	1.0236	26	1.0236	20.0	0.7874	0.06	2.402	2.205	2.992
33111J	55	2.1654	95	3.7402	30	1.1811	30	1.1811	23.0	0.9055	0.06	2.598	2.441	3.386
33112J	60	2.3622	100	3.9370	30	1.1811	30	1.1811	23.0	0.9055	0.06	2.795	2.677	3.583
33113J	65	2.5591	110	4.3307	34	1.3386	34	1.3386	26.5	1.0433	0.06	2.992	2.874	3.976
33114J	70	2.7559	120	4.7244	37	1.4567	37	1.4567	29.0	1.1417	0.06	3.228	3.110	4.370
33115J	75	2.9528	125	4.9213	37	1.4567	37	1.4567	29.0	1.1417	0.06	3.425	3.268	4.567
33116J	80	3.1496	130	5.1181	37	1.4567	37	1.4567	29.0	1.1417	0.06	3.622	3.465	4.764
33117J	85	3.3465	140	5.5118	41	1.6142	41	1.6142	32.0	1.2598	0.08	3.937	3.701	5.118
33118J	90	3.5433	150	5.9055	45	1.7717	45	1.7717	35.0	1.3780	0.08	4.134	3.937	5.512
33120J	100	3.9370	165	6.4961	52	2.0472	52	2.0472	40.0	1.5748	0.08	4.528	4.370	6.102
33122J	110	4.3307	180	7.0866	56	2.2047	56	2.2047	43.0	1.6929	0.08	4.961	4.764	6.693

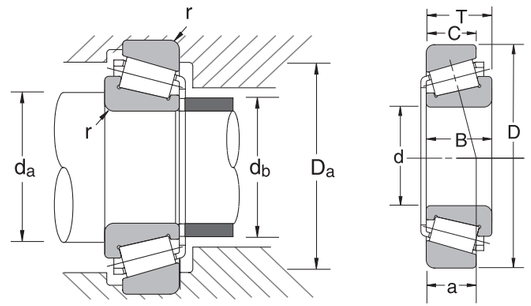
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
33109J	18900	25400	4.50	6.00	0.75	1.22
33110J	20000	28300	4.30	5.60	0.80	1.32
33111J	25200	35500	3.80	5.00	0.88	1.93
33112J	25900	37300	3.40	4.80	0.93	2.01
33113J	33300	49000	3.20	4.30	1.02	2.91
33114J	39800	58900	3.00	4.00	1.10	3.77
33115J	40900	61800	2.80	3.80	1.15	3.97
33116J	41800	65000	2.60	3.60	1.20	4.15
33117J	51700	82100	2.40	3.40	1.29	5.53
33118J	58200	91000	2.40	3.20	1.39	6.92
33120J	70800	116000	2.10	2.80	1.59	9.70
33122J	82100	137000	1.90	2.60	1.74	12.2

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: 33200 Metric Series

Bore Diameter 25 - 100 mm, 0.9843 – 3.9370 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
33205J	25	0.9843	52	2.0472	22	0.8661	22	0.8661	18.0	0.7087	0.71	1.339	1.142	1.811
33206J	30	1.1811	62	2.4409	25	0.9843	25	0.9843	19.5	0.7677	0.77	1.535	1.378	2.205
33207J	35	1.3780	72	2.8346	28	1.1024	28	1.1024	22.0	0.8661	0.87	1.811	1.614	2.480
33208J	40	1.5748	80	3.1496	32	1.2598	32	1.2598	25.0	0.9843	0.98	2.008	1.811	2.795
33209J	45	1.7717	85	3.3465	32	1.2598	32	1.2598	25.0	0.9843	0.98	2.205	2.008	2.992
33210J	50	1.9685	90	3.5433	32	1.2598	32	1.2598	24.5	0.9646	0.96	2.402	2.205	3.189
33211J	55	2.1654	100	3.9370	35	1.3780	35	1.3780	27.0	1.0630	1.06	2.638	2.441	3.583
33212J	60	2.3622	110	4.3307	38	1.4961	38	1.4961	29.0	1.1417	1.14	2.835	2.677	3.976
33213J	65	2.5591	120	4.7244	41	1.6142	41	1.6142	32.0	1.2598	1.26	3.031	2.913	4.370
33214J	70	2.7559	125	4.9213	41	1.6142	41	1.6142	32.0	1.2598	1.26	3.228	3.071	4.567
33215J	75	2.9528	130	5.1181	41	1.6142	41	1.6142	31.0	1.2205	1.22	3.425	3.268	4.764
33216J	80	3.1496	140	5.5118	46	1.8110	46	1.8110	35.0	1.3780	1.38	3.740	3.504	5.118
33217J	85	3.3465	150	5.9055	49	1.9291	49	1.9291	37.0	1.4567	1.46	3.937	3.740	5.512
33220J	100	3.9370	180	7.0866	63	2.4803	63	2.4803	48.0	1.8898	1.89	4.646	4.524	6.378

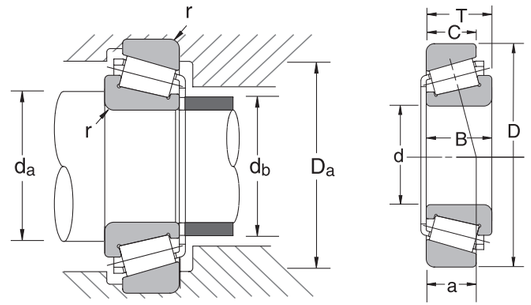
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
33205J	10680	12700	7.50	10.0	0.56	0.49
33206J	14950	17900	6.00	8.0	0.63	0.78
33207J	19450	24300	5.30	7.1	0.72	1.19
33208J	24050	30800	4.80	6.3	0.82	1.64
33209J	24950	33000	4.30	6.0	0.87	1.80
33210J	26530	37100	4.00	5.3	0.91	1.91
33211J	31700	43400	3.60	5.0	0.99	2.60
33212J	37320	51900	3.40	4.5	1.09	3.44
33213J	45410	63400	3.00	4.0	1.15	4.50
33214J	46990	67200	2.80	4.0	1.20	4.74
33215J	48330	70800	2.80	3.8	1.24	4.96
33216J	57550	86600	2.60	3.4	1.37	6.46
33217J	63170	93300	2.40	3.2	1.47	7.87
33220J	92170	143000	1.97	2.7	1.81	14.91

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: Metric Series – Medium Angle 30200C Series

Bore Diameter 20 - 85 mm, 0.7874 – 3.3465 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
30204C	20	0.7874	47	1.8504	15.25	0.6004	14	0.5512	12	0.4724	0.039	1.143	1.024	1.615
302/22C	22	0.8661	50	1.9685	15.25	0.6004	14	0.5512	12	0.4724	0.039	1.221	1.143	1.734
30205C	25	0.9843	52	2.0472	16.25	0.6398	15	0.5906	12	0.4724	0.039	1.340	1.261	1.812
302/28C	28	1.1024	58	2.2835	17.25	0.6791	16	0.6299	12	0.4724	0.039	1.458	1.340	2.049
30206C	30	1.1811	62	2.4409	17.25	0.6791	16	0.6299	12	0.4724	0.059	1.537	1.418	2.206
302/32C	32	1.2598	65	2.5591	18.25	0.7185	17	0.6693	13	0.5118	0.039	1.615	1.537	2.325
30207C	35	1.3780	72	2.8346	18.25	0.7185	17	0.6693	13	0.5118	0.059	1.812	1.734	2.482
30208C	40	1.5748	80	3.1496	19.75	0.7776	18	0.7087	14	0.5512	0.059	2.009	1.931	2.797
30209C	45	1.7717	85	3.3465	20.75	0.8169	19	0.7480	15	0.5906	0.059	2.206	2.087	2.992
30210C	50	1.9685	90	3.5433	21.75	0.8563	20	0.7874	16	0.6299	0.059	2.403	2.283	3.189
30216C	80	3.1496	140	5.5118	28.25	1.1122	26	1.0236	20	0.7874	0.118	3.743	3.622	5.118
30217C	85	3.3465	150	5.9055	30.50	1.2008	28	1.1024	22	0.8661	0.118	3.940	3.858	5.512

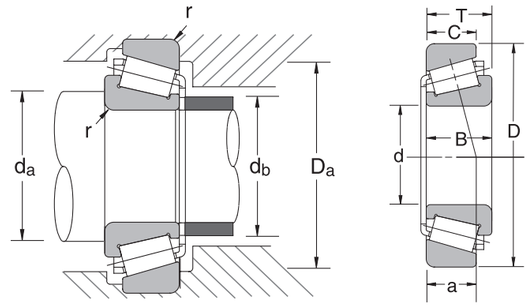
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
30204C	5370	5400	8.0	11.00	0.51	0.269
302/22C	6110	6630	7.5	10.00	0.51	0.305
30205C	6320	7080	6.7	9.50	0.57	0.330
302/28C	7640	8660	6.3	8.50	0.67	0.445
30206C	7980	8320	5.6	7.50	0.70	0.525
302/32C	10200	11800	5.6	7.50	0.67	0.590
30207C	10600	12300	5.0	6.70	0.77	0.715
30208C	24100	29000	4.5	6.00	0.85	0.935
30209C	14200	17600	4.3	5.60	0.84	1.050
30210C	15700	20900	3.8	5.30	0.95	1.190
30216C	33000	42700	2.6	3.40	1.33	3.600
30217C	38400	50800	2.4	3.20	1.43	4.500

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: Metric Series – Medium Angle 30300C Series

Bore Diameter 20 - 95 mm, 0.7874 – 3.7402 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
30304C	20	0.7874	52	2.0472	16.25	0.6398	16	0.6299	12	0.4724	0.079	1.221	1.064	1.694
303/22C	22	0.8661	56	2.2047	17.25	0.6791	16	0.6299	13	0.5118	0.039	1.300	1.182	1.852
30305C	25	0.9843	62	2.4409	18.25	0.7185	17	0.6693	14	0.5512	0.059	1.418	1.379	2.088
303/28C	28	1.1024	68	2.6772	19.75	0.7776	18	0.7087	14	0.5512	0.059	1.537	1.497	2.325
30306C	30	1.1811	72	2.8346	20.75	0.8169	19	0.7480	14	0.5512	0.079	1.615	1.497	2.482
303/32C	32	1.2598	75	2.9528	21.75	0.8563	20	0.7874	16	0.6299	0.039	1.694	1.694	2.600
30307C	35	1.3780	80	3.1496	22.75	0.8957	21	0.8268	16	0.6299	0.059	1.852	1.734	2.797
30308C	40	1.5748	90	3.5433	25.25	0.9941	23	0.9055	18	0.7087	0.059	2.049	1.970	3.191
30309C	45	1.7717	100	3.9370	27.25	1.0728	25	0.9843	19	0.7480	0.059	2.246	2.246	3.583
30310C	50	1.9685	110	4.3307	29.25	1.1516	27	1.0630	20	0.7874	0.079	2.561	2.559	3.937
30314C	70	2.7559	150	5.9055	38.00	1.4961	35	1.3780	27	1.0630	0.138	3.467	3.425	5.433
30319C	95	3.7402	200	7.8740	49.50	1.9488	45	1.7717	36	1.4173	0.157	4.570	4.685	7.323

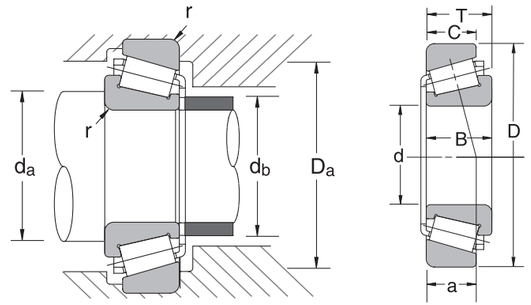
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
30304C	6970	6500	8.0	11.0	0.530	0.370
303/22C	7760	7640	6.7	9.5	0.630	0.440
30305C	9440	10100	6.0	8.5	0.650	0.585
303/28C	11100	11400	5.6	7.5	0.690	0.740
30306C	12700	12500	5.3	7.1	0.730	0.860
303/32C	13400	15400	5.0	6.7	0.740	0.980
30307C	15300	15800	4.8	6.3	0.800	1.120
30308C	19000	21000	4.3	5.6	0.890	1.580
30309C	23200	26300	3.6	5.0	1.000	2.170
30310C	26800	31000	3.4	4.5	1.100	2.760
30314C	45200	53100	2.4	3.4	1.440	6.200
30319C	78700	96700	1.9	2.6	1.920	15.000

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: Metric Series – Medium Angle 32200C Series

Bore Diameter 20 - 60 mm, 0.7874 - 2.3622 inch



Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
32204C	20	0.7874	47	1.8504	19.25	0.7579	18	0.7087	15	0.5906	0.059	1.143	0.984	1.615
322/22C	22	0.8661	50	1.9685	19.25	0.7579	18	0.7087	15	0.5906	0.039	1.221	1.143	1.734
32205C	25	0.9843	52	2.0472	19.25	0.7579	18	0.7087	15	0.5906	0.039	1.340	1.182	1.812
322/28C	28	1.1024	58	2.2835	20.25	0.7972	19	0.7480	15	0.5906	0.059	1.458	1.300	2.049
32206C	30	1.1811	62	2.4409	21.25	0.8366	20	0.7874	16	0.6299	0.059	1.537	1.379	2.206
322/32C	32	1.2598	65	2.5591	22.25	0.8760	21	0.8268	17	0.6693	0.039	1.615	1.537	2.325
32207C	35	1.3780	72	2.8346	24.25	0.9547	23	0.9055	18	0.7087	0.059	1.812	1.655	3.664
32208C	40	1.5748	80	3.1496	24.75	0.9744	23	0.9055	18	0.7087	0.059	2.009	1.850	2.797
32209C	45	1.7717	85	3.3465	24.75	0.9744	23	0.9055	18	0.7087	0.059	2.206	2.047	2.992
32210C	50	1.9685	90	3.5433	24.75	0.9744	23	0.9055	18	0.7087	0.079	2.403	2.283	3.189
32212C	60	2.3622	110	4.3307	29.75	1.1713	28	1.1024	22	0.8661	0.098	2.837	2.677	3.976

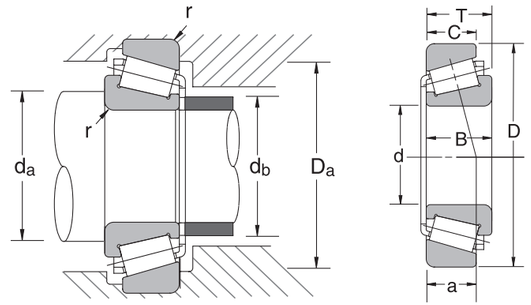
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
32204C	7080	7530	8.5	11.0	0.57	0.355
322/22C	7530	8880	7.5	10.0	0.60	0.390
32205C	7870	9440	7.1	9.5	0.62	0.415
322/28C	9440	11200	6.3	8.5	0.64	0.530
32206C	10800	12600	6.0	8.0	0.70	0.630
322/32C	11100	13500	5.6	7.5	0.80	0.730
32207C	13600	16100	5.0	7.1	0.81	0.950
32208C	16600	20300	4.8	6.3	0.85	1.200
32209C	17000	21500	4.3	6.0	0.96	1.300
32210C	17600	23200	4.0	5.4	0.98	1.380
32212C	23600	29200	3.4	4.5	1.08	2.450

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: Metric Series – Medium Angle 32300C Series

Bore Diameter 20 - 75 mm, 0.7874 - 2.9528 inch



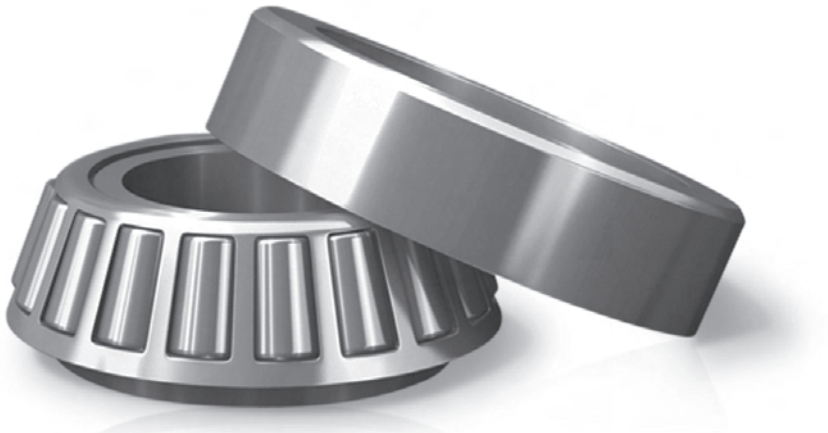
Bearing Number	Nominal Bearing Dimensions										Preferred Shoulder Diameters (in)			
	d		D		T		B		C					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	r*	d_a (min)	d_b (max)	D_a (max)
32304C	20	0.7874	52	2.0472	22.25	0.8760	21	0.8268	17	0.6693	0.059	1.300	1.024	1.694
323/28C	28	1.1024	68	2.6772	25.75	1.0138	24	0.9449	19	0.7480	0.059	1.615	1.379	2.325
32305C	25	0.9843	62	2.4409	25.25	0.9941	24	0.9449	19	0.7480	0.059	1.497	1.300	2.088
323/32C	32	1.2598	75	2.9528	29.75	1.1713	28	1.1024	22	0.8661	0.059	1.773	1.615	2.600
32306C	30	1.1811	72	2.8346	28.75	1.1319	27	1.0630	22	0.8661	0.079	1.694	1.418	2.482
32307C	35	1.3780	80	3.1496	32.75	1.2894	31	1.2205	24	0.9449	0.059	1.931	1.734	2.797
32308C	40	1.5748	90	3.5433	35.25	1.3878	33	1.2992	25	0.9843	0.059	2.128	1.891	3.191
32309C	45	1.7717	100	3.9370	38.25	1.5059	36	1.4173	28	1.1024	0.059	2.325	2.206	3.583
32310C	50	1.9685	110	4.3307	42.25	1.6634	40	1.5748	31	1.2205	0.079	2.677	2.323	3.937
32312C	60	2.3622	130	5.1181	48.50	1.9094	46	1.8110	35	1.3780	0.138	3.191	2.913	4.646
32314C	70	2.7559	150	5.9055	54.00	2.1260	51	2.0079	39	1.5354	0.138	3.585	3.346	5.433
32315C	75	2.9528	160	6.2992	58.00	2.2835	55	2.1654	43	1.6929	0.138	3.782	3.543	5.827

*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Effective Load Center (inches)	Bearing Weight Approx.
	C_r	C_{or}	Grease	Oil	a	lbs
32304C	9440	10000	7.5	10.0	0.65	0.515
323/28C	14400	15600	5.6	7.5	0.83	0.980
32305C	12500	14400	6.3	8.5	0.77	0.805
323/32C	19000	21400	5.0	7.1	0.87	1.370
32306C	17100	19400	5.6	7.5	0.83	1.220
32307C	20000	24700	4.8	6.3	0.93	1.700
32308C	24100	29000	4.3	5.6	1.06	2.270
32309C	29900	37800	3.8	5.0	1.21	3.050
32310C	36900	49000	3.6	4.8	1.32	4.050
32312C	44100	56000	3.0	4.0	1.57	6.150
32314C	58900	76400	2.4	3.4	1.74	8.950
32315C	69700	94400	2.4	3.2	1.88	11.600

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Inch Tapered Roller Bearings



Prefix
EH: Extra Heavy
EL: Extra Light
H: Heavy
HH: Heavier than Heavy
HM: Heavy Medium
L: Light
LL: Lighter than Light
LM: Light Medium
M: Medium

Basic Series
1-3 digit number that identifies maximum bore range

Additional Features*
R: Conforms to ABMA Standard
G: Case Carburized Cups & Cone

*NSK uses these two standard suffixes. Either one or two letter suffixes may appear.

LM	1	19	49	R

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

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	E	L EL	KEL
Cup Angle	0° To 23°59'59.99	1xxxx	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 ABMA 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 contact NSK. NSK assumes no liability with respect to errors or omissions.

Applications

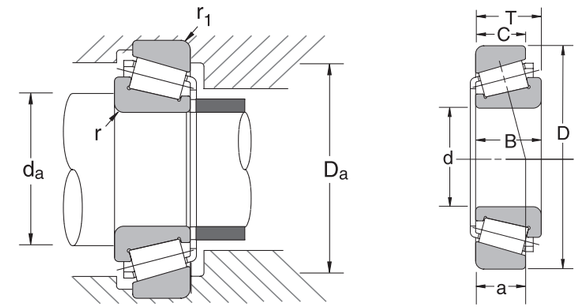
Shown below are some common applications utilizing a tapered roller bearing design. The design allows for combinations of heavy radial and thrust loads with low to moderate speeds. This section covers only single row tapers although NSK manufactures a full line of two and four row tapers as well. For more details on multiple row tapered roller bearings, please contact an NSK representative.

Metric designs function the same as their inch series cousins, the difference lies in the units of measure. NSK metric tapers are standardly supplied with cup and cone together, while inch series bearing are available by the cup, cone, or cup and cone. The applications shown below are for either metric or inch bearings, with the equipment manufacturer choosing the preference of dimensional measurements. Metric tapers are usually found in equipment designed in Europe or Asia.

› Guide Boxes in Bar and Rod Mills › Pumps and Compressors › Cranes and Hoists › Gears and Drives › Stamping Presses › Machine Tool Spindles › Bow Thrusts on Ships › Speed Reducers › Transmissions › Sheaves › Conveyor and Transfer Equipment › Construction Equipment › Mining Equipment › Oil Field Equipment › Automotive Front and Rear Axles › Plastic Forming Equipment › Agriculture Equipment › Motorcycle Wheels › Pinion Shafts of Differential Gears › Drum Shafts › Crankshafts › Crushers

Tapered Roller Bearings: Inch Series

Bore Diameter 12.700 – 30.213 mm, .5000 – 1.1895 inch, ½ - 1 3/16 fractional inch



Bearing Number		Basic Bearing Dimensions									
		d Cone		D Cup		T Assembly		B Cone	C Cup	Eff. Load Center a
Cone	Cup	inch	mm	inch	mm	inch	mm	inch	inch	inch
A4050	A4138	0.5000	12.700	1.3775	34.988	0.4330	10.998	0.4326	0.3437	0.33
A4059	A4138	0.5906	15.000	1.3775	34.988	0.4330	10.998	0.4326	0.3437	0.33
A6062	A6157	0.6250	15.875	1.5745	39.992	0.4730	12.014	0.4391	0.3750	0.41
11590	11520	0.6250	15.875	1.6875	42.862	0.5625	14.288	0.5625	0.3750	0.52
A6067	A6157	0.6690	16.993	1.5745	39.992	0.4730	12.014	0.4391	0.3750	0.41
LM11749	LM11710	0.6875	17.462	1.5700	39.878	0.5450	13.843	0.5750	0.4200	0.34
A6075	A6157	0.7500	19.050	1.5745	39.992	0.4730	12.014	0.4391	0.3750	0.41
LM11949	LM11910	0.7500	19.050	1.7810	45.237	0.6100	15.494	0.6550	0.4750	0.39
05075	05185	0.7500	19.050	1.8504	47.000	0.5662	14.381	0.5662	0.4375	0.41
09067	09195	0.7500	19.050	1.9380	49.225	0.7100	18.034	0.7500	0.5625	0.42
09078	09195	0.7500	19.050	1.9380	49.225	0.7813	19.845	0.8480	0.5625	0.42
09067	09196	0.7500	19.050	1.9380	49.225	0.8350	21.209	0.7500	0.6875	0.55
09074	09194	0.7500	19.050	1.9380	49.225	0.9063	23.020	0.8480	0.6875	0.55
05079	05185	0.7874	20.000	1.8504	47.000	0.5662	14.381	0.5662	0.4375	0.41
M12649	M12610	0.8437	21.430	1.9687	50.005	0.6900	17.526	0.7200	0.5500	0.44
LM12749	LM12710	0.8661	22.000	1.7810	45.237	0.6100	15.494	0.6550	0.4750	0.40
LM12749	LM12711	0.8661	22.000	1.8110	46.000	0.6100	15.494	0.6550	0.4750	0.40
07087	07196	0.8750	22.225	1.9687	50.005	0.5313	13.495	0.5614	0.3750	0.42
07098	07204	0.9835	24.981	2.0470	51.994	0.5910	15.011	0.5614	0.5000	0.48
07097	07196	0.9843	25.000	1.9687	50.005	0.5313	13.495	0.5614	0.3750	0.42
07097	07204	0.9843	25.000	2.0470	51.994	0.5910	15.011	0.5614	0.5000	0.48
07100	07196	1.0000	25.400	1.9687	50.005	0.5313	13.495	0.5614	0.3750	0.42
L44643	L44610	1.0000	25.400	1.9800	50.292	0.5600	14.224	0.5800	0.4200	0.43
15101	15245	1.0000	25.400	2.4409	62.000	0.7500	19.050	0.8125	0.5625	0.52
15100	15250X	1.0000	25.400	2.5000	63.500	0.8125	20.638	0.8125	0.6250	0.58
23100	23256	1.0000	25.400	2.5625	65.088	0.8750	22.225	0.8450	0.6250	0.79
L44649	L44610	1.0625	26.988	1.9800	50.292	0.5600	14.224	0.5800	0.4200	0.43
L45449	L45410	1.1417	29.000	1.9800	50.292	0.5600	14.224	0.5800	0.4200	0.43
15117	15245	1.1811	30.000	2.4409	62.000	0.7500	19.050	0.8125	0.5625	0.52
15117	15250	1.1811	30.000	2.5000	63.500	0.8125	20.638	0.8125	0.6250	0.58
M86649	M86610	1.1875	30.162	2.5312	64.292	0.8438	21.433	0.8438	0.6563	0.71
15118	15245	1.1895	30.213	2.4409	62.000	0.7500	19.050	0.8125	0.5625	0.52

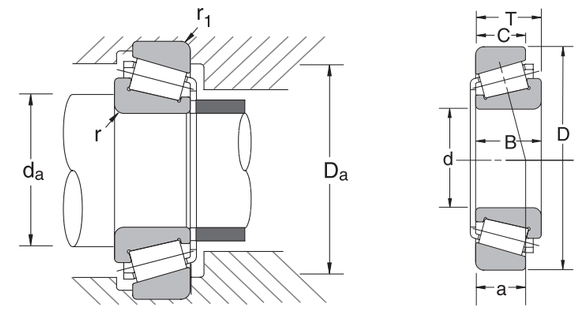
Bearing Number		Preferred Shoulder Diameters											
		Cone (r*) (inch)	Cup (r_1*) (inch)	d_a (inch)		D_a (inch)		Basic Load Ratings (lbf)		Approximate Component Weight (lbs)	
Cone	Cup			max	min	min	max	C_r	C_{or}	Cone	Cup
A4050	A4138	0.05	0.05	0.73	0.67	1.14	1.26	2640	2450	0.07	0.05
A4059	A4138	0.03	0.05	0.77	0.75	1.14	1.26	2640	2450	0.07	0.05
A6062	A6157	0.05	0.05	0.87	0.81	1.34	1.46	3360	3530	0.09	0.07
11590	11520	0.06	0.06	0.96	0.89	1.36	1.56	3890	3860	0.13	0.09
A6067	A6157	0.03	0.05	0.87	0.83	1.34	1.46	3360	3530	0.09	0.07
LM11749	LM11710	0.05	0.05	0.91	0.85	1.34	1.46	5060	5050	0.12	0.06
A6075	A6157	0.04	0.05	0.94	0.91	1.34	1.46	3360	3530	0.08	0.07
LM11949	LM11910	0.05	0.05	0.98	0.93	1.56	1.63	6410	6500	0.18	0.10
05075	05185	0.05	0.05	0.98	0.93	1.59	1.67	5360	5370	0.16	0.10
09067	09195	0.05	0.05	1.00	0.94	1.65	1.75	8000	7950	0.24	0.14
09078	09195	0.05	0.05	1.00	0.94	1.65	1.75	8000	7950	0.27	0.14
09067	09196	0.05	0.06	1.00	0.94	1.63	1.75	8000	7950	0.24	0.19
09074	09194	0.06	0.14	1.02	0.94	1.54	1.75	8000	7950	0.26	0.18
05079	05185	0.06	0.05	1.04	0.94	1.59	1.67	5360	5370	0.15	0.10
M12649	M12610	0.05	0.05	1.08	1.00	1.73	1.81	8680	9020	0.24	0.13
LM12749	LM12710	0.05	0.05	1.08	1.02	1.56	1.63	6570	7500	0.17	0.08
LM12749	LM12711	0.05	0.05	1.08	1.02	1.57	1.67	6570	7500	0.17	0.09
07087	07196	0.05	0.04	1.12	1.06	1.75	1.85	10000	12500	0.21	0.07
07098	07204	0.06	0.05	1.22	1.14	1.77	1.89	10000	12500	0.18	0.13
07097	07196	0.06	0.04	1.22	1.14	1.75	1.85	10000	12500	0.21	0.07
07097	07204	0.06	0.05	1.22	1.14	1.77	1.89	10000	12500	0.21	0.13
07100	07196	0.04	0.04	1.20	1.16	1.75	1.85	10000	12500	0.18	0.07
L44643	L44610	0.05	0.05	1.24	1.16	1.75	1.85	6210	7190	0.19	0.08
15101	15245	0.03	0.05	1.28	1.24	2.17	2.28	10400	11900	0.47	0.18
15100	15250X	0.14	0.06	1.50	1.24	2.17	2.32	10400	11900	0.47	0.25
23100	23256	0.06	0.06	1.54	1.36	2.09	2.48	10100	10700	0.46	0.31
L44649	L44610	0.14	0.05	1.48	1.22	1.75	1.85	6210	7190	0.17	0.08
L45449	L45410	0.14	0.05	1.56	1.30	1.75	1.89	6010	7670	0.17	0.08
15117	15245	0.05	0.05	1.44	1.38	2.17	2.28	10400	11900	0.40	0.18
15117	15250	0.05	0.05	1.44	1.38	2.20	2.32	10400	11900	0.40	0.25
M86649	M86610	0.06	0.06	1.61	1.50	2.13	2.40	11500	14500	0.46	0.28
15118	15245	0.14	0.05	1.63	1.40	2.17	2.28	10400	11900	0.39	0.18

*Maximum fillet which corner radius of bearing will clear.

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings: Inch Series (cont.)

Bore Diameter 31.750 – 45.242 mm, 1.2500 – 1.7812 inch, 1 1/4 - 1 25/32 fractional inch



Bearing Number		Basic Bearing Dimensions								
		d Cone		D Cup		T Assembly		B Cone	C Cup	Eff. Load Center a
Cone	Cup	inch	mm	inch	mm	inch	mm	inch	inch	inch
LM67048	LM67010	1.2500	31.750	2.3280	59.131	0.6250	15.875	0.6600	0.4650	0.51
15123	15245	1.2500	31.750	2.4409	62.000	0.7150	18.161	0.7500	0.5625	0.52
15125	15245	1.2500	31.750	2.4409	62.000	0.7500	19.050	0.8125	0.5625	0.52
15126	15245	1.2500	31.750	2.4409	62.000	0.7500	19.050	0.8125	0.5625	0.52
15126	15250	1.2500	31.750	2.5000	63.500	0.8125	20.638	0.8125	0.6250	0.58
14125A	14276	1.2500	31.750	2.7170	69.012	0.7813	19.845	0.7710	0.6250	0.61
14123A	14274	1.2500	31.750	2.7170	69.012	1.0625	26.982	1.0520	0.6250	0.61
M88048	M88010	1.3125	33.338	2.6875	68.262	0.8750	22.225	0.8750	0.6875	0.76
14130	14274	1.3125	33.338	2.7170	69.012	0.7813	19.845	0.7710	0.6250	0.61
LM48548	LM48510	1.3750	34.925	2.5625	65.088	0.7100	18.034	0.7200	0.5500	0.56
14136A	14276	1.3750	34.925	2.7170	69.012	1.0625	26.982	1.0520	0.6250	0.61
14137A	14276	1.3750	34.925	2.7170	69.012	0.7813	19.845	0.7710	0.6250	0.61
14138A	14276	1.3750	34.925	2.7170	69.012	0.7813	19.845	0.7710	0.6250	0.61
25877	25821	1.3750	34.925	2.8750	73.025	0.9375	23.812	0.9688	0.7500	0.62
L68149	L68110	1.3780	35.000	2.3280	59.131	0.6250	15.875	0.6600	0.4700	0.53
L68149	L68111	1.3780	35.000	2.3622	60.000	0.6250	15.875	0.6600	0.4700	0.53
HM89449	HM89410	1.4375	36.512	3.0000	76.200	1.1563	29.370	1.1250	0.9063	0.94
JL69349	JL69310	1.4961	38.000	2.4803	63.000	0.6693	17.000	0.6693	0.5315	0.57
LM29749	LM29710	1.5000	38.100	2.5625	65.088	0.7100	18.034	0.7200	0.5500	0.54
2788	2729	1.5000	38.100	3.0000	76.200	0.9375	23.812	1.0100	0.7500	0.62
2788	2720	1.5000	38.100	3.0000	76.200	0.9375	23.812	1.0100	0.7500	0.62
18590	18520	1.6250	41.275	2.8750	73.025	0.6562	16.667	0.6875	0.5000	0.55
LM501349	LM501310	1.6250	41.275	2.8910	73.431	0.7700	19.558	0.7800	0.5800	0.64
LM501349	LM501314	1.6250	41.275	2.8910	73.431	0.8437	21.430	0.7800	0.6537	0.71
26882	26822	1.6250	41.275	3.1250	79.375	0.9375	23.812	1.0000	0.7500	0.64
342	332	1.6250	41.275	3.1496	80.000	1.1250	28.575	1.1801	0.7018	0.58
25577	25523	1.6880	42.875	3.2650	82.931	1.0625	26.988	1.0000	0.8750	0.82
25580	25520	1.7500	44.450	3.2650	82.931	0.9375	23.812	1.0000	0.7500	0.69
3578	3525	1.7500	44.450	3.4375	87.312	1.1875	30.162	1.2160	0.9375	0.79
3782	3720	1.7500	44.450	3.6718	93.264	1.1875	30.162	1.1930	0.9375	0.87
LM102949	LM102910	1.7812	45.242	2.8910	73.431	0.7700	19.558	0.7800	0.6200	0.59
LM603049	LM603011	1.7812	45.242	3.0625	77.788	0.7812	19.842	0.7812	0.5937	0.69

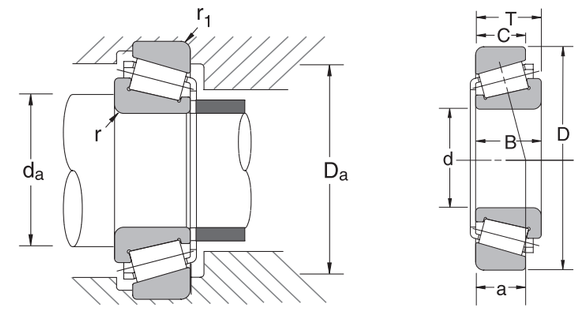
Bearing Number		Preferred Shoulder Diameters									
		Cone (r*) (inch)	Cup (r_1*) (inch)	d_a (inch)		D_a (inch)		Basic Load Ratings (lbf)		Approximate Component Weight (lbs)	
Cone	Cup			max	min	min	max	C_r	C_{or}	Cone	Cup
LM67048	LM67010	0.14	0.05	1.67	1.42	2.05	2.20	7800	9300	0.26	0.14
15123	15245	0.14	0.05	1.67	1.44	2.17	2.28	10400	11900	0.34	0.18
15125	15245	0.14	0.05	1.67	1.44	2.17	2.28	10400	11900	0.36	0.18
15126	15245	0.03	0.05	1.46	1.44	2.17	2.28	10400	11900	0.37	0.18
15126	15250	0.03	0.05	1.46	1.44	2.2	2.32	10400	11900	0.37	0.25
14125A	14276	0.14	0.05	1.73	1.48	2.36	2.48	10600	12600	0.48	0.29
14123A	14274	0.16	0.13	1.63	1.48	2.32	2.48	10600	12600	0.57	0.29
M88048	M88010	0.05	0.06	1.67	1.62	2.28	2.56	12500	15900	0.51	0.20
14130	14274	0.14	0.13	1.77	1.52	2.32	2.48	10400	12600	0.45	0.29
LM48548	LM48510	0.14	0.05	1.81	1.57	2.28	2.40	10700	13000	0.36	0.19
14136A	14276	0.03	0.05	1.63	1.57	2.36	2.48	10400	12600	0.50	0.29
14137A	14276	0.06	0.05	1.65	1.57	2.36	2.48	10400	12600	0.42	0.29
14138A	14276	0.14	0.05	1.81	1.57	2.36	2.48	10400	12600	0.42	0.29
25877	25821	0.06	0.03	1.69	1.59	2.56	2.68	16000	19300	0.67	0.36
L68149	L68110	0.14	0.05	1.79	1.54	2.05	2.20	7830	10500	0.24	0.12
L68149	L68111	0.14	0.05	1.79	1.54	2.09	2.20	7830	10500	0.24	0.14
HM89449	HM89410	0.14	0.13	2.13	1.76	2.44	2.87	17600	23900	0.83	0.55
JL69349	JL69310	0.14	0.05	1.85	1.63	2.20	2.41	8600	11700	0.29	0.13
LM29749	LM29710	0.09	0.05	1.81	1.67	2.32	2.44	9480	12400	0.34	0.17
2788	2729	0.14	0.03	1.97	1.71	2.68	2.76	16500	20500	0.68	0.41
2788	2720	0.14	0.13	1.97	1.71	2.60	2.76	16500	20500	0.68	0.41
18590	18520	0.14	0.06	2.09	1.81	2.60	2.72	10000	120800	0.45	0.19
LM501349	LM501310	0.14	0.03	2.09	1.83	2.64	2.76	12200	15100	0.48	0.24
LM501349	LM501314	0.14	0.03	2.09	1.83	2.60	2.76	12200	15100	0.48	0.28
26882	26822	0.14	0.03	2.13	1.85	2.80	2.91	16200	20900	0.75	0.41
342	332	0.14	0.05	2.09	1.81	2.87	2.95	15300	12100	0.92	0.32
25577	25523	0.14	0.09	2.17	1.93	2.83	3.03	17200	22200	0.83	0.54
25580	25520	0.14	0.03	2.24	1.97	2.91	3.03	17200	22200	0.78	0.41
3578	3525	0.14	0.13	2.24	2.01	2.95	3.19	21600	26900	1.04	0.67
3782	3720	0.14	0.03	2.28	2.05	3.23	3.46	23200	30700	1.47	0.64
LM102949	LM102910	0.14	0.03	2.20	1.97	2.68	2.76	12000	16900	0.45	0.22
LM603049	LM603011	0.14	0.03	2.24	1.97	2.80	2.91	12600	16000	0.53	0.27

*Maximum fillet which corner radius of bearing will clear.

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Tapered Roller Bearings Inch Series (cont.)

Bore Diameter 45.242 – 92.075mm, 1.7812 – 3.625 inch, 1 25/32 – 3 5/8 fractional inch



Bearing Number		Basic Bearing Dimensions								
		d Cone		D Cup		T Assembly		B Cone	C Cup	Eff. Load Center a
Cone	Cup	inch	mm	inch	mm	inch	mm	inch	inch	inch
LM603049	LM603012	1.7812	45.242	3.0625	77.788	0.8437	21.430	0.7812	0.6562	0.75
25590	25520	1.7960	45.618	3.2650	82.931	0.9375	23.812	1.0000	0.7500	0.69
25590	25523	1.7960	45.618	3.2650	82.931	1.0625	26.988	1.0000	0.8750	0.82
18690	18620	1.8125	46.038	3.1250	79.375	0.6875	17.462	0.6875	0.5313	0.61
368A	362A	2.0000	50.800	3.5000	88.900	0.8125	20.638	0.8750	0.6501	0.65
368A	362A	2.0000	50.800	3.5000	88.900	0.8125	20.638	0.8750	0.6501	0.65
387A	382A	2.2500	57.150	3.8125	96.838	0.8268	21.000	0.8640	0.6250	0.71
387A	382A	2.2500	57.150	3.8750	98.425	0.8268	21.000	0.8640	0.7018	0.71
3982	3920	2.5000	63.500	4.4375	112.712	1.1875	30.162	1.1830	0.9375	1.01
39585	39520	2.5000	63.500	4.4375	112.712	1.1875	30.162	1.1875	0.9375	0.93
HM212047	HM212011	2.5000	63.500	4.8125	122.238	1.5000	38.100	1.5100	1.1700	1.07
3984	3920	2.6250	66.675	4.4375	112.712	1.1875	30.162	1.1830	0.9375	1.01
39590	39520	2.6250	66.675	4.4375	112.712	1.1875	30.162	1.1875	0.9375	0.93
560	553X	2.6250	66.675	4.8125	122.238	1.5000	38.100	1.4440	1.1875	1.13
560	552A	2.6250	66.675	4.8750	123.825	1.5000	38.100	1.4400	1.1875	1.13
33287	33462	2.8750	73.025	4.6250	117.475	1.1875	30.162	1.1875	0.9375	1.08
567	563	2.8750	73.025	5.0000	127.000	1.4375	36.512	1.4240	1.1250	1.12
495	493	3.0000	76.200	5.3750	136.525	1.1875	30.162	1.1720	0.8750	1.16
575	572	3.0000	76.200	5.5115	139.992	1.4375	36.512	1.4212	1.1250	1.23
47686	47620	3.2500	82.550	5.2500	133.350	1.3125	33.338	1.3125	1.0313	1.14
580	572	3.2500	82.550	5.5115	139.992	1.4375	36.512	1.4212	1.1250	1.23
663	653	3.2500	82.550	5.7500	146.050	1.6250	41.275	1.6250	1.2500	1.31
749	742	3.3475	85.027	5.9090	150.089	1.7502	44.455	1.8375	1.4375	1.28
497	493	3.3750	85.725	5.3750	136.525	1.1875	30.162	1.1720	1.8750	1.16
665A	653	3.3750	85.725	5.7500	146.050	1.6250	41.275	1.6250	1.2500	1.31
593	592A	3.5000	88.900	6.0000	152.400	1.5625	39.688	1.4300	1.1875	1.46
598	592A	3.6250	92.075	6.0000	152.400	1.5625	39.688	1.4300	1.1875	1.46
598A	592A	3.6250	92.075	6.0000	152.400	1.5625	39.688	1.4300	1.1875	1.46

Bearing Number		Preferred Shoulder Diameters										
		Cone (r*) (inch)	Cup (r_1*) (inch)	d_a (inch)		D_a (inch)		Basic Load Ratings (lbf)		Approximate Component Weight (lbs)	
Cone	Cup			max	min	min	max	C_r	C_{or}	Cone	Cup
LM603049	LM603012	0.14	0.03	2.24	1.97	2.76	2.91	12600	16000	0.53	0.31
25590	25520	0.14	0.03	2.28	2.01	2.91	3.03	17200	22300	0.74	0.44
25590	25523	0.14	0.09	2.28	2.01	2.83	3.03	17200	22300	0.74	0.54
18690	18620	0.11	0.06	2.20	2.01	2.80	2.91	10300	12800	0.45	0.27
368A	362A	0.06	0.05	2.28	2.20	3.19	3.31	16400	19100	0.76	0.36
368A	362A	0.06	0.05	2.44	2.20	3.19	3.31	16400	19100	0.75	0.36
387A	382A	0.14	0.03	2.72	2.44	3.50	3.62	16400	20100	0.88	0.39
387A	382A	0.14	0.03	2.72	2.44	3.54	3.62	16400	20100	0.88	0.50
3982	3920	0.14	0.13	3.03	2.80	3.90	4.17	27000	39800	1.71	0.99
39585	39520	0.14	0.13	3.03	2.80	3.98	4.21	54900	91000	1.97	0.79
HM212047	HM212011	0.28	0.13	3.43	2.87	4.25	4.57	42300	55100	3.17	1.31
3984	3920	0.14	0.13	3.15	2.91	3.90	4.17	27000	39800	1.54	0.99
39590	39520	0.14	0.13	3.15	2.91	3.98	4.21	31900	45400	1.79	0.79
560	553X	0.14	0.13	3.19	2.95	4.25	4.53	41800	68600	2.51	1.51
560	552A	0.14	0.13	3.19	2.95	4.29	4.57	41800	68600	2.51	1.67
33287	33462	0.14	0.13	3.43	3.15	4.09	4.41	26800	40200	1.62	0.97
567	563	0.14	0.13	3.46	3.19	4.41	4.72	37300	52600	2.54	1.44
495	493	0.25	0.13	3.86	3.39	4.80	5.12	29200	43200	2.60	1.21
575	572	0.14	0.13	3.62	3.39	4.92	5.24	39300	58400	3.53	1.78
47686	47620	0.14	0.13	3.82	3.54	4.69	5.04	33900	53100	2.51	1.27
580	572	0.14	0.13	3.86	3.58	4.92	5.24	93300	51900	3.02	1.78
663	653	0.14	0.13	3.90	3.62	5.16	5.47	46500	66500	4.12	1.95
749	742	0.14	0.13	3.98	3.74	5.28	5.59	59600	83200	4.76	2.34
497	493	0.14	0.13	3.90	3.66	4.80	5.12	29200	43200	2.16	1.21
665A	653	0.25	0.13	4.21	3.74	5.16	5.47	46500	66500	3.77	1.95
593	592A	0.14	0.13	4.09	3.86	5.31	5.67	41100	64100	3.77	2.31
598	592A	0.14	0.13	4.21	3.98	5.31	5.67	41100	64100	3.44	2.31
598A	592A	0.25	0.13	4.45	3.98	5.31	5.67	41100	64100	3.46	2.31

*Maximum fillet which corner radius of bearing will clear.

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Notes

Table of Contents

Ball Thrust Bearings

Basic Type & Design
- **51:** Ball Thrust, Single Direction
- **52:** Ball Thrust, Double Direction
- **53:** Ball Thrust, Single Direction, with Aligning Seat
- **54:** Ball Thrust, Double Direction, with Aligning Seat

Bore Size
(04 and up: multiply last two numbers by 5 to get bore in mm)
- **00:** 10 mm
- **01:** 12 mm
- **02:** 15 mm
- **03:** 17 mm
- **04:** 20 mm
- **05:** 25 mm
- **12:** 60 mm
- **20:** 100 mm

Other Features
- **U:** With Aligning Seat Washer
- **X:** Modified Boundary to ISO
- **P5:** Precision Class 5 (ABEC 5)

53	2	05	M	U

Series
- **1:** Extra Light
- **2:** Light
- **3:** Medium
- **4:** Heavy

Cage Type
- **Blank:** Steel
- **M:** Brass

Please refer to the bearing tables for exact part number options

Interchange

Description		Interchange		
		NSK	SKF	FAG
Part Number	Single Direction	511xx	511xx	511xx
	Single Direction	512xx	512xx	512xx
	Single Direction	513xx	513xx	513xx
	Single Direction	514xx	514xx	514xx
	Single Direction with Aligning Seat	532xx	532xx	532xx
	Single Direction with Aligning Seat	533xx	533xx	533xx
	Single Direction with Aligning Seat	534xx	534xx	534xx
	Double Direction	522xx	522xx	522xx
	Double Direction	523xx	523xx	523xx
	Double Direction	524xx	524xx	524xx
	Double Direction with Aligning Seat	542xx	542xx	542xx
	Double Direction with Aligning Seat	543xx	543xx	543xx
	Double Direction with Aligning Seat	544xx	544xx	544xx
Suffix	Steel Cage	BLANK	J	FP
	Brass Cage	M	M	MP
	Boundary Dimensions Adopted to ISO	X	--	X
	With Self-Aligning Seat Washer	U	U	U
	ABEC 5 Precision Class	P5	P5	P5

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

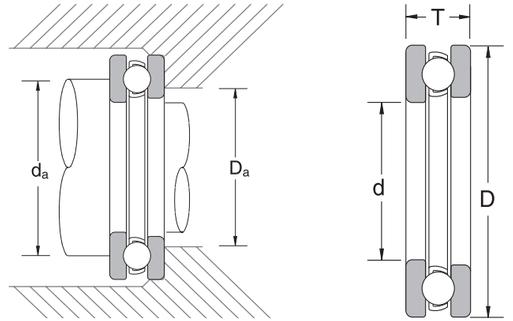
Applications

The ball thrust bearings are designed to handle thrust loads while operating at high speeds. These bearings can be ordered with an aligning seat and aligning washer if misalignment or deflection can not be avoided.

› **Screw Jacks** › **Machine Tool Spindle Tail Stock** › **Vertical Openers (Spinning and Weaving Machines)**

Ball Thrust Bearings: Single Direction, Flat Seat

Bore Diameter 10 – 45 mm, .3937 – 1.7717 inch



COMMON OPTIONS	
P5 (PA5)	ISO 5 / ABEC 5 Precision
P6 (PA3)	ISO 6 / ABEC 3 Precision

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Diameters (inch)		
	d		D		T		r*	d_a min	D_a max
	mm	inch	mm	inch	mm	inch			
51100	10	0.3937	24	0.9449	9	0.3543	0.012	0.709	0.630
51200	10	0.3937	26	1.0236	11	0.4331	0.024	0.788	0.630
51101	12	0.4724	26	1.0236	9	0.3543	0.012	0.788	0.709
51201	12	0.4724	28	1.1024	11	0.4331	0.024	0.867	0.709
51102	15	0.5906	28	1.1024	9	0.3543	0.012	0.906	0.867
51202	15	0.5906	32	1.2598	12	0.4724	0.024	0.985	0.867
51103	17	0.6693	30	1.1811	9	0.3543	0.012	0.985	0.867
51203	17	0.6693	35	1.3780	12	0.4724	0.024	1.103	0.946
51104	20	0.7874	35	1.3780	10	0.3937	0.012	1.143	1.024
51204	20	0.7874	40	1.5748	14	0.5512	0.024	1.261	1.103
51105	25	0.9843	42	1.6535	11	0.4331	0.024	1.379	1.261
51205	25	0.9843	47	1.8504	15	0.5906	0.024	1.497	1.340
51305	25	0.9843	52	2.0472	18	0.7087	0.039	1.615	1.418
51405	25	0.9843	60	2.3622	24	0.9449	0.039	1.812	1.537
51106	30	1.1811	47	1.8504	11	0.4331	0.024	1.576	1.458
51206	30	1.1811	52	2.0472	16	0.6299	0.024	1.694	1.537
51306	30	1.1811	60	2.3622	21	0.8268	0.039	1.891	1.655
51406	30	1.1811	70	2.7559	28	1.1024	0.039	2.128	1.812
51107	35	1.3780	52	2.0472	12	0.4724	0.024	1.773	1.655
51207	35	1.3780	62	2.4409	18	0.7087	0.039	2.009	1.812
51307	35	1.3780	68	2.6772	24	0.9449	0.039	2.167	1.891
51407	35	1.3780	80	3.1496	32	1.2598	0.039	2.443	2.088
51108	40	1.5748	60	2.3622	13	0.5118	0.024	2.049	1.891
51208	40	1.5748	68	2.6772	19	0.7480	0.039	2.246	2.009
51308	40	1.5748	78	3.0709	26	1.0236	0.039	2.482	2.167
51408	40	1.5748	90	3.5433	36	1.4173	0.039	2.758	2.364
51109	45	1.7717	65	2.5591	14	0.5512	0.024	2.246	2.088
51209	45	1.7717	73	2.8740	20	0.7874	0.039	2.443	2.206
51309	45	1.7717	85	3.3465	28	1.1024	0.039	2.719	2.403
51409	45	1.7717	100	3.9370	39	1.5354	0.039	3.073	2.640

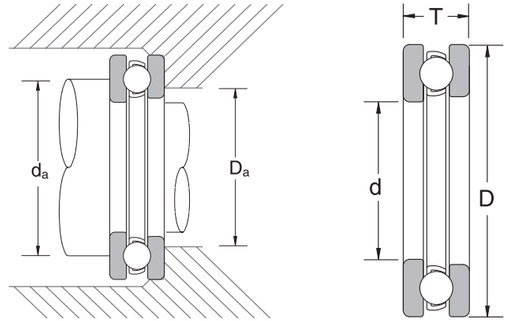
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)
	C_a	C_{oa}	Grease	Oil	lbs
51100	2270	3130	6.7	10.0	0.042
51200	2860	3830	6.0	9.0	0.062
51101	2330	3460	6.7	10.0	0.046
51201	2970	4270	5.6	8.5	0.068
51102	2380	3770	6.3	9.5	0.507
51202	3770	5570	5.0	7.5	0.095
51103	2570	4380	6.0	9.0	0.055
51203	3880	6120	4.8	7.5	0.110
51104	3390	5970	5.3	8.0	0.082
51204	5040	8480	4.3	6.3	0.170
51105	4430	8370	4.8	7.1	0.123
51205	6300	11300	3.8	5.6	0.245
51305	8040	13700	3.2	5.0	0.373
51405	12500	20000	2.6	4.0	0.736
51106	4630	9480	4.3	6.7	0.141
51206	6610	13100	3.4	5.3	0.302
51306	9700	17600	2.8	4.3	0.589
51406	16400	28200	2.2	3.4	1.144
51107	4960	11100	4.0	6.0	0.179
51207	8920	17500	3.0	4.5	0.463
51307	12500	23500	2.4	3.8	0.851
51407	19700	34800	2.0	3.0	1.695
51108	6100	14100	3.6	5.3	0.265
51208	10600	22000	2.8	4.3	0.595
51308	15600	30200	2.2	3.4	1.182
51408	23100	42100	1.7	2.6	2.425
51109	6300	15500	3.4	5.0	0.313
51209	10800	23500	2.6	4.0	0.683
51309	18000	36800	2.0	3.0	1.482
51409	28600	55300	1.6	2.4	3.219

C_a = Dynamic Axial Load Rating C_{oa} = Static Axial Load Rating

Ball Thrust Bearings: Single Direction, Flat Seat (cont.)

Bore Diameter 50 - 85 mm, 1.9685 – 3.3465 inch



COMMON OPTIONS	
P5 (PA5)	ISO 5 / ABEC 5 Precision
P6 (PA3)	ISO 6 / ABEC 3 Precision

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Diameters (inch)		
	d		D		T		r*	d_a min	D_a max
	mm	inch	mm	inch	mm	inch			
51110	50	1.9685	70	2.7559	14	0.5512	0.024	2.443	2.285
51210	50	1.9685	78	3.0709	22	0.8661	0.039	2.640	2.403
51310	50	1.9685	95	3.7402	31	1.2205	0.039	3.034	2.679
51410	50	1.9685	110	4.3307	43	1.6929	0.059	3.388	2.916
51111	55	2.1654	78	3.0709	16	0.6299	0.024	2.719	2.522
51211	55	2.1654	90	3.5433	25	0.9843	0.039	2.994	2.719
51311	55	2.1654	105	4.1339	35	1.3780	0.039	3.349	2.955
51411	55	2.1654	120	4.7244	48	1.8898	0.059	3.704	3.191
51112	60	2.3622	85	3.3465	17	0.6693	0.039	2.955	2.758
51212	60	2.3622	95	3.7402	26	1.0236	0.039	3.191	2.916
51312	60	2.3622	110	4.3307	35	1.3780	0.039	3.546	3.152
51412	60	2.3622	130	5.1181	51	2.0079	0.059	4.019	3.467
51113	65	2.5591	90	3.5433	18	0.7087	0.039	3.152	2.955
51213	65	2.5591	100	3.9370	27	1.0630	0.039	3.388	3.113
51313	65	2.5591	115	4.5276	36	1.4173	0.039	3.743	3.349
51413	65	2.5591	140	5.5118	56	2.2047	0.079	4.334	3.743
51114	70	2.7559	95	3.7402	18	0.7087	0.039	3.349	3.152
51214	70	2.7559	105	4.1339	27	1.0630	0.039	3.585	3.310
51314	70	2.7559	125	4.9213	40	1.5748	0.039	4.058	3.625
51414	70	2.7559	150	5.9055	60	2.3622	0.079	4.649	4.019
51115	75	2.9528	100	3.9370	19	0.7480	0.039	3.546	3.349
51215	75	2.9528	110	4.3307	27	1.0630	0.039	3.782	3.507
51315	75	2.9528	135	5.3150	44	1.7323	0.059	4.373	3.901
51415	75	2.9528	160	6.2992	65	2.5591	0.079	4.925	4.334
51116	80	3.1496	105	4.1339	19	0.7480	0.039	3.743	3.546
51216	80	3.1496	115	4.5276	28	1.1024	0.039	3.979	3.704
51316	80	3.1496	140	5.5118	44	1.7323	0.059	4.570	4.098
51416	80	3.1496	170	6.6929	68	2.6772	0.079	5.240	4.610
51117	85	3.3465	110	4.3307	19	0.7480	0.039	3.940	3.743
51217	85	3.3465	125	4.9213	31	1.2205	0.039	4.295	3.979
51317	85	3.3465	150	5.9055	49	1.9291	0.059	4.886	4.373
51417X	85	3.3465	180	7.0866	72	2.8346	0.079	5.555	4.886

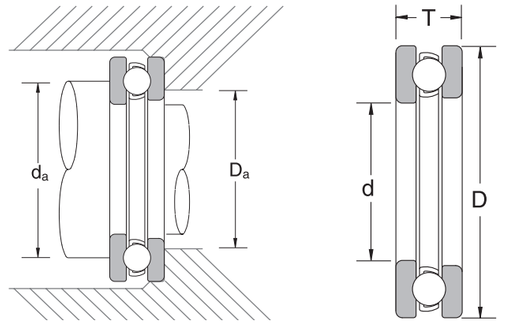
*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)
	C_a	C_{oa}	Grease	Oil	lbs
51110	6530	17000	3.2	4.8	0.34
51210	11000	25100	2.4	3.6	0.83
51310	21900	45400	1.8	2.8	2.05
51410	33100	64800	1.4	2.2	4.28
51111	7940	20900	2.8	4.3	0.50
51211	15800	35700	2.2	3.2	1.32
51311	26000	54900	1.6	2.4	2.89
51411	40800	78300	1.3	1.9	5.69
51112	9370	25400	2.6	4.0	0.62
51212	16100	37900	2.0	3.0	1.48
51312	26700	59100	1.6	2.4	3.09
51412	45400	89300	1.2	1.8	6.97
51113	9480	26500	2.4	3.8	0.71
51213	17000	42300	1.9	2.8	1.67
51313	27600	63300	1.5	2.4	3.40
51413	52500	111000	1.1	1.7	9.04
51114	9810	28400	2.4	3.6	0.76
51214	16600	42300	1.9	2.8	1.75
51314	30900	70500	1.4	2.0	4.41
51414	56700	125000	1.0	1.5	11.13
51115	9810	29500	2.2	3.4	0.86
51215	17500	47000	1.8	2.8	1.86
51315	35700	82700	1.3	1.9	5.73
51415	57100	126000	1.0	1.4	13.56
51116	10100	31700	2.2	3.4	0.92
51216	17700	49200	1.8	2.6	2.05
51316	36800	88200	1.3	1.9	6.04
51416	61300	140000	0.9	1.3	15.90
51117	10400	33700	2.2	3.2	0.97
51217	21600	59300	1.6	2.4	2.69
51317	46500	110000	1.1	1.7	7.87
51417X	69400	170000	0.9	1.3	18.76

C_a = Dynamic Axial Load Rating C_{oa} = Static Axial Load Rating

Ball Thrust Bearings: Single Direction, Flat Seat (cont.)

Bore Diameter 90 – 160mm, 3.5433 – 6.2992 inch



COMMON OPTIONS	
P5 (PA5)	ISO 5 / ABEC 5 Precision
P6 (PA3)	ISO 6 / ABEC 3 Precision

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Diameters (inch)		
	d		D		T		r*	d_a min	D_a max
	mm	inch	mm	inch	mm	inch			
51118	90	3.5433	120	4.7244	22	0.8661	0.039	4.255	4.019
51218	90	3.5433	135	5.3150	35	1.3780	0.039	4.610	4.255
51318	90	3.5433	155	6.1024	50	1.9685	0.059	5.083	4.570
51418X	90	3.5433	190	7.4803	77	3.0315	0.079	5.871	5.161
51120	100	3.9370	135	5.3150	25	0.9843	0.039	4.767	4.492
51220	100	3.9370	150	5.9055	38	1.4961	0.039	5.122	4.728
51320	100	3.9370	170	6.6929	55	2.1654	0.059	5.595	5.043
51420X	100	3.9370	210	8.2677	85	3.3465	0.099	6.501	5.713
51122	110	4.3307	145	5.7087	25	0.9843	0.039	5.161	4.886
51222	110	4.3307	160	6.2992	38	1.4961	0.039	5.516	5.122
51322X	110	4.3307	190	7.4803	63	2.4803	0.079	6.225	5.595
51422X	110	4.3307	230	9.0551	95	3.7402	0.099	7.131	6.265
51124	120	4.7244	155	6.1024	25	0.9843	0.039	5.555	5.280
51224	120	4.7244	170	6.6929	39	1.5354	0.039	5.910	5.516
51324X	120	4.7244	210	8.2677	70	2.7559	0.079	6.816	6.186
51424X	120	4.7244	250	9.8425	102	4.0157	0.118	7.722	6.856
51126	130	5.1181	170	6.6929	30	1.1811	0.039	6.068	5.752
51226X	130	5.1181	190	7.4803	45	1.7717	0.059	6.540	6.068
51326X	130	5.1181	225	8.8583	75	2.9528	0.079	7.328	6.659
51426X	130	5.1181	270	10.6299	110	4.3307	0.118	8.353	7.407
51128X	140	5.5118	180	7.0866	31	1.2205	0.039	6.462	6.146
51228X	140	5.5118	200	7.8740	46	1.8110	0.059	6.934	6.462
51328X	140	5.5118	240	9.4488	80	3.1496	0.079	7.841	7.131
51428X	140	5.5118	280	11.0236	112	4.4094	0.118	8.747	7.801
51130X	150	5.9055	190	7.4803	31	1.2205	0.039	6.856	6.540
51230X	150	5.9055	215	8.4646	50	1.9685	0.059	7.447	6.934
51330X	150	5.9055	250	9.8425	80	3.1496	0.079	8.235	7.525
51430X	150	5.9055	300	11.8110	120	4.7244	0.118	9.377	8.353
51132X	160	6.2992	200	7.8740	31	1.2205	0.039	7.250	6.934
51232X	160	6.2992	225	8.8583	51	2.0079	0.059	7.841	7.329
51332X	160	6.2992	270	10.6299	87	3.4252	0.099	8.865	8.077
51432X	160	6.2992	320	12.5984	130	5.1181	0.158	10.008	8.904

*Maximum fillet which corner radius of bearing will clear.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)
	C_a	C_{oa}	Grease	Oil	lbs
51118	13600	42800	1.9	3.0	1.42
51218	25600	69400	1.4	2.2	3.73
51318	48300	118000	1.1	1.7	8.44
51418X	73900	185000	8.0	1.2	22.49
51120	19300	60200	1.7	2.6	2.12
51220	30200	84900	1.3	2.0	4.96
51320	53600	134000	1.0	1.5	10.98
51420X	83800	220000	7.1	1.1	32.63
51122	19700	64800	1.7	2.4	2.29
51222	30600	88200	1.3	1.9	5.34
51322X	63500	170000	9.0	1.3	15.83
51422X	92600	260000	6.3	1.0	44.09
51124	20200	69400	1.6	2.4	2.47
51224	31700	97000	1.2	1.8	5.93
51324X	73900	209000	8.0	1.2	21.39
51424X	108000	313000	6.0	0.9	57.76
51126	23600	79400	1.4	2.0	3.70
51226X	41200	123000	1.1	1.6	8.71
51326X	78300	231000	7.5	1.1	26.68
51426X	118000	357000	5.3	0.8	71.21
51128X	24300	84900	1.3	2.0	4.03
51228X	41700	130000	1.0	1.5	9.48
51328X	82700	254000	6.7	1.0	34.39
51428X	125000	392000	5.3	0.8	76.50
51130X	24700	90400	1.3	1.9	4.28
51230X	53600	165000	9.5	1.4	12.15
51330X	86000	271000	6.7	1.0	36.82
51430X	139000	452000	4.8	0.7	95.90
51132X	25400	95900	1.2	1.9	4.54
51232X	56000	181000	9.0	1.4	13.32
51332X	101000	331000	6.0	0.9	47.40
51432X	146000	498000	4.5	0.7	116.20

C_a = Dynamic Axial Load Rating C_{oa} = Static Axial Load Rating

Ball Thrust Bearings: Double Direction, Flat Seat

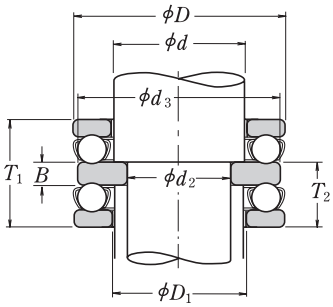
Bore Diameter 10 – 65 mm

Bearing Number With Flat Seat	Boundary Dimensions (mm)					Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Weight (lbs)
	d_2	d	D_1	D	T_1	C_a	C_{oa}	Grease	Oil	approx
52202	10	15	17	32	22	3754.50	5575.54	4800	7100	0.178
52204	15	20	22	40	26	5058.45	8430.76	4000	6000	0.326
52405	15	25	27	60	45	12589.93	20121.40	2400	3600	1.412
52205	20	25	27	47	28	6294.96	11353.42	3400	5300	0.469
52305	20	25	27	52	34	8093.53	13826.44	3000	4500	0.714
52406	20	30	32	70	52	16411.87	28327.34	2200	3200	2.154
52206	25	30	32	52	29	6632.19	13039.57	3200	5000	0.559
52306	25	30	32	60	38	9667.27	17648.38	2600	4000	1.064
52407	25	35	37	80	59	19671.76	34847.12	1800	2800	3.150
52207	30	35	37	62	34	8880.40	17535.97	2800	4300	0.894
52307	30	35	37	68	44	12589.93	23606.12	2400	3600	1.564
52208	30	40	42	68	36	10678.96	22144.78	2600	3800	1.196
52308	30	40	42	78	49	15737.41	30350.72	2000	3000	2.291
52408	30	40	42	90	65	23156.47	42266.19	1700	2400	4.361
52209	35	45	47	73	37	10791.37	23606.12	2400	3600	1.335
52309	35	45	47	85	52	18098.02	36645.68	1900	2800	2.819
52409	35	45	47	100	72	28776.98	55305.76	1500	2200	5.969
52210	40	50	52	78	39	11016.19	24955.04	2400	3400	1.535
52310	40	50	52	95	58	21919.96	45413.67	1700	2600	3.921
52410	40	50	52	110	78	33048.56	64748.20	1400	2000	7.731
52211	45	55	57	90	45	15737.41	35746.40	2000	3000	2.445
52311	45	55	57	105	64	25854.32	54856.12	1500	2400	5.352
52411	45	55	57	120	87	40692.45	78687.05	1200	1800	10.264
52212	50	60	62	95	46	16074.64	37994.60	1900	3000	2.687
52312	50	60	62	110	64	26753.60	59127.70	1500	2200	5.705
52412	50	60	62	130	93	45413.67	88803.96	1100	1700	12.643
52413	50	65	68	140	101	52607.91	111285.97	1000	1600	16.322
52213	55	65	67	100	47	16973.92	42491.01	1900	2800	2.952
52313	55	65	67	115	65	27652.88	63399.28	1500	2200	6.167
52214	55	70	72	105	47	16636.69	42491.01	1800	2800	3.172
52314	55	70	72	125	72	30800.36	70818.35	1300	2000	8.084
52414	55	70	73	150	107	56654.68	124775.18	1000	1500	19.802
52215	60	75	77	110	47	17535.97	46987.41	1800	2600	3.392
52315	60	75	77	135	79	35746.40	82059.35	1200	1800	10.441
52415	60	75	78	160	115	57104.32	125899.28	900	1400	23.789
52216	65	80	82	115	48	17760.79	49010.79	1700	2600	3.656
52316	65	80	82	140	79	36870.50	88803.96	1200	1800	10.991
52416	65	80	83	170	120	61151.08	139388.49	850	1300	27.753
52417X	65	85	88	180	128	69694.24	169739.21	800	1200	33.921

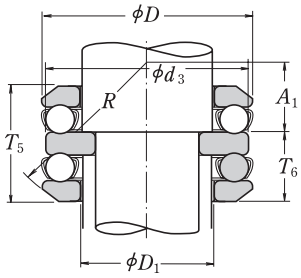
C_a = Dynamic Axial Load Rating C_{oa} = Static Axial Load Rating

Ball Thrust Bearings: Double Direction, Flat Seat

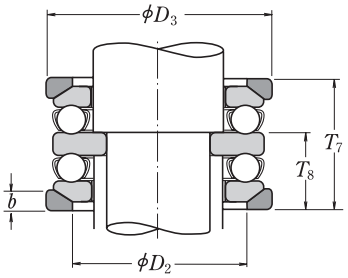
Bore Diameter 70 – 190 mm



With Flat Seat



With Aligning Seat



With Aligning Seat Washer

Bearing Number With Flat Seat	Boundary Dimensions (mm)					Basic Load Ratings (lbs)		Limiting Speeds (RPM)		Weight (lbs)
	d_2	d	D_1	D	T_1	C_a	C_{oa}	Grease	Oil	approx
52217	70	85	88	125	55	21582.73	59352.52	1500	2200	4.978
52317	70	85	88	150	87	46537.77	110161.87	1100	1600	14.053
52418X	70	90	93	190	135	74190.65	185476.62	750	1100	38.546
52218	75	90	93	135	62	25629.50	69694.24	1400	2000	6.806
52318	75	90	93	155	88	48111.51	118030.58	1100	1600	14.956
52420X	80	100	103	210	150	83183.45	221447.84	670	1000	59.031
52220	85	100	103	150	67	30350.72	84307.55	1300	1900	8.987
52320	85	100	103	170	97	53732.01	133767.99	950	1500	19.427
52422X	90	110	113	230	166	93300.36	258543.17	600	900	78.414
52222	95	110	113	160	67	30575.54	88803.96	1200	1800	9.670
52322X	95	110	113	190	110	63399.28	169739.21	850	1300	27.974
52424X	95	120	123	250	177	115782.37	346223.02	560	850	104.846
52224	100	120	123	170	68	31699.64	96672.66	1200	1800	10.837
52324X	100	120	123	210	123	74190.65	209082.73	750	1100	38.767
52426X	100	130	134	270	192	118030.58	357464.03	530	800	127.313
52226X	110	130	133	190	80	41142.09	123651.08	1000	1500	16.366
52326X	110	130	134	225	130	78687.05	231564.75	710	1100	47.357
52428X	110	140	144	280	196	123651.08	393435.25	500	750	137.445
52228X	120	140	143	200	81	41816.55	129271.58	1000	1500	17.643
52328X	120	140	144	240	140	83183.45	254046.76	670	1000	54.626
52430X	120	150	153	300	209	139388.49	451888.49	480	710	171.366
52230X	130	150	153	215	89	53507.19	165242.81	900	1300	22.907
52330X	130	150	154	250	140	85431.65	269784.17	630	950	66.740
52432X	130	160	164	320	226	146133.09	496852.52	430	630	206.167
52434X	135	170	174	340	236	160746.40	557553.96	400	600	242.291
52232X	140	160	163	225	90	55980.22	180980.22	850	1300	24.670
52332X	140	160	164	270	153	106789.57	352967.63	600	900	77.313
52436X	140	180	184	360	245	168615.11	613758.99	380	560	277.533
52234X	150	170	173	240	97	62949.64	9150004.45	800	1200	29.956
52334X	150	170	174	280	153	104541.37	352967.63	560	850	89.868
52236X	150	180	183	250	98	63848.92	214703.24	800	1200	32.599
52336X	150	180	184	300	165	107913.67	377697.84	530	800	101.982
52238X	160	190	194	270	109	71942.45	249550.36	710	1100	48.678
52338X	160	190	195	320	183	123651.08	440647.48	480	710	248.899
52240X	170	200	204	280	109	70818.35	249550.36	710	1000	50.881
52340X	170	200	205	340	192	134892.09	499100.72	450	670	172.687
52244X	190	220	224	300	110	73066.55	272032.37	670	1000	55.507

C_a = Dynamic Axial Load Rating C_{oa} = Static Axial Load Rating

Spherical Thrust Bearings

Basic Type & Design
292xx: Spherical Roller Thrust, Light
293xx: Spherical Roller Thrust, Medium
294xx: Spherical Roller Thrust, Heavy

Cage Type
E: Pressed Steel*
M: Machined Brass (not always shown in the part number)

293	26	E

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

05:	25 mm	**48:**	240 mm
20:	100 mm	**96:**	480 mm

500 millimeters and larger written as:

/500:	500 mm	**/710:**	710 mm
/630:	630 mm	**/1000:**	1000 mm

Please refer to the bearing tables for exact part number options

*The "E" designation has replaced the "H." This is nomenclature change only, not a design change.

Interchange

Description		Interchange			
		NSK	SKF	FAG	TORR/TIMKEN
Part Number	Light	292xx	292xx	292xx	292xx
	Medium	293xx	293xx	293xx	293xx
	Heavy	294xx	294xx	294xx	294xx
Suffix	Steel Cage	E	EJ	E	EJ
	Brass Cage	M	M	EMB	EM

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

Applications

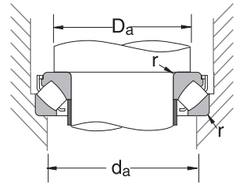
Listed below are popular applications for the spherical thrust bearings. Also available, but not shown, are cylindrical roller thrust bearings (TMP) and tapered roller thrust bearings (TT, TTF or V-Flat). Please consult an NSK representative for more information.

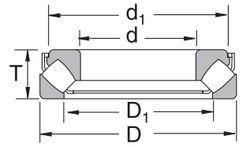
The spherical thrust bearings are designed to handle very heavy thrust loads in one direction while operating at low to moderate speeds. The design of the spherical thrust will also allow for some radial load while thrust load is imposed. The spherical shape of the outer ring raceway makes these bearings excellent for handling misalignment.

› Deep Well Pumps › Centrifugal Pumps › Power Plant Preheater › Coal Pulverizer › Plastic Forming Equipment › Crane Hook › Industrial Gear Boxes › Axial Piston Pumps

Spherical Roller Thrust Bearings

Bore Diameter 60 – 190 mm, 2.3622 – 7.4803 inch





COMMON OPTIONS	
E*	Stamped Steel Cage
M**	Machined Brass Cage

*The "E" designation has replaced the "H". This is a nomenclature change only, not a design change.

**May not be shown in part number

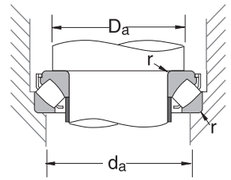
Bearing Number	Nominal Bearing Dimensions								
	d		D		T		d_1	D_1	C
	mm	inch	mm	inch	mm	inch	inch	inch	inch
29412E	60	2.3622	130	5.1181	42	1.6535	4.508	3.504	0.787
29413E	65	2.5591	140	5.5118	45	1.7717	4.783	3.661	0.866
29414E	70	2.7559	150	5.9055	48	1.8898	5.177	4.016	0.945
29415E	75	2.9528	160	6.2992	51	2.0079	5.433	4.213	0.984
29416E	80	3.1496	170	6.6929	54	2.1260	5.827	4.508	1.063
29317E	85	3.3465	150	5.9055	39	1.5354	5.295	4.409	0.748
29417E	85	3.3465	180	7.0866	58	2.2935	6.161	4.882	1.102
29318E	90	3.5433	150	6.1024	39	1.5354	5.492	4.646	0.748
29418E	90	3.5433	190	7.4803	60	2.3622	6.516	5.098	1.142
29320E	100	3.9370	170	6.6929	42	1.6535	5.984	5.039	0.819
29420E	100	3.9370	210	8.2677	67	2.6378	7.293	5.669	1.299
29322E	110	4.3307	190	7.4803	48	1.8898	6.673	5.610	0.945
29422E	110	4.3307	230	9.0551	73	2.8740	7.874	6.181	1.417
29324E	120	4.7244	210	8.2677	54	2.1260	7.382	6.161	1.063
29424E	120	4.7244	250	9.8425	78	3.0709	8.465	6.732	1.496
29326E	130	5.1181	225	8.8583	58	2.2835	8.012	6.634	1.102
29426E	130	5.1181	270	10.6299	85	3.3465	9.252	7.293	1.654
29328E	140	5.5118	240	9.4488	60	2.3622	8.524	7.047	1.181
29428E	140	5.5118	280	11.0236	85	3.3465	9.626	7.697	1.654
29330E	150	5.9055	250	9.9425	60	2.3622	8.819	7.480	1.142
29430E	150	5.9055	300	11.8110	90	3.5433	10.472	8.228	1.732
29332E	160	6.2992	270	10.6299	67	2.6378	9.567	7.992	1.299
29432E	160	6.2992	320	12.5984	95	3.7402	10.945	8.839	1.811
29334E	170	6.6929	280	11.0236	67	2.6378	9.921	8.445	1.260
29434	170	6.6929	340	13.3958	103	4.0551	12.205	9.567	1.969
29336E	180	7.0866	300	11.8110	73	2.8740	10.630	8.937	1.417
29436	180	7.0866	360	14.1732	109	4.2913	12.992	10.039	2.047
29338E	190	7.4803	320	12.5984	78	3.0709	11.358	9.606	1.496
29438	190	7.4803	380	14.9606	115	4.5276	13.583	10.669	2.165

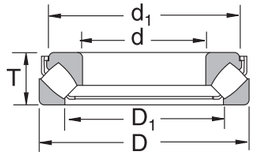
Bearing Number	Preferred Shoulder Diameters (inch)			Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)	Bearing Weight (Approx.)
	r*	D_a min	d_a max	C_a	C_{oa}	Oil	lbs
29412E	0.059	3.543	4.252	74500	199000	2.6	5.60
29413E	0.079	3.937	4.528	91000	247000	2.4	7.05
29414E	0.079	4.134	4.921	102000	279000	2.2	8.60
29415E	0.079	4.528	5.197	116000	322000	2.2	10.30
29416E	0.079	4.724	5.512	129000	360000	2.0	12.20
29317E	0.059	4.528	5.315	74500	234000	2.2	5.95
29417E	0.079	5.118	5.906	142000	396000	1.9	14.40
29318E	0.059	4.724	5.512	78500	243000	2.2	6.25
29418E	0.079	5.315	6.181	156000	438000	1.8	16.60
29320E	0.059	5.118	5.906	92000	288000	2.0	7.95
29420E	0.098	5.906	6.890	189000	540000	1.6	22.70
29322E	0.079	5.709	6.496	120000	384000	1.8	11.60
29422E	0.098	6.496	7.480	227000	659000	1.4	29.30
29324E	0.079	6.299	7.087	144000	472000	1.6	16.10
29424E	0.118	7.087	8.071	262000	764000	1.4	36.50
29326E	0.079	6.693	7.677	166000	551000	1.5	19.70
29426E	0.118	7.677	8.858	298000	877000	1.2	46.50
29328E	0.079	7.283	8.071	189000	632000	1.4	22.90
29428E	0.118	8.071	9.252	310000	944000	1.2	49.00
29330E	0.079	7.677	8.465	196000	652000	1.4	23.80
29430E	0.118	8.661	9.843	355000	1100000	1.1	60.00
29332E	0.098	8.768	9.252	226000	764000	1.3	31.50
29432E	0.157	9.055	10.433	390000	1210000	1.1	70.80
29334E	0.098	8.661	9.646	235000	787000	1.2	32.50
29434	0.157	9.646	11.220	375000	1300000	0.1	96.00
29336E	0.098	9.252	10.236	277000	944000	1.1	42.50
29436	0.157	10.236	11.811	420000	1460000	0.9	115.00
29338E	0.118	9.843	10.827	310000	1060000	1.0	50.50
29438	0.157	10.827	12.598	475000	1670000	0.9	132.00

*Maximum fillet which corner radius of bearing will clear. C_a = Dynamic Axial Load Rating C_{oa} = Static Axial Load Rating

Spherical Roller Thrust Bearings (cont.)

Bore Diameter 200 - 360 mm, 7.8740 – 14.1732 inch





COMMON OPTIONS	
E*	Stamped Steel Cage
M**	Machined Brass Cage

*The "E" designation has replaced the "H". This is a nomenclature change only, not a design change.

**May not be shown in part number

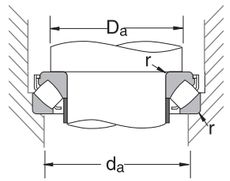
Bearing Number	Nominal Bearing Dimensions								
	d		D		T		d_1	D_1	C
	mm	inch	mm	inch	mm	inch	inch	inch	inch
29240	200	7.8740	280	11.0236	48	1.8898	10.472	9.291	0.945
29340E	200	7.8740	340	13.3858	85	3.3465	12.067	10.118	1.614
29440	200	7.8740	400	15.7480	122	4.8031	14.370	11.024	2.323
29244	220	8.6614	300	11.8110	48	1.8898	11.220	10.000	0.945
29344	220	8.6614	360	14.1732	85	3.3465	13.189	11.024	1.614
29444	220	8.6614	420	16.5354	122	4.8031	15.157	12.126	2.283
29248	240	9.4488	340	13.3858	60	2.3622	12.795	11.142	1.181
29348	240	9.4488	380	14.9606	85	3.3465	13.976	11.811	1.614
29448	240	9.4488	440	17.3228	122	4.8031	15.945	12.835	2.323
29252	260	10.2362	360	14.1732	60	2.3622	13.583	11.890	1.181
29352	260	10.2362	420	16.5354	95	3.7402	15.354	12.953	1.772
29452	260	10.2362	480	18.8976	132	5.1969	17.520	14.055	2.520
29256	280	11.0236	380	14.9606	60	2.3622	14.370	12.717	1.181
29356	280	11.0236	440	17.3228	95	3.7402	18.898	15.118	1.811
29456	280	11.0236	520	20.4724	145	5.7087	18.898	15.118	2.677
29260	300	11.8110	420	16.9540	73	2.8740	15.748	13.898	1.496
29360	300	11.8110	480	18.8976	109	4.2913	17.717	14.921	1.969
29460	300	11.8110	540	21.2598	145	5.7087	19.685	15.827	2.756
29264	320	12.5984	440	17.3228	73	2.8740	16.535	14.646	1.496
29364	320	12.5984	500	19.6850	109	4.2913	18.504	15.709	2.087
29464	320	12.5984	580	22.8346	155	6.1024	21.850	17.165	2.953
29268	340	13.3858	460	11.1102	73	2.8740	17.323	15.551	1.457
29368	340	13.3858	540	21.2598	122	4.8031	20.079	16.850	2.323
29468	340	13.3858	620	24.4094	170	6.6929	23.228	18.189	3.228
29272	360	14.1732	500	19.6850	85	3.3465	18.898	16.654	1.732
29372	360	14.1732	560	22.0472	122	4.8031	20.669	17.638	2.323
29472	360	14.1732	640	25.1969	170	6.6929	24.016	18.898	3.228

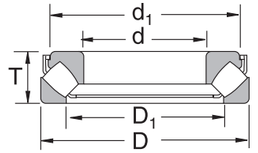
Bearing Number	Preferred Shoulder Diameters (inch)			Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)	Bearing Weight (Approx.)
	r*	D_a min	d_a min	C_a	C_{oa}	Oil	lbs
29240	0.079	9.252	10.039	121000	519000	1.50	18.8
29340E	0.118	10.433	11.614	407657	1230000	1.00	63.0
29440	0.157	11.417	13.189	594608	1830000	0.80	152.0
29244	0.079	10.236	10.827	126000	562000	1.40	20.0
29344	0.118	11.220	12.402	347937	1170000	0.95	73.0
29444	0.197	12.205	13.976	610188	1940000	0.80	163.0
29248	0.079	11.220	12.008	207723	776000	1.20	37.0
29348	0.118	11.811	12.992	353130	1210000	0.90	79.0
29448	0.197	12.992	14.764	545000	2050000	0.75	174.0
29252	0.079	12.008	12.795	222004	866000	1.20	40.0
29352	0.157	12.992	14.370	382000	1530000	0.80	107.0
29452	0.197	14.173	15.945	732225	2410000	0.71	231.0
29256	0.079	12.795	13.583	199000	922000	1.10	42.0
29356	0.157	13.780	15.354	475167	1720000	0.80	116.0
29456	0.197	15.354	17.323	1025634	2950000	0.63	291.0
29260	0.098	13.976	14.961	261000	1160000	0.95	66.0
29360	0.157	14.961	16.535	568643	2050000	0.71	163.0
29460	0.197	16.142	18.110	908790	3080000	0.60	310.0
29264	0.098	14.764	15.748	268000	1230000	0.95	71.5
29364	0.157	15.748	17.323	501000	2110000	0.67	170.0
29464	0.236	17.126	19.488	821000	3300000	0.56	385.0
29268	0.098	15.551	16.535	277000	1290000	0.90	74.0
29368	0.157	16.929	18.504	593000	2520000	0.63	227.0
29468	0.236	18.307	20.866	989000	3910000	0.53	480.0
29272	0.118	16.535	17.913	348000	1640000	0.80	112.0
29372	0.157	17.717	19.488	600000	2590000	0.60	236.0
29472	0.236	19.094	21.654	944000	3870000	0.50	505.0

*Maximum fillet which corner radius of bearing will clear. C_a = Dynamic Axial Load Rating C_{oa} = Static Axial Load Rating

Spherical Roller Thrust Bearings (cont.)

Bore Diameter 380 - 500 mm, 14.9606 – 19.6850 inch





COMMON OPTIONS	
E*	Stamped Steel Cage
M**	Machined Brass Cage

*The "E" designation has replaced the "H". This is a nomenclature change only, not a design change.

**May not be shown in part number

Bearing Number	Nominal Bearing Dimensions								
	d		D		T		d_1	D_1	C
	mm	inch	mm	inch	mm	inch	inch	inch	inch
29276	380	14.9606	520	20.4724	85	3.3465	19.528	17.362	1.654
29376	380	14.9606	600	23.6220	132	5.1969	22.362	18.780	2.480
29476	380	14.9606	670	26.3780	175	6.8898	25.197	19.843	3.346
29280	400	15.7480	540	21.2598	85	3.3465	20.354	18.110	1.654
29380	400	15.7480	620	24.4094	132	5.1969	23.228	19.449	2.520
29480	400	15.7480	710	27.9528	185	7.2935	26.772	21.102	3.504
29284	420	16.5354	580	22.8346	95	3.7402	21.772	19.252	1.811
29384	420	16.5354	650	25.5906	140	5.5118	24.409	20.472	2.677
29484	420	16.5354	730	28.7402	185	7.2835	27.559	21.890	3.504
29288	440	17.3228	600	23.6220	95	3.7402	22.638	20.000	1.929
29388	440	17.3228	680	26.7717	145	5.7087	25.394	12.575	2.756
29488	440	17.3228	780	30.7087	206	8.1102	29.331	23.150	3.937
29292	460	18.1102	620	24.4094	95	3.7402	23.307	20.866	1.811
29392	460	18.1102	710	27.9528	150	5.9055	26.220	22.323	2.835
29492	460	18.1102	800	31.4961	206	8.1102	30.118	23.937	3.937
29296	480	18.8976	650	25.5906	103	4.0551	24.567	21.890	2.165
29396	480	18.8976	730	28.7402	150	5.9055	27.165	23.228	2.835
29496	480	18.8976	850	33.4646	224	8.8189	31.890	25.118	4.252
292/500	500	19.6850	670	26.3780	103	4.0551	25.394	22.598	2.165
293/500	500	19.6850	750	29.5276	150	5.9055	28.150	24.055	2.913
294/500	500	19.6850	870	34.2520	224	8.8189	32.677	26.024	4.213

Bearing Number	Preferred Shoulder Diameters (inch)			Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)	Bearing Weight (Approx.)
	r*	D_a min	d_a min	C_a	C_{oa}	Oil	lbs
29276	0.118	17.323	18.701	364000	1750000	0.75	115
29376	0.197	18.898	20.669	742000	3260000	0.56	310
29476	0.236	20.079	22.638	1080000	4380000	0.48	560
29280	0.118	19.110	19.291	369000	1800000	0.75	121
29380	0.197	19.695	21.654	843876	3260000	0.53	330
29480	0.236	21.260	24.016	1210000	4970000	0.45	675
29284	0.157	19.291	20.669	452000	2200000	0.67	159
29384	0.197	20.669	22.638	787000	3530000	0.50	375
29484	0.236	22.047	24.803	1270000	5280000	0.43	710
29288	0.157	20.079	21.457	456000	2270000	0.67	170
29388	0.197	21.654	23.622	843000	3780000	0.48	420
29488	0.315	23.425	26.378	1470000	6110000	0.40	900
29292	0.157	20.866	22.441	463000	2320000	0.63	176
29392	0.197	22.638	24.803	1064583	4140000	0.45	465
29492	0.315	24.213	27.165	1520000	6430000	0.38	925
29296	0.157	21.850	23.425	533000	2720000	0.60	214
29396	0.197	23.425	25.591	933000	4270000	0.45	475
29496	0.315	25.394	28.740	1620000	6970000	0.36	1200
292/500	0.157	22.638	24.213	537000	2790000	0.60	220
293/500	0.197	24.213	26.378	978000	4590000	0.45	485
294/500	0.315	26.378	29.528	1760000	7420000	0.34	1230

*Maximum fillet which corner radius of bearing will clear. C_a = Dynamic Axial Load Rating C_{oa} = Static Axial Load Rating

Tapered Roller Thrust Bearings

Bore Size
Metric : exact Inch: Rounded
76: 76.2mm (3.0")
101: 101.6mm (4.0")
150: 150mm

Outer Diameter Size (Approximate)
30: 300mm
24: 245mm
31: 311.15mm (12.5")

Special Material
G: Case Hardened
G2: Outer Ring only
G3: Inner Ring only
G4: Rollers only

150	TTF	30	01	G	P5

Basic Type
TT: Tapered Thrust
TTF: Tapered Thrust Flat (See diagram)

Tolerance Type
1st Digit 0-4: Metric Tolerance
1st Digit 5-9: Inch Tolerance
2nd Digit: Design Place Holder

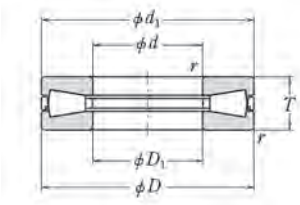
Precision Class
Blank: Normal
P6: Class 6
P5: Class 5

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

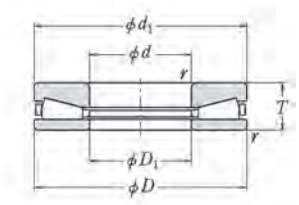
Applications

Tapered roller thrust bearings contain tapered rollers. TT type bearings, which have a rib on the housing washer, can accurately guide the shaft in the radial direction. TTF – type bearings, which have no rib on the housing washer, can tolerate some eccentricity during operation.

› **Construction Equipment** › **Rolling Mill Applications** › **Swivels of Drilling Rigs** › **Crane Hooks**



TT

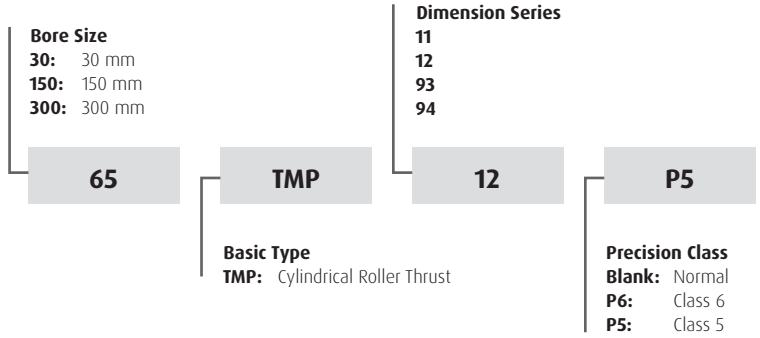


TTF

Bearing Number	Boundary Dimensions							Basic Load Ratings (lbs)		Dimensions		
	d		D		T		r min	C_a	C_{0a}	d_1	D_1	r_a max
	mm	inch	mm	inch	mm	inch	inch	lbs	lbs	inch	inch	inch
*76TT1651	76.2	3.0000	161.925	6.3750	33.338	1.3125	0.1299	85,427	328,221	3.0079	6.3750	0.1299
*101TT2151	101.6	4.0000	215.900	8.5000	46.038	1.8125	0.1299	159,614	651,946	4.0630	8.4370	0.1299
*127TT2651	127.0	5.0000	266.700	10.5000	58.738	2.3125	0.1890	233,801	977,919	5.0630	10.4370	0.1890
150TTF3001	150.0	5.9055	300.000	11.8110	90.000	3.5433	0.1969	330,469	1,416,296	5.9843	12.0472	0.1575

*Bearings are inch design.

Cylindrical Roller Thrust Bearings



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

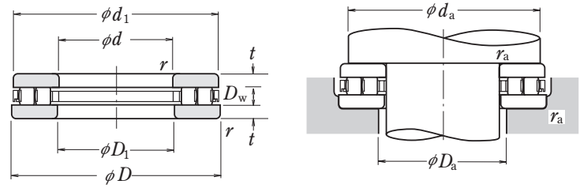
Applications

Cylindrical roller thrust bearings contain cylindrical rollers. They can sustain only axial loads, but they are suitable for heavy loads and have high axial rigidity. The cages are machined brass.

› Gear Boxes › Crane Hooks › Oil Well Swivels › Cone Pumps › Winch Systems

Cylindrical Roller Thrust Bearings

Bore Diameter 65 – 260 mm



Bearing Number	Boundary Dimensions							Dimensions			
	d		D		T		r min	d_1	D_1	Dw	t
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
65 TMP 12	65	2.5591	100	3.9370	27	1.0630	0.0394	3.9370	2.6378	0.4921	0.2854
110 TMP 12	110	4.3307	160	6.2992	38	1.4961	0.0433	6.2992	4.4488	0.5906	0.4528
130 TMP 12	130	5.1181	190	7.4803	45	1.7717	0.0591	7.3622	5.2362	0.7480	0.5118
130 TMP 93	130	5.1181	225	8.8583	58	2.2835	0.0827	8.8583	5.2362	0.8661	0.7087
150 TMP 12	150	5.9055	215	8.4646	50	1.9685	0.0787	8.4646	6.0236	0.7480	0.6102
150 TMP 93	150	5.9055	250	9.8425	60	2.3622	0.0827	9.8425	6.0236	0.9843	0.6890
160 TMP 93	160	6.2992	270	10.6299	67	2.6378	0.1181	10.4331	6.4567	0.9843	0.8268
170 TMP 12	170	6.6929	240	9.4488	55	2.1654	0.0591	9.3307	6.8110	0.8661	0.6496
170 TMP 93	170	6.6929	280	11.0236	67	2.6378	0.1181	11.0236	6.8110	0.9843	0.8268
180 TMP 94	180	7.0866	360	14.1732	109	4.2913	0.1969	13.9370	7.4409	1.7717	1.2598
190 TMP 12	190	7.4803	270	10.6299	62	2.4409	0.1181	10.4724	7.6772	1.1811	0.6299
190 TMP 93	190	7.4803	320	12.5984	78	3.0709	0.1575	12.5984	7.6772	1.2598	0.9055
220 TMP 11	220	8.6614	270	10.6299	37	1.4567	0.0433	10.5118	8.7795	0.6693	0.3937
260 TMP 12	260	10.2362	360	14.1732	79	3.1102	0.0827	13.9764	10.3937	1.2598	0.9252

Bearing Number	Abutment and Fillet Dimensions			Basic Load Ratings (lbs)		Limiting Speeds		Bearing Weight (Approx.)
	d_a min	D_a max	r_a max	C_a	C_{0a}	Grease	Oil	
	inch	inch	inch	lbs	lbs	RPM	RPM	lbs
65 TMP 12	3.6614	2.7953	0.0394	24,729	73,063	950	2800	1.771
110 TMP 12	5.9055	4.6850	0.0394	51,256	192,212	630	1900	5.852
130 TMP 12	6.9685	5.5906	0.0591	67,443	245,042	530	1600	9.900
130 TMP 93	8.4252	5.5118	0.0787	131,513	532,797	430	1300	22.880
150 TMP 12	7.9528	6.4173	0.0787	84,303	337,213	480	1400	13.530
150 TMP 93	9.2913	6.4961	0.0787	142,754	564,270	400	1200	28.160
160 TMP 93	10.0394	6.8110	0.0984	167,483	708,148	360	1100	37.180
170 TMP 12	8.9370	7.1654	0.0591	109,032	440,626	430	1300	18.040
170 TMP 93	10.4331	7.2047	0.0984	179,847	786,831	340	1000	38.940
180 TMP 94	13.1890	8.0709	0.1575	368,687	1,393,815	240	710	128.040
190 TMP 12	10.0394	7.8740	0.0984	158,490	591,248	360	1100	25.960
190 TMP 93	11.9291	8.0709	0.1181	242,794	1,011,640	400	900	60.720
220 TMP 11	10.3150	8.9370	0.0394	86,551	418,145	480	1500	9.900
260 TMP 12	13.4646	10.8661	0.0787	223,685	977,919	280	850	55.440

Notes

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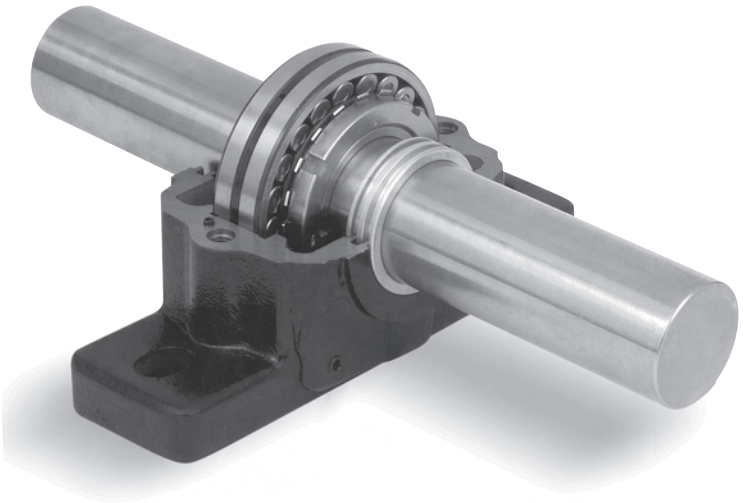
Pillow Blocks



SAF: Two or Four Bolt Pillow Block, Cast Iron
SDAF: Four Bolt Heavy Duty Type Pillow Block, Cast Iron
SAFS: Two or Four Bolt Pillow Block, Cast Steel
FSAF: Four Bolt Pillow Block, Cast Iron (optional)
FSAFS: Four Bolt Pillow Block, Cast Steel (optional)
SDAFS: Four Bolt Heavy Duty Pillow Block, Cast Steel

0xx: Housings use Tapered Bore Spherical Roller Bearings with Adapter Sleeves
2xx: Housings use Straight Bore Self-Aligning Ball or Spherical Roller Bearings
3xx: Housings use Straight Bore Self-Aligning Ball or Spherical Roller Bearings
5xx: Housings use Tapered Bore Self-Aligning Ball or Spherical Roller Bearings with Adapter Sleeves
6xx: Housings use Tapered Bore Self-Aligning Ball or Spherical Roller Bearings with Adapter Sleeves

Shaft size. Only used for Pillow Block units in 000 K Series

SAF	22	517	K	11 - 1/2

22: 222xx or 223xx Spherical Roller Bearing
2: 22xx or 23xx Self-Aligning Ball Bearing
1: 12xx or 13xx Double-Row Self-Aligning Ball Bearing

Indicated on adapter type mounting arrangement for 000 K Series.
Example: SDAF23064K/11-1/2

Please refer to the bearing tables for exact part number options

Applications

NSK Pillow Blocks are designed for exceptional performance in a wide range of applications. The pillow blocks are manufactured in a wide variety of sizes out of heavy-duty cast iron. They are also available in ductile and cast steel as an option. NSK pillow blocks are tremendous at keeping water and contaminants away from the bearing while keeping lubrication inside the housing. The housing comes standard with a triple-ring labyrinth seal; but for applications where contamination is a greater concern, taconite seals are available.

NSK Pillow Blocks are completely interchangeable with other manufacturers units.

- **General Industry (Conveyors, Roller Tables, Fans and Blowers)**
- **Steel Mills (Runout Tables, Strip Processing Lines)**
- **Processing Industry (Crushers, Hammer Mills, Ball and Rod Mills, Decanters, Kilns)**
- **Paper Making Equipment (Dryer Cans, Jack Ladders, Chip Conveyers, Pumps, Pulpers, Breast Rolls, Press Rolls)**

Accessories

LER Standard Labyrinth Seal

The LER is a popular standard labyrinth seal for SAF blocks.

LER-DC Dust Cover/Wiper Seal for LER or PER Seals

LER-DC Dust Cover/Wiper Seal can be used with both LER or PER seals. They provide an additional barrier and flinger for contaminants. The housing's machined face provides for an ideal contact for the wiper seal to shroud seal area and create an additional labyrinth. The LER-DC in combination with the PER and PER-PTV seal, provides optimum protection for low speed application in harsh environments.

PER Labyrinth with O-Ring

The PER interchanges completely and includes an O-ring shaft seal for a snug fit on the shaft. The O-ring will cause the PER to generally spin on the shaft.

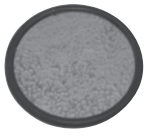
PER-PTV-Ring Seal for use with PER Labyrinth

PER-PTV-ring is a lip contact seal installed over the PER and within the housing seal grooves. The PTV-ring seal allows the grease to slowly purge creating a barrier for contaminants. The lip contact seal can be reversed to also retain grease for applications where contamination is of less concern or access for re-lube is difficult.

TER Taconite with V-Ring Face Seal

TER-OS Taconite Seal with Oil Seal

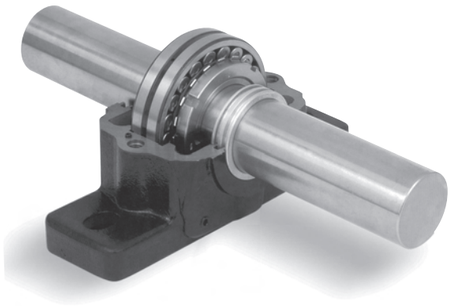
The TER taconite seal is available in two versions...one with a V-ring face seal and the other with an oil seal as a shaft contact seal. Both include a felt shaft seal and an O-ring seal for the housing side to provide a tight yet flexible fit.

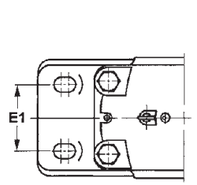


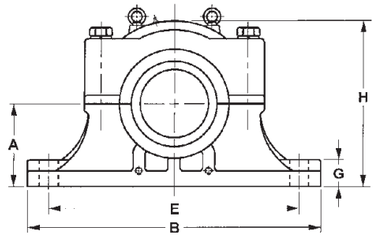
EPR End Cover

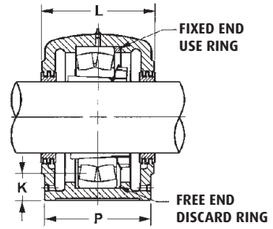
The EPR end cover seals one end of the housing.

Pillow Block: SAF 000K Series









Housing No.	A	B	P	G	E		E_1	H	K Static Oil Level	L	Bolts (No. Req'd)	Wt.
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	In.	lbs.*
SAF 024KX4-3/16	4-1/2	15-1/4	4-3/8	1-3/4	13-1/8	11-5/8	2-3/8	8-3/4	1-3/4	6	(4)--3/4	48
SAF 026KX4-7/16	4-15/16	16-1/2	4-3/4	2	14-1/2	12-5/8	2-3/4	9-5/8	1-7/8	6-1/2	(4)--3/4	56
SAF 028KX4-15/16	5-1/4	16-1/2	4-3/4	2-1/8	14-1/2	13-1/4	2-3/4	10-1/4	1-15/16	7-3/8	(4)--3/4	69
SAF 030KX5-3/16	6	18-3/8	5-1/8	2-3/8	16	14-5/8	3-1/4	11-9/16	2-7/16	8	(4)--7/8	107
SAF 032KX5-7/16	6	18-3/8	5-1/8	2-3/8	16	14-5/8	3-1/4	11-9/16	2-7/16	8	(4)--7/8	125
SAF 034KX5-15/16	6	20-1/8	5-7/8	2-3/8	17-1/8	16	3-3/8	11-3/4	2-1/8	7-5/8	(4)--1	120
SAF 036KX6-7/16	6-11/16	22	6-1/4	2-5/8	19-1/4	17-3/8	3-3/4	13-1/2	2-3/16	8-3/4	(4)--1	172
SAF 038KX6-15/16	6-11/16	22	6-1/4	2-5/8	19-1/4	17-3/8	3-3/4	13-1/2	2-3/16	8-3/4	(4)--1	167
SAF 040KX7-3/16	7-1/16	24-3/4	6-3/4	2-3/4	21-5/8	19-3/8	4-1/4	14-3/8	2-5/16	9-5/8	(4)--1	193
SAF 044KX7-15/16	7-7/8	28	7-1/2	3-1/8	24-3/8	21-5/8	4-1/2	15-7/8	2-5/8	10-5/8	(4)--1-1/4	304
SAF 048KX8-7/16	8-1/4	29-1/2	8	3-3/8	25	22-1/2	5	16-1/2	2-7/32	11-1/4	(4)--1-1/4	270
SAF 048KX8-1/2	8-1/4	29-1/2	8	3-3/8	25	22-1/2	5	16-1/2	2-7/32	11-1/4	(4)--1-1/4	270
SAF 048KX8-15/16	8-1/4	29-1/2	8	3-3/8	25	22-1/2	5	16-1/2	2-7/32	11-1/4	(4)--1-1/4	270
SAF 048KX9	8-1/4	29-1/2	8	3-3/8	25	22-1/2	5	16-1/2	2-7/32	11-1/4	(4)--1-1/4	270
SAF 052KX9-7/16	9-1/2	32-3/4	8-3/4	3-3/4	27-7/8	24-3/4	5-1/4	18-5/8	2-3/4	12	(4)--1-1/2	450
SAF 052KX9-1/2	9-1/2	32-3/4	8-3/4	3-3/4	27-7/8	24-3/4	5-1/4	18-5/8	2-3/4	12	(4)--1-1/2	450
SAF 056KX9-15/16	9-7/8	34-1/4	9	4	29-1/2	26-1/4	5-1/2	20-3/16	2-7/8	12-1/4	(4)--1-1/2	507
SAF 056KX10	9-7/8	34-1/4	9	4	29-1/2	26-1/4	5-1/2	20-3/16	2-7/8	12-1/4	(4)--1-1/2	507
SAF 056KX10-7/16	9-7/8	34-1/4	9	4	29-1/2	26-1/4	5-1/2	20-3/16	2-7/8	12-1/4	(4)--1-1/2	507
SAF 056KX10-1/2	9-7/8	34-1/4	9	4	29-1/2	26-1/4	5-1/2	20-3/16	2-7/8	12-1/4	(4)--1-1/2	507

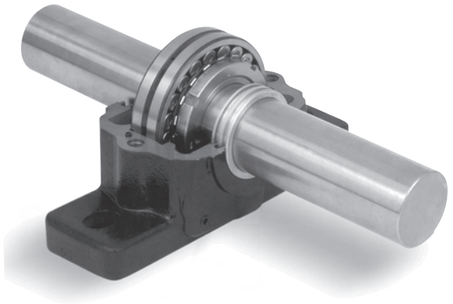
* Weights are approximate.

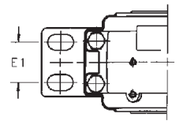
Shaft Diameter S-1 in.	Complete Unit Number	Housing Only [a]	Bearing Number	Adapter Locknut and Lockwasher or Lockplate	Labyrinth Seals (2 required)	Fixing Ring [b] (1 required)	End [c] Cover	Taconite Seal Part No.
4-3/16	SAF23024K/4-3/16	SAF024KX4-3/16	23024K	SNW3024X4-3/16	LER113	FR180X10	EPR14	TER113
4-7/16	SAF23026K/4-7/16	SAF026KX4-7/16	23026K	SNW3026X4-7/16	LER117	FR200X10	EPR15	TER117
4-15/16	SAF23028K/4-15/16	SAF028KX4-15/16	23028K	SNW3028X4-15/16	LER122	SR-0-20	EPR27	TER122
5-3/16	SAF23030K/5-3/16	SAF030KX5-3/16	23030K	SNW3030X5-3/16	LER125	SR-0-21	EPR16	TER125
5-7/16	SAF23032K/5-7/16	SAF032KX5-7/16	23032K	SNW3032X5-7/16	LER130	FR240X10	EPR16	TER130
5-15/16	SAF23034K/5-15/16	SAF034KX5-15/16	23034K	SNW3034X5-15/16	LER140	FR260X10	EPR18	TER140
6-7/16	SAF23036K/6-7/16	SAF036KX6-7/16	23036K	SNW3036X6-7/16	LER148	FR280X10	EPR19	TER148
6-15/16	SAF23038K6-15/16	SAF038KX6-15/16	23038K	SNW3038X6-15/16	LER155	FR290X10	EPR20	TER155
7-3/16	SAF23040K/7-3/16	SAF040KX7-3/16	23040K	SNW3040X7-3/16	LER159	FR310X10	EPR21	TER159
7-15/16	SAF23044K/7-15/16	SAF044KX7-15/16	23044K	SNW3044X7-15/16	LER167	FR340X10	EPR23	TER167
8-7/16	SAF23048K/8-7/16	SAF048KX8-7/16	23048K	SNP3048X8-7/16	LER550	A8897	---	TER550
8-1/2	SAF23048K/8-1/2	SAF048KX8-1/2	23048K	SNP3048X8-1/2	LER551	A8897	---	TER551
8-15/16	SAF23048K/8-15/16	SAF048KX8-15/16	23048K	SNP3048X8-15/16	LER552	A8897	---	TER552
9	SAF23048K/9	SAF048KX9	23048K	SNP3048X9	LER513	A8897	---	TER513
9-7/16	SAF23052K/9-7/16	SAF052KX9-7/16	23052K	SNP3052X9-7/16	LER553	A8898	---	TER553
9-1/2	SAF23052K/9-1/2	SAF052KX9-1/2	23052K	SNP3052X9-1/2	LER178	A8898	---	TER178
9-15/16	SAF23056K/9-15/16	SAF056KX9-15/16	23056K	SNP3056X9-15/16	ER751	A8819	---	TER751
10	SAF23056K/10	SAF056KX10	23056K	SNP3056X10	ER705	A8819	---	TER705
10-7/16	SAF23056K/10-7/16	SAF056KX10-7/16	23056K	SNP3056X10-7/16	ER745	A8819	---	TER745
10-1/2	SAF23056K/10-1/2	SAF056KX10-1/2	23056K	SNP3056X10-1/2	ER710	A8819	---	TER710

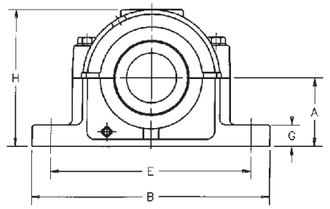
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS). Taconite (TER) and LOR seals with O-rings are also available.

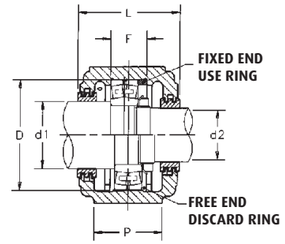
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

Pillow Block: SAF 200 Series









Housing No.	A	B	P	G	E		E_1	H	L	Bolts (No. Req'd)	Wt.	D	F	d_1	d_2
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	lbs.*	mm	mm	In.	In.
SAF216	3-1/2	13	3-1/2	1-1/4	11	9-5/8	2-1/8	6-15/16	5-3/8	(2)-3/4	30	140	43	3-5/8	3
FSAF216	3-1/2	13	3-1/2	1-1/4	11	9-5/8		6-15/16	5-3/8	(4)-5/8	30	140	43	3-5/8	3
SAF217	3-3/4	13	3-1/2	1-1/4	11	9-7/8	2-1/8	7-3/8	5-3/8	(2)-3/4	32	150	46	3-5/16	3-3/16
FSAF217	3-3/4	13	3-1/2	1-1/4	11	9-7/8		7-3/8	5-3/8	(4)-5/8	32	150	46	3-5/16	3-3/16
SAF218	4	13-3/4	3-7/8	1-5/16	11-5/8	10-3/8	2-1/8	7-3/4	5-3/4	(2)-3/4	38	160	50	4-1/8	3-3/8
FSAF218	4	13-3/4	3-7/8	1-5/16	11-5/8	10-3/8		7-3/4	5-3/4	(4)-5/8	38	160	50	4-1/8	3-3/8
SAF220	4-1/2	15-1/4	4-3/8	1-3/4	13-1/8	11-5/8	2-3/8	8-3/4	6	(2)-7/8	60	180	56	4-1/2	3-13/16
FSAF220	4-1/2	15-1/4	4-3/8	1-3/4	13-1/8	11-5/8		8-3/4	6	(4)-3/4	60	180	56	4-1/2	3-13/16
SAF222	4-15/16	16-1/2	4-3/4	2	14-1/2	12-5/8	2-3/4	9-5/8	6-1/2	(4)-3/4	78	200	63	4-7/8	4-3/16
SAF224	5-1/4	16-1/2	4-3/4	2-1/8	14-1/2	13-1/4	2-3/4	10-1/4	7-3/8	(4)-3/4	91	215	68	5-5/16	4-9/16
SAF226	6	18-3/8	5-1/8	2-3/8	16	14-5/8	3-1/4	11-1/2	8	(4)-7/8	125	230	74	5-7/8	4-15/16
SAF228	6	20-1/8	5-7/8	2-3/8	17-1/8	16	3-3/8	11-3/4	7-5/8	(4)-1	129	250	78	6-1/4	5-5/16
SAF230	6-5/16	21-1/4	6-1/4	2-1/2	18-1/4	17	3-3/4	12-1/2	8-3/8	(4)-1	165	270	83	6-5/8	5-3/4
SAF232	6-11/16	22	6-1/4	2-5/8	19-1/4	17-3/8	3-3/4	13-5/16	8-3/4	(4)-1	179	290	90	7	6-1/16
SAF234	7-1/16	24-3/4	6-3/4	2-3/4	21-5/8	19-3/8	4-1/4	14-3/16	9-5/8	(4)-1	228	310	96	7-7/16	6-7/16
SAF236	7-1/2	26-3/4	7-1/8	3	23-5/8	20-7/8	4-5/8	14-7/8	10	(4)-1	258	320	96	7-13/16	6-7/8
SAF238	7-7/8	28	7-1/2	3-1/8	24-3/8	21-5/8	4-1/2	15-11/16	10-3/4	(4)-1	305	340	102	8-3/8	7-1/4
SAF240	8-1/4	29-1/2	8	3-3/8	25	22-1/2	5	16-1/2	11-1/4	(4)-1	361	360	108	8-3/4	7-5/8
SAF244	9-1/2	32-3/4	8-3/4	3-3/4	27-7/8	24-3/4	5-1/4	18-5/8	12	(4)-1	500	400	118	9-9/16	8-5/16

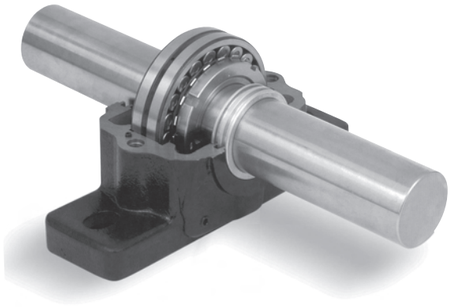
* Weights are approximate.

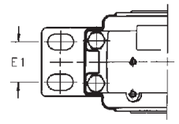
Shaft		Complete Unit Number	Housing Only [a]	Bearing Number	Locknut	Lockwasher	Labyrinth Seals		Fixing Ring [b]		End [c] Cover
D_1	D_2						D_1	D_2	Size	Qty.	
3-5/8	3	SAF1216 SAF2216 SAF22216	SAF216 FSAF216	1216 2216 22216	AN16	W16	LER82	LER54	FR140X8.5 FR140X10 FR140X10	2 1 1	EPR09
3-15/16	3/3-16	SAF1217 SAF2217 SAF22217	SAF217 FSAF217	1217 2217 22217	AN17	W17	LER89	LER63	FR150X9 FR150X10 FR150X10	2 1 1	EPR09
4-1/8	3-3/8	SAF1218 SAF2218 SAF22218	SAF218 FSAF218	1218 2218 22218	AN18	W18	LER112	LER191	FR160X10 FR160X10 FR160X10	2 1 1	EPR11
4-1/2	3-3/16	SAF1220 SAF2220 SAF22220	SAF220 FSAF220	1220 2220 22220	AN20	W20	LER118	LER106	FR180X11 FR180X10 FR180X10	2 1 1	EPR12
4-7/8	4-3/16	SAF1222 SAF2222 SAF22222	SAF222	1222 2222 22222	AN22	W22	LER121	LER113	FR200X12.5 FR200X10 FR200X10	2 1 1	EPR14
5-5/16	4-9/16	SAF22224	SAF224	22224	AN24	W24	LER127	LER119	FR215X10	1	EPR15
5-7/8	4-15/16	SAF22226	SAF226	22226	AN26	W26	LER136	LER122	FR230X10	1	EPR27
6-1/4	5-5/16	SAF22228	SAF228	22228	AN28	W28	LER144	LER127	FR250X10	1	EPR16
6-5/8	5-3/4	SAF22230	SAF230	22230	AN30	W30	LER151	LER134	FR270X10	1	EPR17
7	6-1/16	SAF22232	SAF232	22232	AN32	W32	LER156	LER142	FR290X10	1	EPR18
7-7/16	6-7/16	SAF22234	SAF234	22234	AN34	W34	LER161	LER148	FR310X10	1	EPR19
7-13/16	6-7/8	SAF22236	SAF236	22236	AN36	W36	LER165	LER154	FR320X10	1	EPR20
8-3/8	7-1/4	SAF22238	SAF238	22238	AN38	W38	LER171	LER160	FR340X10	1	EPR21
8-3/4	7-5/8	SAF22240	SAF240	22240	AN40	W40	LER175	LER164	FR360X10	1	EPR22
9-9/16	8-5/16	SAF22244	SAF244	22244	AN44	W44	LER179	LER170	FR400X10	1	EPR24

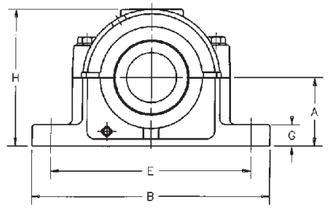
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS).
Taconite (TER) and LOR seals with O-rings are also available.

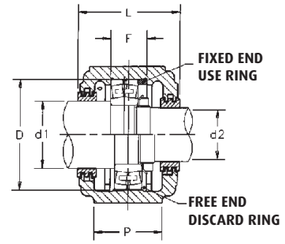
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

Pillow Block: SAF 300 Series









Housing No.	A	B	P	G	E		E_1	H	L	Bolts (No. Req'd)	Wt.	D	F	d_1	d_2
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	lbs.*	mm	mm	In.	In.
SAF308	2-1/2	8-1/4	2-3/8	1	7	6-1/2		4-13/16	4	(2)-1/2	10	90	42.8	1-15/16	1-7/16
SAF309	2-3/4	9/5/2008	2-3/4	1	7-7/8	7-3/8		5-5/16	4-1/4	(2)-5/8	13	100	46	2-1/8	1-11/16
SAF310	3	10-5/8	2-3/4	1-1/8	9	7-3/4		5-13/16	4-5/8	(2)-5/8	17	110	51	2-3/8	1-7/8
SAF311	3-1/4	11	3-1/8	1-3/16	9-1/2	8-1/8		6-3/16	5	(2)-5/8	21	120	53	2-9/16	2-1/16
FSAF311	3-1/4	11	3-1/8	1-3/16	9-1/2	8-1/8	2	6-3/16	5	(4)-1/2	21	120	53	2-9/16	2-1/16
SAF313	3-1/2	13	3-1/2	1-1/4	11	9-5/8		6-15/16	5-3/8	(2)-3/4	30	140	58	3-1/16	2-7/16
FSAF313	3-1/2	13	3-1/2	1-1/4	11	9-5/8	2-1/8	6-15/16	5-3/8	(4)-5/8	30	140	58	3-1/16	2-7/16
SAF314	3-3/4	13	3-1/2	1-1/4	11	9-7/8		7-3/8	5-3/8	(2)-3/4	32	150	63	3-1/4	2-5/8
FSAF314	3-3/4	13	3-1/2	1-1/4	11	9-7/8	2-1/8	7-3/8	5-3/8	(4)-5/8	32	150	63	3-1/4	2-5/8
SAF315	4	13-3/4	3-7/8	1-5/16	11-5/8	10-3/8		7-13/16	6-1/4	(2)-3/4	41	160	65	3-7/16	2-13/16
FSAF315	4	13-3/4	3-7/8	1-5/16	11-5/8	10-3/8	2-1/8	7-13/16	6-1/4	(4)-5/8	41	160	65	3-7/16	2-13/16
SAF316	4-1/4	14-1/4	3-7/8	1-5/16	12-5/8	10-5/8		8-1/4	6-1/2	(2)-3/4	49	170	68	3-5/8	3
FSAF316	4-1/4	14-1/4	3-7/8	1-5/16	12-5/8	10-5/8	2-1/8	8-1/4	6-1/2	(4)-5/8	49	170	68	3-5/8	3
SAF317	4-1/2	15-1/4	4-3/8	1-3/4	13-1/8	11-5/8		8-3/4	6-3/4	(2)-7/8	65	180	70	3-15/16	3-3/16
FSAF317	4-1/2	15-1/4	4-3/8	1-3/4	13-1/8	11-5/8	2-3/8	8-3/4	6-3/4	(4)-3/4	65	180	70	3-15/16	3-3/16

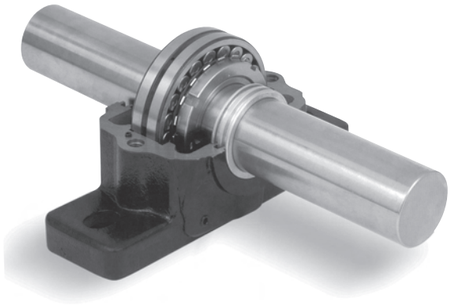
* Weights are approxmate

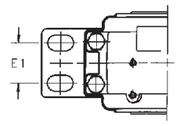
Shaft		Complete Unit Number	Housing Only [a]	Bearing Number	Locknut	Lockwasher	Labyrinth Seals		Fixing Ring [b]		End [c] Cover
D_1	D_2						D_1	D_2	Size	Qty.	
1/15/16	1-7/16	SAF1308 SAF2308 SAF21308 SAF22308	SAF308	1308 2308 21308 22308	N08	W08	LER24	LER17	FR90X10 FR90X10 FR90X10.2 FR90X10	2 1 2 1	EPR03
2-1/8	1-11/16	SAF1309 SAF2309 SAF21309 SAF22309	SAF309	1309 2309 21309 22309	N09	W09	LER28	LER20	FR100X10.5 FR100X10 FR100X10.5 FR100X10	2 1 2 1	EPR04
2-3/8	1-7/8	SAF1310 SAF2310 SAF21310 SAF22310	SAF310	1310 2310 21310 22310	N10	W10	LER35	LER23	FR110X11.5 FR110X10 FR110X11.5 FR110X10	2 1 2 1	EPR05
2-9/16	2-1/16	SAF1311 SAF2311 SAF21311 SAF22311	SAF311 FSAF311	1311 2311 21311 22311	N11	W11	LER40	LER27	FR120X12 FR120X10 FR120X12 FR120X10	2 1 2 1	EPR06
3-1/16	2-7/16	SAF1313 SAF2313 SAF21313 SAF22313	SAF313 FSAF313	1313 2313 21313 22313	N13	W13	LER55	LER37	FR140X12.5 FR140X10 FR140X12.5 FR140X10	2 1 2 1	EPR07
3-1/4	2-5/8	SAF1314 SAF2314 SAF21314 SAF22314	SAF314	1314 2314 21314 22314	N14	W14	TS314X3-1/4	TS314X2-5/8	FR150X12.5 FR150X10 FR150X12.5 FR150X10	2 1 2 1	---
3-7/16	2-13/16	SAF1315 SAF2315 SAF21315 SAF22315	SAF315 FSAF315	1315 2315 21315 22315	N15	W15	LER79	LER46	FR160X14 FR160X10 FR160X14 FR160X10	2 1 2 1	EPR08
3-5/8	3	SAF1316 SAF2316 SAF21316 SAF22316	SAF316 FSAF316	1316 2316 21316 22316	AN16	W16	LER84	LER60	FR170X14.5 FR170X10 FR170X14.5 FR170X10	2 1 2 1	EPR10
3-15/16	3-3/16	SAF1317 SAF2317 SAF21317 SAF22317	SAF317 FSAF317	1317 2317 21317 22317	AN17	W17	LER109	LER188	FR180X14.5 FR180X10 FR180X14.5 FR180X10	2 1 2 1	EPR11

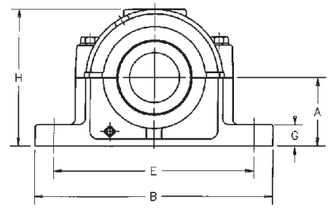
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS). Taconite (TER) and LOR seals with O-rings are also available.

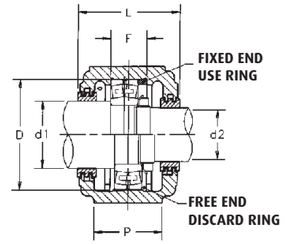
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

Pillow Block: SAF 300 Series (cont.)









Housing No.	A	B	P	G	E		E_1	H	L	Bolts (No. Req'd)	Wt.	D	F	d_1	d_2
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	lbs.*	mm	mm	In.	In.
SAF318	4-3/4	15-1/2	4-3/8	2	13-1/2	12	2-1/4	9-3/16	6-7/8	(4)-3/4	75	190	74	4-1/8	3-3/8
SAF320	5-1/4	16-1/2	4-3/4	2-1/8	14-1/2	13-1/4	2-3/4	10-1/4	7-3/8	(4)-3/4	91	215	83	4-1/2	3-13/16
SAF322	6	18-3/8	5-1/8	2-3/8	16	14-5/8	3-1/4	11-1/2	8	(4)-7/8	120	240	90	4-7/8	4-3/16
SAF324	6-5/16	21-1/4	6-1/4	2-1/2	18-1/4	17	3-3/4	12-1/2	8-3/8	(4)-1	166	260	96	5-5/16	4-9/16
SAF326	6-11/16	22	6-1/4	2-5/8	19-1/4	17-3/8	3-3/4	13-5/16	8-3/4	(4)-1	184	280	103	5-7/8	4-15/16
SAF328	7-1/16	24-3/4	6-3/4	2-3/4	21-5/8	19-3/8	4-1/4	14-3/16	9-5/8	(4)-1	243	300	112	6-1/4	5-5/16
SAF330	7-1/2	26-3/4	7-1/8	3	23-5/8	20-7/8	4-5/8	14-7/8	9-3/4	(4)-1	259	320	118	6-5/8	5-3/4
SAF332	7-7/8	28	7-1/2	3-1/8	24-3/8	21-5/8	4-1/2	15-11/16	10-3/4	(4)-11/4	299	340	124	7	6-1/16
SAF334	8-1/4	29-1/2	8	3-3/8	25	22-1/2	5	16-1/2	11-1/4	(4)-11/4	355	360	130	7-7/16	6-7/16
SAF336	8-7/8	31-1/4	8-1/4	3-1/2	26-5/8	24	5-1/4	17-3/4	11-3/8	(4)-11/4	360	380	136	7-13/16	6-7/8
SAF338	9-1/2	32-3/4	8-3/4	3-3/4	27-7/8	24-3/4	5-1/4	18-5/8	12	(4)-11/2	477	400	142	8-3/8	7-1/4
SAF340	9-7/8	34-1/4	9	4	29-1/2	26-1/4	5-1/2	20	12-1/16	(4)-11/2	480	420	148	8-3/4	7-5/8

* Weights are approximate.

Shaft		Complete Unit Number	Housing Only [a]	Bearing Number	Locknut	Lockwasher	Labyrinth Seals		Fixing Ring [b]		End [c] Cover
D_1	D_2						D_1	D_2	Size	Qty.	
4-1/8	3-3/8	SAF1318 SAF2318 SAF21318 SAF22318	SAF318 FSAF318	1318 2318 21318 22318	AN18	W18	LER112	LER191	FR190X15.5 FR190X10 FR190X15.5 FR190X10	2 1 2 1	EPR11
4-1/2	3-13/16	SAF1320 SAF2320 SAF21320 SAF22320	SAF320 FSAF320	1320 2320 21320 22320	AN20	W20	LER118	LER106	FR215X18 FR215X10 FR215X18 FR215X10	2 1 2 1	EPR12
4-7/8	4-3/16	SAF1322 SAF21322 SAF22322	SAF322	1322 21322 22322	AN22	W22	LER121	LER113	FR240X20 FR240X20 FR240X10	2 2 1	EPR14
5-5/16	4-9/16	SAF22324	SAF324	22324	AN24	W24	ER127	LER119	FR260X10	1	EPR15
5-7/8	4-15/16	SAF22326	SAF326	22326	AN26	W26	LER136	LER122	FR280X10	1	EPR27
6-1/4	5-15/6	SAF22328	SAF328	22328	N28	W28	LER144	LER127	FR300X10	1	EPR16
6-5/8	5-3/4	SAF22330	SAF330	22330	AN30	W30	LER151	LER134	FR320X10	1	EPR17
7	6-1/16	SAF22332	SAF332	22332	AN32	W32	LER156	LER142	FR340X10	1	EPR18
7-7/16	6-7/16	SAF22334	SAF334	22334	AN34	W34	LER161	LER148	FR360X10	1	EPR19
7-13/16	6-7/8	SAF22336	SAF336	22336	AN36	W36	LER165	LER154	FR380X10	1	EPR20
8-3/8	7-1/4	SAF22338	SAF338	22338	AN38	W38	LER171	LER160	FR400X10	1	EPR21
8-3/4	7-5/8	SAF22340	SAF340	22340	AN40	W40	LER175	LER164	FR420X10	1	EPR22

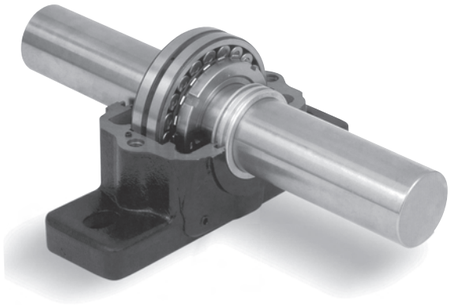
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS).
Taconite (TER) and LOR seals with O-rings are also available.

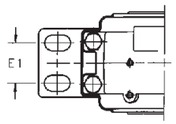
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.

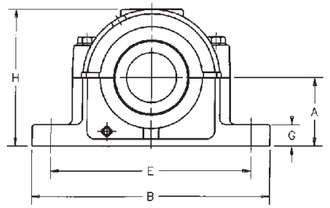
[b] Fixing Ring is used for fixed block only; do not use for float mounting.

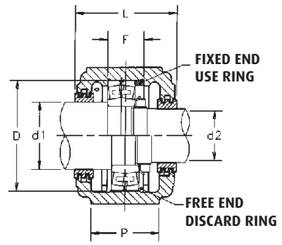
[c] End Cover is optional.

Pillow Block: SAF 500 Series









Housing No.	A	B	P	G	E		E_1	H	L	X	Bolts (No. Req'd)	Wt.	D	F	d_1
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	In.	lbs.*	mm	In.	In.
SAF505	1-1/2	6-1/2	1-3/4	11/16	5-1/2	4-5/8	--	2-15/16	2-7/8	--	2-(1/2)	4	--	--	3/4
SAF506	1-3/4	7-1/2	2	11/16	6-1/8	5-1/4	--	3-5/16	3-1/4	--	2-(1/2)	6	--	--	15/16
SAF507	2	7-1/2	2	7/8	6-1/8	5-5/8		3-7/8	3-1/4	1.000	(2)-1/2	8.0	80	8	1-3/16
SAF509	2-1/4	8-1/4	2-3/8	13/16	7	6-1/4		4-3/8	3-5/8	0.114	(2)-1/2	9.3	85	29	1-7/16
SAF510	2-1/2	8-1/4	2-3/8	15/16	7	6-1/2		4-3/4	3-5/8	0.133	(2)-1/2	10.1	90	30	1-11/16
SAF511	2-3/4	9-5/8	2-3/4	15/16	7-7/8	7-3/8		5-1/4	3-7/8	0.114	(2)-5/8	12.5	100	31	1-15/16
SAF513	3	11	3-1/8	1	9-1/2	8-1/8	2	5-15/16	4-1/2	0.157	(2)-5/8	19.0	120	39	2-3/16
FSAF513	3	11	3-1/8	1	9-1/2	8-1/8		5-15/16	4-1/2	0.157	(4)-1/2	19.0	120	39	2-3/16
SAF515	3-1/4	11-1/4	3-1/8	1-1/8	9-5/8	8-5/8	1-7/8	6-3/8	4-3/4	0.118	(2)-5/8	18.3	130	37	2-7/16
FSAF515	3-1/4	11-1/4	3-1/8	1-1/8	9-5/8	8-5/8		6-3/8	4-3/4	0.118	(4)-1/2	18.3	130	37	2-7/16
SAF516	3-1/2	13	3-1/2	1-3/16	11	9-5/8	2-1/8	6-7/8	4-7/8	0.187	(2)-3/4	27.3	140	43	2-11/16
FSAF516	3-1/2	13	3-1/2	1-3/16	11	9-5/8		6-7/8	4-7/8	0.187	(4)-5/8	27.3	140	43	2-11/16
SAF517	3-3/4	13	3-1/2	1-1/4	11	9-7/8	2-1/8	7-5/16	5	0.187	(2)-3/4	31.8	150	46	2-15/16
FSAF517	3-3/4	13	3-1/2	1-1/4	11	9-7/8		7-5/16	5	0.187	(4)-5/8	31.8	150	46	2-15/16

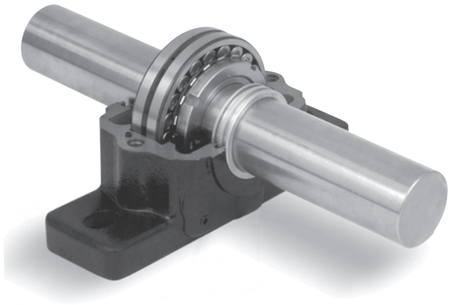
* Weights are approximate.

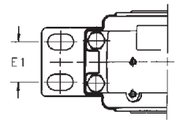
Shaft Size	Complete Unit Number	Housing Only [a]	Bearing Number	Adapters		Labyrinth Seals		Fixing Ring [b]		End Cover [c]
				SNW Type	H Type	LER	Taconite	Size	Qty.	
3/4	SAF1505 SAF2505	SAF505	1205K 2205K	SNW05 x 3/4 SNW05 x 3/4	H205 x 3/4 H305 x 3/4	LER6	--	FR52 x 5 FR52 x 7	2 1	--
15/16	SAF1506 SAF2506	SAF506	1206K 2206K	SNW06 x 15/16 SNW06 x 15/16	H206 x 15/16 H306 x 15/16	LER10	--	FR62 x 7 FR62 x 10	2 1	--
1-3/16	SAF1507 SAF2507	SAF507	1207K 2207K	SNW07X1-3/16 SNW07X1-3/16	HA207X1-3/16 HA307X1-3/16	LER14	---	FR72X8 FR72X10	2 1	---
1-7/16	SAF1509 SAF2509 SAF22509	SAF509	1209K 2209K 22209K	SNW09X1-7/16 SNW09X1-7/16 SNW09X1-7/16	HA209X1-7/16 HA309X1-7/16 HA309X1-7/16	LER17	TER17	FR85X5 FR85X6 FR85X6	2 1 1	EPR03
1-11/16	SAF1510 SAF2510 SAF22510	SAF510	1210K 2210K 22210K	SNW10X1-11/16 SNW10X1-11/16 SNW10X1-11/16	HA210X1-11/16 HA310X1-11/16 HA310X1-11/16	LER20	TER20	FR90X5 FR90X7 FR90X7	2 1 1	EPR04
1-15/16	SAF1511 SAF2511 SAF22511	SAF511	1211K 2211K 22211K	SNW11X1-15/16 SNW11X1-15/16 SNW11X1-15/16	HA211X1-15/16 HA311X1-15/16 HA311X1-15/16	LER24	TER24	FR100X5 FR100X6 FR100X6	2 1 1	EPR05
2-3/16	SAF1513 SAF2513 SAF22513	SAF513 FSAF513	1213K 2213K 22213K	SNW13X2-3/16 SNW13X2-3/16 SNW13X2-3/16	HA213X2-3/16 HA313X2-3/16 HA313X2-3/16	LER29	TER29	FR120X8 FR120X8 FR120X8	2 1 1	EPR06
2-7/16	SAF1515 SAF2515 SAF22515	SAF515 FSAF515	1215K 2215K 22215K	SNW15X2-7/16 SNW15X2-7/16 SNW15X2-7/16	HA215X2-7/16 HA315X2-7/16 HA315X2-7/16	LER37	TER37	FR130X6 FR130X6 FR130X6	2 1 1	EPR07
2-11/16	SAF1516 SAF2516 SAF22516	SAF516 FSAF516	1216K 2216K 22216K	SNW16X2-11/16 SNW16X2-11/16 SNW16X2-11/16	HA216X2-11/16 HA316X2-11/16 HA316X2-11/16	LER44	TER44	FR140X8.5 FR140X10 FR140X10	2 1 1	EPR08
2-15/16	SAF1517 SAF2517 SAF22517	SAF517 FSAF517	1217K 2217K 22217K	SNW17X2-15/16 SNW17X2-15/16 SNW17X2-15/16	HA217X2-15/16 HA317X2-15/16 HA317X2-15/16	LER53	TER53	FR150X9 FR150X10 FR150X10	2 1 1	EPR09

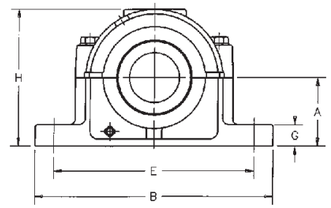
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS).
LOR seals with O-rings are also available.

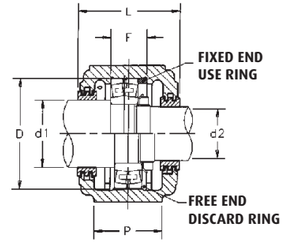
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

Pillow Block: SAF 500 Series (cont.)









Housing No.	A	B	P	G	E		E_1	H	L	X	Bolts (No. Req'd)	Wt.	D	F	d_1
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	In.	lbs.*	mm	In.	In.
SAF518	4	13-3/4	3-7/8	1-5/16	11-5/8	10-3/8	2-1/8	7-3/4	5-3/4	0.187	(2)-3/4	36.6	160	50	3-3/16
FSAF518	4	13-3/4	3-7/8	1-5/16	11-5/8	10-3/8		7-3/4	5-3/4	0.187	(4)-5/8	36.6	160	50	3-3/16
SAF520	4-1/2	15-1/4	4-3/8	1-3/4	13-1/8	11-5/8	2-3/8	8-3/4	6-1/8	0.187	(2)-7/8	50.3	180	56	3-7/16
FSAF520	4-1/2	15-1/4	4-3/8	1-3/4	13-1/8	11-5/8		8-3/4	6-1/8	0.187	(4)-3/4	50.3	180	56	3-7/16
SAF522	4-15/16	16-1/2	4-3/4	2	14-1/2	12-5/8	2-3/4	9-5/8	6-1/2	0.187	(4)-3/4	69.2	200	63	3-15/16
SAF524	5-1/4	16-1/2	4-3/4	2-1/8	14-1/2	13-1/4	2-3/4	10-1/4	7-3/8	0.187	(4)-3/4	71.2	215	68	4-3/16
SAF526	6	18-3/4	5-1/8	2-3/8	16	14-5/8	3-1/4	11-1/2	8	0.187	(4)-4/8	94.8	230	74	4-7/16
SAF528	6	20-1/8	5-7/8	2-3/8	17-1/8	16	3-3/8	11-3/4	7-5/8	0.187	(4)-1	110.0	250	78	4-15/16
SAF530	6-5/16	21-1/4	6-1/4	2-1/2	18-1/4	17	3-3/4	12-1/2	8-3/8	0.187	(4)-1	138.0	270	83	5-3/16
SAF532	6-11/16	22	6-1/4	2-5/8	19-1/4	17-3/8	3-3/4	13-5/16	8-3/4	0.187	(4)-1	158.0	290	90	5-7/16
SAF534	7-1/16	24-3/4	6-3/4	2-3/4	21-5/8	19-3/8	4-1/4	14-3/16	9-5/8	0.187	(4)-1	185.0	310	96	5-15/16
SAF536	7-1/2	26-3/4	7-1/8	3	23-5/8	20-7/8	4-5/8	14-7/16	10	0.187	(4)-1	217.0	320	96	6-7/16
SAF538	7-7/8	28	7-1/2	3-1/8	24-3/8	21-5/8	4-1/2	15-11/16	10-3/4	0.187	(4)-11/4	285.0	340	102	6-15/16
SAF540	8-1/4	29-1/2	8	3-3/8	25	22-1/2	5	16-1/2	11-1/4	0.187	(4)-11/4	331.0	360	108	7-3/16
SAF544	9-1/2	32-3/4	8-3/4	3-3/4	27-7/8	24-3/4	5-1/4	18-5/8	12	0.187	(4)-11/2	391.0	400	111	7-15/16

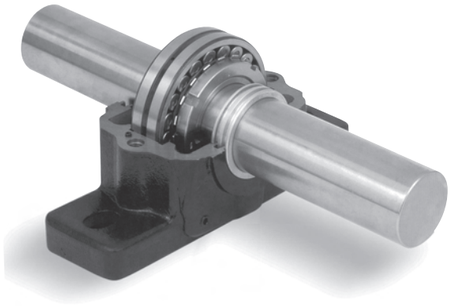
* Weights are approximate.

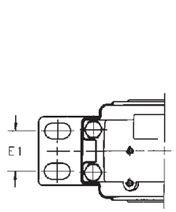
Shaft Size	Complete Unit Number	Housing Only [a]	Bearing Number	Adapters		Labyrinth Seals		Fixing Ring [b]		End Cover [c]
				SNW Type	H Type	LER	Taconite	Size	Qty.	
3-3/16	SAF1518	SAF518	1218K	SNW18X3-3/16	HA218X3-3/16			FR160X10	2	
	SAF2518	FSAF518	2218K	SNW18X3-3/16	HA318X3-3/16	LER188	TER188	FR160X10	1	EPR11
	SAF22518		22218K	SNW18X3-3/16	HA318X3-3/16			FR160X10	1	
3-7/16	SAF1520	SAF520	1220K	SNW20X3-7/16	HA220X3-7/16	LER102	TER102	FR180X11	2	EPR12
	SAF2520	FSAF520	2220K	SNW20X3-7/16	HA320X3-7/16			FR180X10	1	
	SAF22520		22220K	SNW20X3-7/16	HA320X3-7/16			FR180X10	1	
3-15/16	SAF1522	SAF522	1222K	SNW22X3-15/16	HA222X3-15/16	LER109	TER109	FR200X12.5	2	EPR13
	SAF2522		2222K	SNW22X3-15/16	HA322X3-15/16			FR200X10	1	
	SAF22522		22222K	SNW22X3-15/16	HA322X3-15/16			FR200X10	1	
4-3/16	SAF22524	SAF524	22224K	SNW24X4-3/16	HA3124X4-3/16	LER113	TER113	FR215X10	1	EPR14
4-7/16	SAF22526	SAF526	22226K	SNW26X4-7/16	HA3126X4-7/16	LER117	TER117	FR230X10	1	EPR15
4-15/16	SAF22528	SAF528	22228K	SNW28X4-15/16	HA3128X4-15/16	LER122	TER122	FR250X10	1	EPR27
5-3/16	SAF22530	SAF530	22230K	SNW30X5-3/16	HA3130X5-3/16	LER125	TER125	FR270X10	1	EPR16
5-7/16	SAF22532	SAF532	22232K	SNW32X5-7/16	HA3132X5-7/16	LER130	TER130	FR290X10	1	EPR16
5-15/16	SAF22534	SAF534	22234K	SNW34X5-15/16	HA3134X5-15/16	LER140	TER140	FR310X10	1	EPR18
6-7/16	SAF22536	SAF536	22236K	SNW36X6-7/16	HA3136X6-7/16	LER148	TER148	FR320X10	1	EPR19
6-15/16	SAF22538	SAF538	22238K	SNW38X6-15/16	HA3138X6-15/16	LER155	TER155	FR340X10	1	EPR20
7-3/16	SAF22540	SAF540	22240K	SNW40X7-3/16	HA3140X7-3/16	LER159	TER159	FR360X10	1	EPR20
7-15/16	SAF22544	SAF544	22244K	SNW44X7-15/16	HA3144X7-15/16	LER167	TER167	FR400X10	1	EPR20

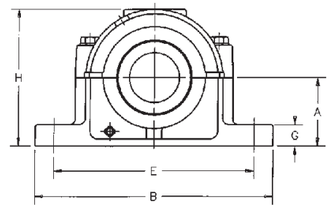
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS).
LOR seals with O-rings are also available.

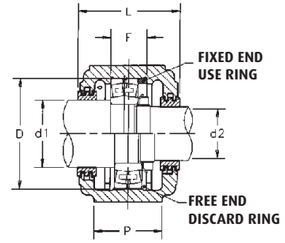
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

Pillow Block: SAF 600 Series









Housing No.	A	B	P	G	E		E_1	H	L	Bolts (No. Req'd)	Wt.	D	F	d_1
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	lbs.*	mm	mm	In.
SAF609	2-3/4	9-5/8	2-3/4	1	7-7/8	7-3/8		5-6/16	4-1/4	(2)-5/8	13.6	100	46	1-7/16
SAF610	3	10-5/8	2-3/4	1-1/8	9	7-3/4		5-13/16	4-5/8	(2)-5/8	17.8	110	51	1-11/16
SAF611	3-1/4	11	3-1/3	1-3/16	9-1/2	8-1/8	2	6-3/16	4-7/8	(2)-5/8	21.3	120	53	1-15/16
FSAF611	3-1/4	11	3-1/3	1-3/16	9-1/2	8-1/8		6-3/16	4-7/8	(4)-1/2	21.3	120	53	1-15/16
SAF613	3-1/2	13	3-1/2	1-1/4	11	9-5/8	2-1/8	6-15/16	5-3/8	(2)-3/4	30.2	140	58	2-3/16
FSAF613	3-1/2	13	3-1/2	1-1/4	11	9-5/8		6-15/16	5-3/8	(4)-5/8	30.2	140	58	2-3/16
SAF615	4	13-3/4	3-7/8	1-5/16	11-5/8	10-3/8	2-1/8	7-3/4	6-1/4	(2)-3/4	41.3	160	65	2-7/16
FSAF615	4	13-3/4	3-7/8	1-5/16	11-5/8	10-3/8		7-3/4	6-1/4	(4)-5/8	41.3	160	65	2-7/16
SAF616	4-1/4	14-1/4	3-7/8	1-5/16	12-5/8	10-5/8	2-1/8	8-1/4	6-1/2	(2)-3/4	48.0	170	68	2-11/16
FSAF616	4-1/4	14-1/4	3-7/8	1-5/16	12-5/8	10-5/8		8-1/4	6-1/2	(4)-5/8	48.0	170	68	2-11/16
SAF617	4-1/2	15-1/4	4-3/8	1-3/4	13-1/8	11-5/8	2-3/8	8-3/4	6-3/4	(2)-7/8	71.0	180	70	2-15/16
FSAF617	4-1/2	15-1/4	4-3/8	1-3/4	13-1/8	11-5/8		8-3/4	6-3/4	(4)-3/4	71.0	180	70	2-15/16
SAF618	4-3/4	15-1/2	4-3/8	2	13-1/2	12	2-1/4	9-3/16	6-7/8	(4)-3/4	76.0	190	74	3-3/16

* Weights are approximate.

Shaft Size	Complete Unit Number	Housing Only [a]	Bearing Number	Adapters		Labyrinth Seals		Fixing Ring [b]		End Cover [c]
				SNW Type	H Type	LER	Taconite	Size	Qty.	
1-7/16	SAF1609	SAF609	1309K	SNW09X1-7/16	HA309X1-7/16	LER17	TER17	FR100X10.5	2	EPR03
	SAF2609		2309K	SNW09X1-7/16	HA2309X1-7/16			FR100X10	1	
	SAF21609		21309K	SNW09X1-7/16	HA309X1-7/16			FR100X10.5	2	
	SAF22609		22309K	SNW109X1-7/16	HA2309X1-7/16			FR100X10	1	
1-11/16	SAF1610	SAF610	1310K	SNW10X1-11/16	HA310X1-11/16	LER20	TER20	FR110X11.5	2	EPR04
	SAF2610		2310K	SNW10X1-11/16	HA2310X1-11/16			FR110X10	1	
	SAF21610		21310K	SNW10X1-11/16	HA310X1-11/16			FR110X11.5	2	
	SAF22610		22310K	SNW110X1-11/16	HA2310X1-11/16			FR110X10	1	
1-15/16	SAF1611	SAF611	1311K	SNW11X1-15/16	HA311X1-15/16	LER24	TER24	FR120X12	2	EPR05
	SAF2611	FSAF611	2311K	SNW11X1-15/16	HA2311X1-15/16			FR120X10	1	
	SAF21611		21311K	SNW11X1-15/16	HA311X1-15/16			FR120X12	2	
	SAF22611		22311K	SNW111X1-15/16	HA2311X1-15/16			FR120X10	1	
2-3/16	SAF1613	SAF613	1313K	SNW13X2-3/16	HA313X2-3/16	LER32	TER32	FR140X12.5	2	EPR07
	SAF2613	FSAF613	2313K	SNW13X2-3/16	HA2313X2-3/16			FR140X10	1	
	SAF21613		21313K	SNW13X2-3/16	HA313X2-3/16			FR140X12.5	2	
	SAF22613		22313K	SNW113X2-3/16	HA2313X2-3/16			FR140X10	1	
2/7/2016	SAF1615	SAF615	1315K	SNW15X2-7/16	HA315X2-7/16	LER37	TER37	FR160X14	2	EPR07
	SAF2615	FSAF615	2315K	SNW15X2-7/16	HA2315X2-7/16			FR160X10	1	
	SAF21615		21315K	SNW15X2-7/16	HA315X2-7/16			FR160X14	2	
	SAF22615		22315K	SNW115X2-7/16	HA2315X2-7/16			FR160X10	1	
2/11/2016	SAF1616	SAF616	1316K	SNW16X2-11/16	HA316X2-11/16	LER44	TER44	FR170X14.5	2	EPR08
	SAF2616	FSAF616	2316K	SNW16X2-11/16	HA2316X2-11/16			FR170X10	1	
	SAF21616		21316K	SNW16X2-11/16	HA316X2-11/16			FR170X14.5	2	
	SAF22616		22316K	SNW116X2-11/16	HA2316X2-11/16			FR170X10	1	
2/15/2016	SAF1617	SAF617	1317K	SNW17X2-15/16	HA317X2-15/16	LER184	TER184	FR180X14.5	2	EPR10
	SAF2617	FSAF617	2317K	SNW17X2-15/16	HA2317X2-15/16			FR180X10	1	
	SAF21617		21317K	SNW17X2-15/16	HA317X2-15/16			FR180X14.5	2	
	SAF22617		22317K	SNW117X2-15/16	HA2317X2-15/16			FR180X10	1	
3/3/2016	SAF1618	SAF618	1318K	SNW18X3-3/16	HA318X3-3/16	LER188	TER188	FR190X15.5	2	EPR11
	SAF2618		2318K	SNW18X3-3/16	HA2318X3-3/16			FR190X10	1	
	SAF21618		21318K	SNW18X3-3/16	HA318X3-3/16			FR190X15.5	2	
	SAF22618		22318K	SNW118X3-3/16	HA2318X3-3/16			FR190X10	1	

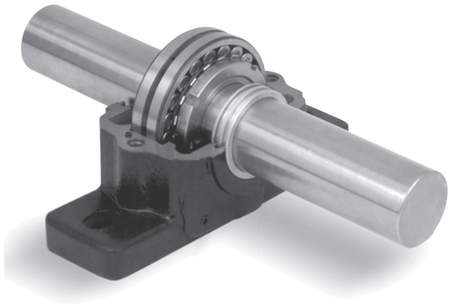
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS).
LOR seals with O-rings are also available.

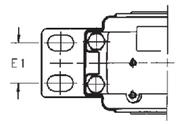
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.

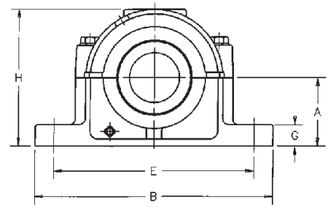
[b] Fixing Ring is used for fixed block only; do not use for float mounting.

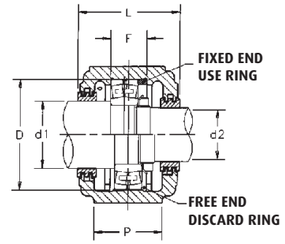
[c] End Cover is optional.

Pillow Block: SAF 600 Series (cont.)









Housing No.	A	B	P	G	E		E_1	H	L	Bolts (No. Req'd)	Wt.	D	F	d_1
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	lbs.*	mm	mm	In.
SAF620	5-1/4	16-1/2	4-3/4	2-1/8	14-1/2	13-1/4	2-3/4	10-1/4	7-3/8	(4)-3/4	98.0	215	83	3-7/16
SAF622	6	18-3/8	5-1/8	2-3/8	16	14-5/8	3	11-1/2	8	(4)-7/8	125.0	240	90	3-15/16
SAF624	6-5/16	21-1/4	6-1/4	2-1/2	18-1/4	17	3-3/4	12-1/2	8-3/8	(4)-1	166.0	260	96	4-3/16
SAF626	6-11/16	22	6-1/4	2-5/8	19-1/4	17-3/8	3-3/4	13-5-16	8-3/4	(4)-1	193.0	280	103	4-7/16
SAF628	7-1/16	24-3/4	6-3/4	2-3/4	21-5/8	19-3/8	4-1/4	14-3/16	9-5/8	(4)-1	244.0	300	112	4-15/16
SAF630	7-1/2	26-3/4	7-1/8	3	23-5/8	20-7/8	4-5/8	14-7/8	9-3/4	(4)-1	271.0	320	116	5-3/16
SAF632	7-7/8	28	7-1/2	3-1/8	24-3/8	21-5/8	4-1/2	15-11/16	10-3/4	(4)-11/4	280.0	340	124	5-7/16
SAF634	8-1/4	29-1/2	8	3-3/8	25	22-1/2	5	16-1/2	11-1/4	(4)-11/4	345.0	360	130	5-15/16
SAF636	8-7/8	31-1/4	8-1/4	3-1/2	26-5/8	24	5-1/4	17-3/4	11-3/8	(4)-11/4	375.0	380	136	6-7/16
SAF638	9-1/2	32-3/4	8-3/4	3-3/4	27-7/8	24-3/4	5-1/4	18-5/8	12	(4)-11/2	480.0	400	142	6-15/16
SAF640	9-7/8	34-1/4	9	4	29-1/2	26-1/4	5-1/2	20	12-1/16	(4)-11/2	500.0	420	148	7-3/16

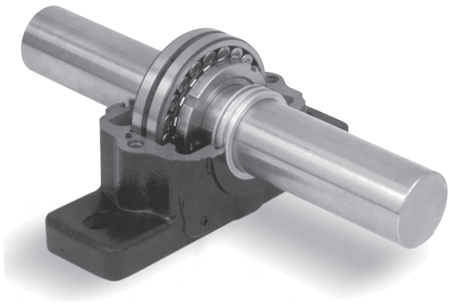
* Weights are approximate.

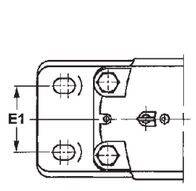
Shaft Size	Complete Unit Number	Housing Only [a]	Bearing Number	Adapters		Labyrinth Seals		Fixing Ring [b]		End Cover [c]
				SNW Type	H Type	LER	Taconite	Size	Qty.	
3-7/16	SAF1620	SAF620	1320K	SNW20X3-7/16	HA320X3-7/16			FR215X18	2	
	SAF2620		2320K	SNW20X3-7/16	HA2320X3-7/16			FR215X10	1	
	SAF21620		21320K	SNW20X3-7/16	HA320X3-7/16	LER102	TER102	FR215X18	2	EPR12
3-15/16	SAF22620	SAF622	22320K	SNW120X3-7/16	HA2320X3-7/16			FR215X10	1	
	SAF1622		1322K	SNW22X3-15/16	HA322X3-15/16			FR240X20	2	
	SAF21622		21322K	SNW22X3-15/16	HA322X3-15/16	LER109	TER109	FR240X20	2	EPR13
	SAF22622		22322K	SNW122X3-15/16	HA2322X3-15/16			FR240X10	1	
4-3/16	SAF22624	SAF624	22324K	SNW124X4-3/16	HA2324X4-3/16	LER113	TER113	FR260X10	1	EPR14
4-7/16	SAF22626	SAF626	22326K	SNW126X4-7/16	HA2326X4-7/16	LER117	TER117	FR280X10	1	EPR15
4-15/16	SAF22628	SAF628	22328K	SNW128X4-15/16	HA2328X4-15/16	LER122	TER122	FR300X10	1	EPR27
5-3/16	SAF22630	SAF630	22330K	SNW130X5-3/16	HA2330X5-3/16	LER125	TER125	FR320X10	1	EPR16
5-7/16	SAF22632	SAF632	22332K	SNW132X5-7/16	HA2332X5-7/16	LER130	TER130	FR340X10	1	EPR16
5-15/16	SAF22634	SAF634	22334K	SNW134X5-15/16	HA2334X5-15/16	LER140	TER140	FR360X10	1	EPR18
6-7/16	SAF22636	SAF636	22336K	SNW136X6-7/16	HA2336X6-7/16	LER148	TER148	FR380X10	1	EPR19
6-15/16	SAF22638	SAF638	22338K	SNW138X6-15/16	HA2338X6-15/16	LER155	TER155	FR400X10	1	EPR20
7-3/16	SAF22640	SAF640	22340K	SNW140X7-3/16	HA2340X7-3/16	LER159	---	FR420X10	1	EPR21

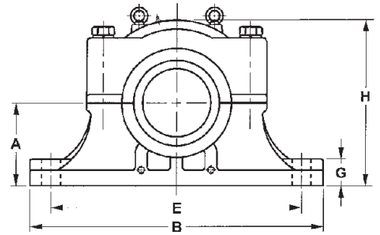
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS).
LOR seals with O-rings are also available.

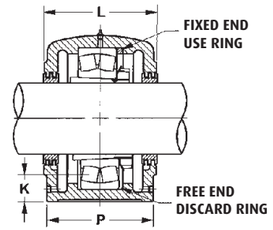
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

Pillow Block: SDAF 000K Series









Housing No.	A	B	P	G	E		E_1	H	K Static Oil Level	L	Bolts (No. Req'd)	Wt.
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	In.	lbs.*
SDAF060K/10-15/16	12	38-1/4	14-3/4	3-3/8	33-1/2	32-3/4	9	23-7/16	4-3/8	14-1/2	(4)--1-5/8	875
SDAF060K/11	12	38-1/4	14-3/4	3-3/8	33-1/2	32-3/4	9	23-7/16	4-3/8	14-1/2	(4)--1-5/8	875
SDAF064K/11-7/16	12	38-1/4	14-3/4	3-3/8	33-1/2	32-3/4	9	23-7/16	4	15-1/2	(4)--1-5/8	878
SDAF064K/11-1/2	12	38-1/4	14-3/4	3-3/8	33-1/2	32-3/4	9	23-7/16	4	15-1/2	(4)--1-5/8	878
SDAF064K/11-15/16	12	38-1/4	14-3/4	3-3/8	33-1/2	32-3/4	9	23-7/16	4	15-1/2	(4)--1-5/8	878
SDAF064K/12	12	38-1/4	14-3/4	3-3/8	33-1/2	32-3/4	9	23-7/16	4	15-1/2	(4)--1-5/8	878
SDAF068K/12-7/16	12	39	15-1/4	4-3/16	33-1/2	32	10	24	3-3/8	15-3/4	(4)--1-7/8	1100
SDAF068K/12-1/2	12	39	15-1/4	4-3/16	33-1/2	32	10	24	3-3/8	15-3/4	(4)--1-7/8	1100
SDAF072K/12-15/16	12-13/16	41-3/4	15-3/4	4-1/2	36-1/2	35	10-1/2	25-3/4	3-23/32	16-1/4	(4)--1-7/8	1170
SDAF072K/13	12-13/16	41-3/4	15-3/4	4-1/2	36-1/2	35	10-1/2	25-3/4	3-23/32	16-1/4	(4)--1-7/8	1170
SDAF072K/13-7/16	12-13/16	41-3/4	15-3/4	4-1/2	36-1/2	35	10-1/2	25-3/4	3-23/32	16-1/4	(4)--1-7/8	1170
SDAF072K/13-1/2	12-13/16	41-3/4	15-3/4	4-1/2	36-1/2	35	10-1/2	25-3/4	3-23/32	16-1/4	(4)--1-7/8	1170
SDAF076K/13-15/16	12-13/16	41-3/4	15-3/4	4-1/2	36-1/2	35	10-1/2	25-3/4	3-3/8	16-1/4	(4)--1-7/8	1146
SDAF076K/14	12-13/16	41-3/4	15-3/4	4-1/2	36-1/2	35	10-1/2	25-3/4	3-3/8	16-1/4	(4)--1-7/8	1146

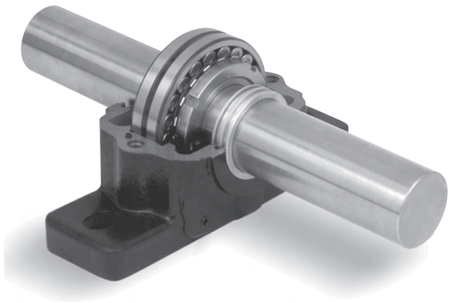
* Weights are approximate.

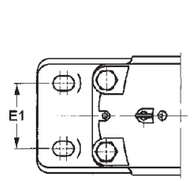
Shaft Diameter S-1 in	Complete Unit Number	Housing Only [a]	Bearing Number	Adapter Locknut and Lockwasher or Lockplate	Labyrinth Seal Ring (2 required)	Fixing Ring [b] (1 required)
10-15/16	SDAF23060K/10-15/16	SDAF060K/10-15/16	23060K	SNP3060X10-15/16	ER858	A8967
11	SDAF23060K/11	SDAF060K/11	23060K	SNP3060X11	ER825	A8967
11-7/16	SDAF23064K/11-7/16	SDAF064K/11-7/16	23064K	SNP3064X11-7/16	ER861	A8968
11-1/2	SDAF23064K/11-1/2	SDAF064K/11-1/2	23064K	SNP3064X11-1/2	ER832	A8968
11-15/16	SDAF23064K/11-15/16	SDAF064K/11-15/16	23064K	SNP3064X11-15/16	ER859	A8968
12	SDAF23064K/12	SDAF064K/12	23064K	SNP3064X12	ER818	A8968
12-7/16	SDAF23068K/12-7/16	SDAF068K/12-7/16	23068K	SNP3068X12-7/16	ER865	A8969
12-1/2	SDAF23068K/12-1/2	SDAF068K/12-1/2	23068K	SNP3068X12-1/2	ER866	A8969
12-15/16	SDAF23072K/12-15/16	SDAF072K/12-15/16	23072K	SNP3072X12-15/16	ER869	A8970
13	SDAF23072K/13	SDAF072K/13	23072K	SNP3072X13	ER846	A8970
13-7/16	SDAF23072K/13-7/16	SDAF072K/13-7/16	23072K	SNP3072X13-7/16	ER872	A8970
13-1/2	SDAF23072K/13-1/2	SDAF072K/13-1/2	23072K	SNP3072X13-1/2	ER823	A8970
13-15/16	SDAF23076K/13-15/16	SDAF076K/13-15/16	23076K	SNP3076X13-15/16	ER875	A8971
14	SDAF23076K/14	SDAF076K/14	23076K	SNP3076X14	ER876	A8971

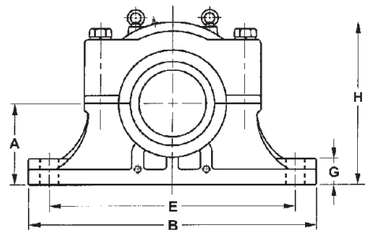
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS).
Taconite (TER) and LOR seals with O-rings are also available.

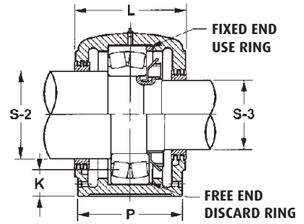
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.

Pillow Block: SDAF 200 Series









Housing No.	A	B	P	G	E		E_1	H	K Static Oil Level	L	Bolts (No. Req'd)	Wt.
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	In.	lbs.*
SDAF220	4-1/2	15-1/4	6	1-7/8	13-1/8	11-5/8	3-3/8	8-15/16	1-3/4	6-3/4	(4)--3/4	69
SDAF222	4-15/16	16-1/2	6-3/4	2-1/8	14-1/2	12-5/8	4	9-7/8	1-7/8	7-1/4	(4)--7/8	100
SDAF224	5-1/4	16-1/2	6-7/8	2-1/4	14-1/2	13-1/4	4-1/8	10-1/2	1-15/16	7-3/8	(4)--7/8	106
SDAF226	6	18-3/8	7-1/2	2-3/8	16	14-5/8	4-1/2	11-7/8	2-7/16	8	(4)--1	147
SDAF228	6	20-1/8	7-1/2	2-3/8	17-1/8	16	4-1/2	12-1/16	2-1/8	7-15/16	(4)--1	141
SDAF230	6-5/16	21-1/4	7-7/8	2-1/2	18-1/4	17	4-3/4	12-13/16	2-3/16	8-3/8	(4)--1-1/8	157
SDAF232	6-11/16	22	8-1/4	2-1/2	19-1/4	17-3/8	5	13-11/16	2-3/16	8-3/4	(4)--1-1/8	188
SDAF234	7-1/16	24-3/4	9	2-1/2	21-5/8	19-3/8	5-1/2	14-1/4	2-5/16	9-5/8	(4)--1-1/4	212
SDAF236	7-1/2	26-3/4	9-3/8	2-3/4	23-5/8	20-7/8	5-7/8	15-3/16	2-9/16	10	(4)--1-1/4	276
SDAF238	7-7/8	27-5/8	10	3	23-1/2	21-1/2	6-1/4	16-1/4	2-5/8	10-5/8	(4)--1-3/8	338
SDAF240	8-1/4	28-3/4	10-1/2	3-1/4	25	23	6-3/4	17-1/8	2-11/16	11-1/8	(4)--1-3/8	344
SDAF244	9-1/2	32	11-1/4	3-1/2	27-7/8	25-5/8	7-1/4	19-1/4	3-3/8	11-7/8	(4)--1-1/2	520

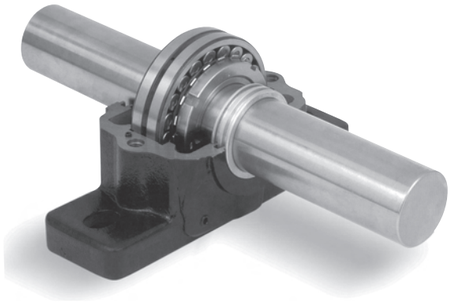
* Weights are approximate.

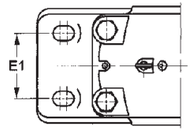
Shaft Diameter		Complete Unit Number	Housing Only [a]	Bearing Number	Locknut	Lockwasher	Labyrinth Seal Ring		Fixing Ring [b] (1 required)	End Cover [c]
S-2 in.	S-3 in.						S-2 Shaft (1 required)	S-3 Shaft (1 required)		
4-1/2	3-13/16	SDAF22220	SDAF220	22220	AN20	W20	LER205	LER87	FR180X10	EPR12
4-7/8	4-3/16	SDAF22222	SDAF222	22222	AN22	W22	LER121	LER113	FR200X10	EPR14
5-5/16	4-9/16	SDAF22224	SDAF224	22224	AN24	W24	LER127	LER119	FR215X10	EPR15
5-7/8	4-15/16	SDAF22226	SDAF226	22226	AN26	W26	LER136	LER122	FR230X10	EPR27
6-1/4	5-5/16	SDAF22228	SDAF228	22228	AN28	W28	LER144	LER127	FR250X10	---
6-5/8	5-3/4	SDAF22230	SDAF230	22230	AN30	W30	LER151	LER134	FR270X10	EPR17
7	6-1/16	SDAF22232	SDAF232	22232	AN32	W32	LER156	LER142	FR290X10	EPR18
7-7/16	6-7/16	SDAF22234	SDAF234	22234	AN34	W34	LER161	LER148	FR310X10	EPR19
7-13/16	6-7/8	SDAF22236	SDAF236	22236	AN36	W36	LER165	LER154	FR320X10	EPR20
8-3/8	7-1/4	SDAF22238	SDAF238	22238	AN38	W38	LER240	LER229	FR340X10	EPR22
8-3/4	7-5/8	SDAF22240	SDAF240	22240	AN40	W40	LER244	LER233	FR360X10	EPR23
9-9/16	8-15/16	SDAF22244	SDAF244	22244	N44	W44	LER248	LER239	FR400X10	EPR25

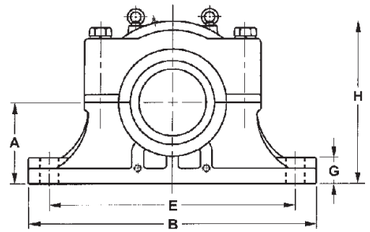
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS). Taconite (TER) and LOR seals with O-rings are also available.

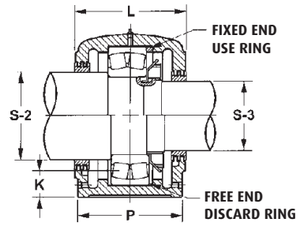
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

Pillow Block: SDAF 300 Series









Housing No.	A	B	P	G	E		E_1	H	K Static Oil Level	L	Bolts (No. Req'd)	Wt.
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	In.	lbs.*
SDAF316	4-1/4	14-1/4	5-1/2	1-3/4	12-5/8	10-5/8	3-1/4	8-1/4	1-3/4	6-3/8	(4)--5/8	53
SDAF317	4-1/2	15-1/4	6	1-7/8	13-1/8	11-5/8	3-3/8	8-15/16	1-13/16	6-3/4	(4)--3/4	67
SDAF318	4-3/4	15-1/2	6-1/8	2	13-1/2	12	3-5/8	9-7/16	2	6-7/8	(4)--3/4	72
SDAF320	5-1/4	16-1/2	6-7/8	2-1/4	14-1/2	13-1/4	4-1/8	10-1/2	2-1/8	7-3/8	(4)--7/8	106
SDAF322	6	18-3/8	7-1/2	2-3/8	16	14-5/8	4-1/2	11-7/8	2-1/2	8	(4)--1	149
SDAF324	6-5/16	21-1/4	7-7/8	2-1/2	18-1/4	17	4-3/4	12-13/16	2-9/16	8-3/8	(4)--1-1/8	172
SDAF326	6-11/16	22	8-1/4	2-1/2	19-1/4	17-3/8	5	13-11/16	2-5/8	8-3/4	(4)--1-1/8	195
SDAF328	7-1/16	24-3/4	9	2-1/2	21-5/8	19-3/8	5-1/2	14-1/4	2-11/16	9-3/8	(4)--1-1/4	228
SDAF330	7-1/2	26-3/4	9-3/8	2-3/4	23-5/8	20-7/8	5-7/8	15-3/16	2-7/8	9-3/4	(4)--1-1/4	302
SDAF332	7-7/8	27-5/8	10	3	23-1/2	21-1/2	6-1/4	16-1/4	2-15/16	10-5/8	(4)--1-3/8	355
SDAF334	8-1/4	28-3/4	10-1/2	3-1/4	25	23	6-3/4	17-1/8	3-1/16	11-1/8	(4)--1-3/8	380
SDAF336	8-7/8	30-1/2	10-3/4	3-1/4	26-3/8	24-1/8	6-7/8	17-15/16	3-3/8	11-3/8	(4)--1-1/2	405
SDAF338	9-1/2	32	11-1/4	3-1/2	27-7/8	25-5/8	7-1/4	19-1/4	3-11/16	11-7/8	(4)--1-1/2	522
SDAF340	9-7/8	33-1/2	11-3/4	3-1/2	29-1/4	26-5/8	7-5/8	19-15/16	3-3/4	12-3/8	(4)--1-5/8	564

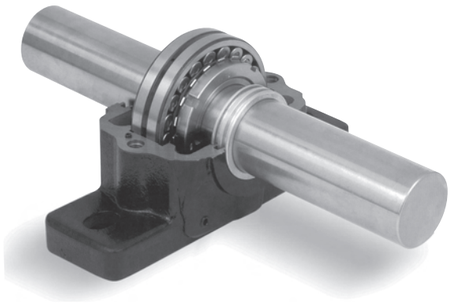
* Weights are approximate.

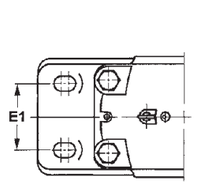
Shaft Diameter		Complete Unit Number	Housing Only [a]	Bearing Number	Locknut	Lockwasher	Labyrinth Seal Ring		Fixing Ring [b] (1 required)	End Cover [c]
S-2 in.	S-3 in.						S-2 Shaft (1 required)	S-3 Shaft (1 required)		
3-5/8	3	SDAF22316	SDAF316	22316	AN16	W16	LER84	LER60	FR170X10	EPR10
3-15/16	3-3/16	SDAF22317	SDAF317	22317	AN17	W17	LER93	LER69	FR180X10	EPR11
4-1/8	3-3/8	SDAF22318	SDAF318	22318	AN18	W18	LER96	LER72	FR190X10	EPR11
4-1/2	3-13/16	SDAF22320	SDAF320	22320	AN20	W20	LER205	LER87	FR218X10	EPR12
4-7/8	4-3/16	SDAF22322	SDAF322	22322	AN22	W22	LER121	LER113	FR240X10	EPR14
5-5/16	4-9/16	SDAF22324	SDAF324	22324	AN24	W24	LER127	LER119	FR260X10	EPR15
5-7/8	4-15/16	SDAF22326	SDAF326	22326	AN26	W26	LER136	LER122	FR280X10	EPR27
6-1/4	5-5/16	SDAF22328	SDAF328	22328	AN28	W28	LER144	LER127	FR300X10	EPR16
6-5/8	5-3/4	SDAF22330	SDAF330	22330	AN30	W30	LER151	LER134	FR320X10	EPR17
7	6-1/16	SDAF22332	SDAF332	22332	AN32	W32	LER225	LER217	FR340X10	EPR19
7-7/16	6-7/16	SDAF22334	SDAF334	22334	AN34	W34	LER230	LER220	FR360X10	EPR26
8	6-7/8	SDAF22336	SDAF336	22336	AN36	W36	LER234	LER223	FR380X10	EPR21
8-3/8	7-1/4	SDAF22338	SDAF338	22338	AN38	W38	LER240	LER229	FR400X10	EPR22
8-3/4	7-5/8	SDAF22340	SDAF340	22340	AN40	W40	LER244	LER233	FR420X10	EPR23

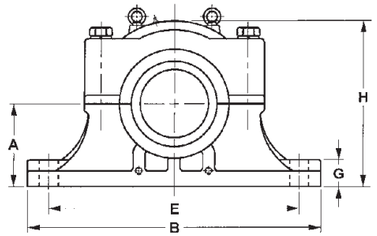
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS). Taconite (TER) and LOR seals with O-rings are also available.

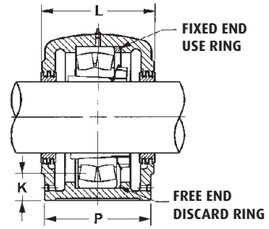
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

Pillow Block: SDAF 500 Series









Housing No.	A	B	P	G	E		E_1	H	K Static Oil Level	L	Bolts (No. Req'd)	Wt.
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	In.	lbs.*
SDAF520	4-1/2	15-1/4	6	1-7/8	13-1/8	11-5/8	3-3/8	8-15/16	1-3/4	6-3/4	(4)--3/4	65
SDAF522	4-15/16	16-1/2	6-3/4	2-1/8	14-1/2	12-5/8	4	9-7/8	1-7/8	7-1/4	(4)--7/8	96
SDAF524	5-1/4	16-1/2	6-7/8	2-1/4	14-1/2	13-1/4	4-1/8	10-1/2	1-15/16	7-3/8	(4)--7/8	107
SDAF526	6	18-3/8	7-1/2	2-3/8	16	14-5/8	4-1/2	11-7/8	2-7/16	8	(4)--1	147
SDAF528	6	20-1/8	7-1/2	2-3/8	17-1/8	16	4-1/2	12-1/16	2-1/8	7-15/16	(4)--1-1/8	131
SDAF530	6-5/16	21-1/4	7-7/8	2-1/2	18-1/4	17	4-3/4	12-13/16	2-3/16	8-3/8	(4)--1-1/8	157
SDAF532	6-11/16	22	8-1/4	2-1/2	19-1/4	17-3/8	5	13-11/16	2-3/16	8-3/4	(4)--1-1/8	187
SDAF534	7-1/16	24-3/4	9	2-1/2	21-5/8	19-3/8	5-1/2	14-1/4	2-5/16	9-5/8	(4)--1-1/4	212
SDAF536	7-1/2	26-3/4	9-3/8	2-3/4	23-5/8	20-7/8	5-7/8	15-3/16	2-9/16	10	(4)--1-1/4	292
SDAF538	7-7/8	27-5/8	10	3	23-1/2	21-1/2	6-1/4	16-1/4	2-5/8	10-5/8	(4)--1-3/8	338
SDAF540	8-1/4	28-3/4	10-1/2	3-1/4	25	23	6-3/4	17-1/8	2-11/16	11-1/8	(4)--1-3/8	344
SDAF544	9-1/2	32	11-1/4	3-1/2	27-7/8	25-5/8	7-1/4	19-1/4	3-3/8	11-7/8	(4)--1-1/2	513

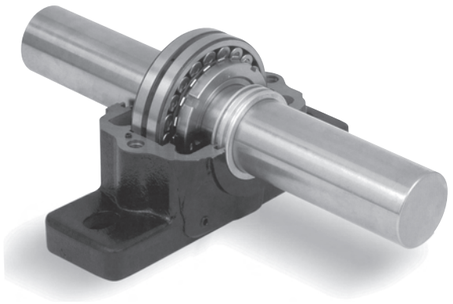
* Weights are approximate.

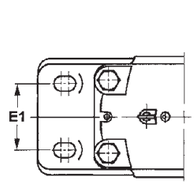
Shaft Diameter S-1 in.	Complete Unit Number	Housing Only [a]	Bearing Number	Adapter Locknut and Lockwasher	Labyrinth Seal Ring (2 required)	Fixing Ring [b] (1 required)	End Cover [c]
3-7/16	SDAF22520	SDAF520	22220K	SNW20X3-7/16	LER75	FR180X10	EPR11
3-15/16	SDAF22522	SDAF522	22222K	SNW22X3-15/16	LER93	FR200X10	EPR13
4-3/16	SDAF22524	SDAF524	22224K	SNW24X4-3/16	LER113	FR218X10	EPR14
4-7/16	SDAF22526	SDAF526	22226K	SNW26X4-7/16	LER117	FR230X10	EPR15
4-15/16	SDAF22528	SDAF528	22228K	SNW28X4-15/16	LER122	FR250X10	---
5-3/16	SDAF22530	SDAF530	22230K	SNW30X5-3/16	LER125	FR270X10	EPR16
5-7/16	SDAF22532	SDAF532	22232K	SNW32X5-7/16	LER130	FR290X10	EPR16
5-15/16	SDAF22534	SDAF534	22234K	SNW34X5-15/16	LER140	FR310X10	EPR18
6-7/16	SDAF22536	SDAF536	22236K	SNW36X6-7/16	LER148	FR320X10	EPR19
6-15/16	SDAF22538	SDAF538	22238K	SNW38X6-15/16	LER224	FR340X10	EPR21
7-3/16	SDAF22540	SDAF540	22240K	SNW40X7-3/16	LER228	FR360X10	EPR22
7-15/16	SDAF22544	SDAF544	22244K	SNW44X7-15/16	LER236	FR400X10	EPR24

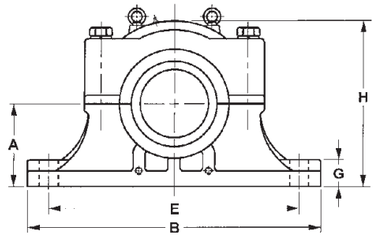
Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS). Taconite (TER) and LOR seals with O-rings are also available.

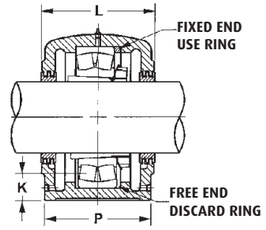
[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

Pillow Block: SDAF 600 Series









Housing No.	A	B	P	G	E		E_1	H	K Static Oil Level	L	Bolts (No. Req'd)	Wt.
	In.	In.	In.	In.	Max In.	Min In.	In.	In.	In.	In.	In.	lbs.*
SDAF616	4-1/4	14-1/4	5-1/2	1-3/4	12-5/8	10-5/8	3-1/4	8-1/4	1-3/4	6-3/8	(4)--5/8	49
SDAF617	4-1/2	15-1/4	6	1-7/8	13-1/8	11-5/8	3-3/8	8-15/16	1-13/16	6-3/4	(4)--3/4	67
SDAF618	4-3/4	15-1/2	6-1/8	2	13-1/2	12	3-5/8	9-7/16	2	6-7/8	(4)--3/4	72
SDAF620	5-1/4	16-1/2	6-7/8	2-1/4	14-1/2	13-1/4	4-1/8	10-1/2	2-1/8	7-3/8	(4)--7/8	110
SDAF622	6	18-3/8	7-1/2	2-3/8	16	14-5/8	4-1/2	11-7/8	2-1/2	8	(4)--1	147
SDAF624	6-5/16	21-1/4	7-7/8	2-1/2	18-1/4	17	4-3/4	12-13/16	2-9/16	8-3/8	(4)--1-1/8	172
SDAF626	6-11/16	22	8-1/4	2-1/2	19-1/4	17-3/8	5	13-11/16	2-5/8	8-3/4	(4)--1-1/8	194
SDAF628	7-1/16	24-3/4	9	2-1/2	21-5/8	19-3/8	5-1/2	14-1/4	2-11/16	9-3/8	(4)--1-1/4	228
SDAF630	7-1/2	26-3/4	9-3/8	2-3/4	23-5/8	20-7/8	5-7/8	15-3/16	2-7/8	9-3/4	(4)--1-1/4	300
SDAF632	7-7/8	27-5/8	10	3	23-1/2	21-1/2	6-1/4	16-1/4	2-15/16	10-5/8	(4)--1-3/8	355
SDAF634	8-1/4	28-3/4	10-1/2	3-1/4	25	23	6-3/4	17-1/8	3-1/16	11-1/8	(4)--1-3/8	392
SDAF636	8-7/8	30-1/2	10-3/4	3-1/4	26-3/8	24-1/8	6-7/8	17-15/16	3-3/8	11-3/8	(4)--1-1/2	405
SDAF638	9-1/2	32	11-1/4	3-1/2	27-7/8	25-5/8	7-1/2	19-1/4	3-11/16	11-7/8	(4)--1-1/2	484
SDAF640	9-7/8	33-1/2	11-3/4	3-1/2	29-1/4	26-5/8	7-5/8	19-15/16	3-3/4	12-3/8	(4)--1-5/8	564

* Weights are approximate.

Shaft Diameter S-1 in.	Complete Unit Number	Housing Only [a]	Bearing Number	Adapter Locknut and Lockwasher	Labyrinth Seal Ring (2 required)	Fixing Ring [b] (1 required)	End Cover [c]
2-11/16	SDAF22616	SDAF616	22316K	SNW116X2-11/16	LER44	FR170X10	EPR08
2-15/16	SDAF22617	SDAF617	22317K	SNW117X2-15/16	LER59	FR180X10	EPR10
3-3/16	SDAF22618	SDAF618	22318K	SNW118X3-3/16	LER69	FR190X10	EPR11
3-7/16	SDAF22620	SDAF620	22320K	SNW120X3-7/16	LER75	FR218X10	EPR11
3-15/16	SDAF22622	SDAF622	22322K	SNW122X3-15/16	LER93	FR240X10	EPR13
4-3/16	SDAF22624	SDAF624	22324K	SNW124X4-3/16	LER113	FR260X10	EPR14
4-7/16	SDAF22626	SDAF626	22326K	SNW126X4-7/16	LER117	FR280X10	EPR15
4-15/16	SDAF22628	SDAF628	22328K	SNW128X4-15/16	LER122	FR300X10	EPR27
5-3/16	SDAF22630	SDAF630	22330K	SNW130X5-3/16	LER125	FR320X10	EPR16
5-7/16	SDAF22632	SDAF632	22332K	SNW132X5-7/16	LER211	FR340X10	EPR17
5-15/16	SDAF22634	SDAF634	22334K	SNW134X5-15/16	LER215	FR360X10	EPR19
6-7/16	SDAF22636	SDAF636	22336K	SNW136X6-7/16	LER220	SR-0-36	EPR26
6-15/16	SDAF22638	SDAF638	22338K	SNW138X6-15/16	LER224	FR400X10	EPR21
7-3/16	SDAF22640	SDAF640	22340K	SNW140X7-3/16	LER228	FR420X10	EPR22

Note: Housings available in cast iron (SAF), Ductile (SAFD) or cast steel (SAFS). Taconite (TER) and LOR seals with O-rings are also available.

[a] "Housing Only" includes cap, base, capbolts, labyrinth seals and fixing rings.
[b] Fixing Ring is used for fixed block only; do not use for float mounting.
[c] End Cover is optional.

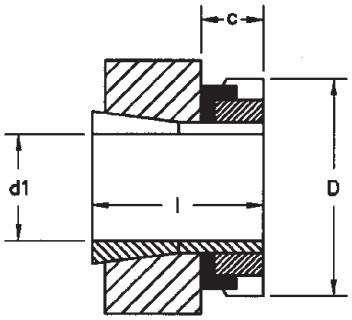
Inch Adapter Sleeves: For 222 Series Bearings

With Nut and Washer (also used with 12, 13, and 22 Series)

Part No. (Bore)	Weight lbs.	Dimension in Inches				Lock Nut	Lock Washer
		d_1	I	D	c		
SNW05X3/4	0.2	3/4	1.27	1.6	0.46	N05	W05
SNW05X11/16	0.3	11/16	1.27	1.6	0.46	N05	W05
SNW06X15/16	0.2	15/16	1.35	1.8	0.46	N06	W06
SNW06X1	0.2	1	1.35	1.8	0.46	N06	W06
SNW07X1-1/16	0.4	1/1-16	1.46	2.1	0.48	N07	W07
SNW07X1-1/4	0.3	1/1-4	1.46	2.1	0.48	N07	W07
SNW07X1-1/8	0.3	1-1/8	1.46	2.1	0.48	N07	W07
SNW07X1-3/16	0.3	1-3/16	1.46	2.1	0.48	N07	W07
SNW08X1-1/4	0.4	1-1/4	1.50	2.3	0.50	N08	W08
SNW08X1-3/8	0.4	1-3/8	1.50	2.3	0.50	N08	W08
SNW08X1-5/16	0.4	1-15/16	1.50	2.3	0.50	N08	W08
SNW09X1-3/8	0.6	1-3/8	1.58	2.5	0.50	N09	W09
SNW09X1-1/2	0.6	1-1/2	1.58	2.5	0.50	N09	W09
SNW09X1-7/16	0.6	1-7/16	1.58	2.5	0.50	N09	W09
SNW10X1-11/16	0.7	1-11/16	1.77	2.7	0.56	N10	W10
SNW10X1-3/4	0.7	1-3/4	1.77	2.7	0.56	N10	W10
SNW10X1-5/8	0.7	1-5/8	1.77	2.7	0.56	N10	W10
SNW11X1-13/16	0.8	1-13/16	1.85	3.0	0.56	N11	W11
SNW11X1-3/4	0.8	1-3/4	1.85	3.0	0.56	N11	W11
SNW11X1-7/8	0.8	1-7/8	1.85	3.0	0.56	N11	W11
SNW11X1-15/16	0.9	1-15/16	1.85	3.0	0.56	N11	W11
SNW11X2	0.9	2	1.85	3.0	0.56	N11	W11
SNW13X2	1.0	2	2.10	3.4	0.63	N13	W13
SNW13X2-1/4	1.4	2-1/4	2.10	3.4	0.63	N13	W13
SNW13X2-3/16	1.4	2-3/16	2.10	3.4	0.63	N13	W13
SNW13X2-5/16	1.3	2-5/16	2.10	3.4	0.63	N13	W13
SNW15X2-1/2	2.3	2-1/2	2.30	3.9	0.67	AN15	W15
SNW15X2-3/8	2.4	2-3/8	2.30	3.9	0.67	AN15	W15
SNW15X2-5/8	2.2	2-5/8	2.30	3.9	0.67	AN15	W15
SNW15X2-7/16	2.2	2-7/16	2.30	3.9	0.67	AN15	W15
SNW16X2-11/16	2.4	2-11/16	2.38	4.2	0.67	AN16	W16
SNW16X2-3/4	2.4	2-3/4	2.38	4.2	0.67	AN16	W16
SNW17X2-15/16	2.9	2-15/16	2.49	4.4	0.70	AN17	W17
SNW17X3	2.9	3	2.49	4.4	0.70	AN17	W17
SNW18X3-1/4	4.0	3-1/4	2.49	4.7	0.78	AN18	W18
SNW18X3	4.0	3	2.65	4.7	0.78	AN18	W18
SNW20X3-1/2	4.0	3-1/2	2.87	5.2	0.84	AN20	W20
SNW20X3-7/16	4.0	3-7/16	2.87	5.2	0.84	AN20	W20
SNW22X3-11/16	4.9	3-11/16	3.21	5.7	0.91	AN22	W22
SNW22X3-15/16	4.8	3-15/16	3.21	5.7	0.91	AN22	W22
SNW22X4	4.8	4	3.21	5.7	0.91	AN22	W22
SNW24X4-1/4	6.2	4-1/4	3.47	6.1	0.94	AN24	W22
SNW24X4-3/16	6.2	4-3/16	3.47	6.1	0.94	AN24	W24
SNW26X4-7/16	9.7	4-7/16	3.76	6.8	1.00	AN26	W26
SNW26X4-1/2	9.7	4-1/2	3.76	6.8	1.00	AN26	W26
SNW28X4-15/16	10.5	4-15/16	3.98	7.1	1.06	AN28	W28
SNW28X4-7/8	10.5	4-7/8	3.98	7.1	1.06	AN28	W28
SNW28X5	10.5	5	3.98	7.1	1.06	AN28	W28
SNW30X5-1/4	16.0	5-1/4	4.24	7.7	1.13	AN30	W30
SNW30X5-3/16	16.0	5-3/16	4.24	7.7	1.13	AN30	W30
SNW32X5-1/2	16.0	5-1/2	4.58	8.1	1.19	AN32	W32
NW32X5-7/16	16.0	5-7/16	4.58	8.1	1.19	AN32	W32
SNW32X5-3/4	16.0	5-3/4	4.58	8.1	1.19	AN32	W32
SNW34X5-15/16	19.5	5-15/16	4.85	8.7	1.22	AN34	W34
SNW34X6	19.5	6	4.85	8.7	1.22	AN34	W34
SNW36X6-7/16	20.5	6-7/16	5.04	9.1	1.25	AN36	W36
SNW36X6-1/2	20.5	6-1/2	5.04	9.1	1.25	AN36	W36
SNW38X6-15/16	23.5	6-15/16	5.26	9.5	1.28	AN38	W38
SNW38X7	23.5	7	5.26	9.5	1.28	AN38	W38
SNW40X7-3/16	30.5	7-3/16	5.48	9.8	1.34	AN40	W40
SNW40X7-3/8	30.5	7-3/8	5.48	9.8	1.34	AN40	W40
SNW44X7-1/2	32.5	7-1/2	5.90	11.0	1.41	AN44	W44
SNW44X7-7/8	32.5	7-7/8	5.90	11.0	1.41	AN44	W44
SNW44X7-15/16	32.5	7-15/16	5.90	11.0	1.41	AN44	W44
SNW44X8	32.5	8	5.90	11.0	1.41	AN44	W44

Inch Adapter Sleeves: For 223 and 232 Series Bearings

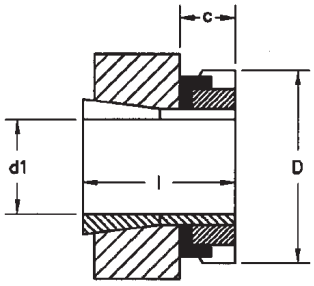
With Nut and Washer



Part No. (Bore)	Weight lbs.	Dimension in Inches				Lock Nut	Lock Washer
		d_1	l	D	c		
SNW109X1-7/16	0.7	1-7/16	2.13	2.53	0.50	N09	W09
SNW109X1-1/2	0.7	1-1/2	2.13	2.53	0.50	N09	W09
SNW110X1-11/16	0.9	1-11/16	2.39	2.69	0.56	N10	W10
SNW110X1-3/4	0.9	1-3/4	2.39	2.69	0.56	N10	W10
SNW111X1-7/8	0.9	1-7/8	2.52	2.97	0.56	N11	W11
SNW111X1-15/16	0.9	1-15/16	2.52	2.97	0.56	N11	W11
SNW111X2	0.9	2	2.52	2.97	0.56	N11	W11
SNW113X2-1/4	1.8	2-1/4	2.77	3.38	0.63	N13	W13
SNW113X2-3/16	1.8	2-3/16	2.77	3.38	0.63	N13	W13
SNW115X2-3/8	3.0	2-3/8	3.08	3.88	0.70	AN15	W15
SNW115X2-7/16	3.0	2-7/16	3.08	3.88	0.70	AN15	W15
SNW115X2-1/2	3.0	2-1/2	3.08	3.88	0.70	AN15	W15
SNW116X2-11/16	3.2	2-11/16	3.20	4.16	0.67	AN16	W16
SNW116X2-3/4	3.2	2-3/4	3.20	4.16	0.67	AN16	W16
SNW117X2-15/16	3.4	2-15/16	3.31	4.41	0.70	AN17	W17
SNW117X3	3.4	3	3.31	4.41	0.70	AN17	W17
SNW118X3.3/16	4.0	3-3/16	3.55	4.66	0.78	AN18	W18
SNW118X3-1/4	4.0	3-1/4	3.55	4.66	0.78	AN18	W18
SNW120X3-7/16	6.3	3-7/16	3.97	5.19	0.84	AN20	W20
SNW120X3-1/2	6.3	3-1/2	3.97	5.19	0.84	AN20	W20
SNW122X3-11/16	6.5	3-11/16	4.35	5.72	0.91	AN22	W22
SNW122X3-15/16	6.5	3-15/16	4.35	5.72	0.91	AN22	W22
SNW122X4	6.5	4	4.35	5.72	0.91	AN22	W22
SNW124X4-3/16	7.8	4-3/16	4.65	6.13	0.94	AN24	W24
SNW124X4-1/4	7.8	4-1/4	4.65	6.13	0.94	AN24	W24
SNW126X4-7/16	12.5	4-7/16	4.98	6.75	1.00	AN26	W26
SNW126X4-1/2	12.5	4-1/2	4.98	6.75	1.00	AN26	W26
SNW128X4-15/16	13.0	4-15/16	5.32	7.09	1.06	AN28	W28
SNW128X5	13.0	5	5.32	7.09	1.06	AN28	W28
SNW130X5-3/16	18.0	5-3/16	5.62	7.69	1.13	AN30	W30
SNW130X5-1/4	18.0	5-1/4	5.62	7.69	1.13	AN30	W30
SNW132X5-7/16	18.0	5-7/16	5.92	8.06	1.19	AN32	W32
SNW134X5-15/16	21.0	5-15/16	6.19	8.66	1.22	AN34	W34
SNW134X6	21.0	6	6.19	8.66	1.22	AN34	W34
SNW136X6-7/16	20.5	6-7/16	6.46	9.06	1.25	AN36	W36
SNW136X6-1/2	20.5	6-1/2	6.46	9.06	1.25	AN36	W36
SNW138X6-15/16	28.0	6-15/16	6.76	9.47	1.28	AN38	W38
SNW138X7	28.0	7	6.76	9.47	1.28	AN38	W38
SNW140X7-3/16	35.5	7-3/16	7.10	9.84	1.34	AN40	W40
SNW144X7-15/16	46.5	7-15/16	7.29	11.00	1.41	N44	W44
SNW144X8	46.5	8	7.29	11.00	1.41	N44	W44

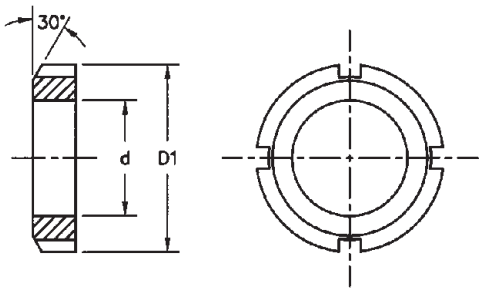
Inch Adapter Sleeves: For 230 Series Bearings

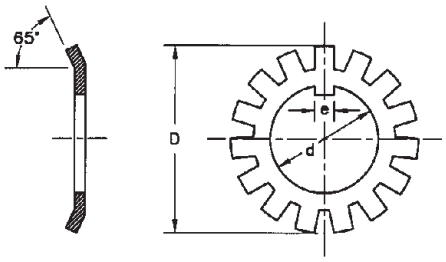
With Nut and Washer



Part No. (Bore)	Weight lbs.	Dimension in Inches				Lock Nut	Lock Washer
		d_1	l	D	c		
SNW3024X4-3/16	6.2	4-3/16	2.95	5.69	0.94	AN24	W24
SNW3026X4-7/16	7.5	4-7/16	3.24	6.13	1.00	AN26	W26
SNW3026X4-1/2	7.5	4-1/2	3.24	6.13	1.00	AN26	W26
SNW3028X4-15/16	8.5	4-15/16	3.34	6.50	1.06	AN28	W28
SNW3028X5	8.5	5	3.34	6.50	1.06	AN28	W28
SNW3030X5-3/16	9.8	5-3/16	3.49	7.13	1.13	AN30	W30
SNW3030X5-1/4	9.8	5-1/4	3.49	7.13	1.13	AN30	W30
SNW3032X5-7/16	12.0	5-7/16	3.71	7.50	1.19	AN32	W32
SNW3034X5-15/16	13.5	5-15/16	4.02	7.88	1.22	AN34	W34
SNW3034X6	13.5	6	4.02	7.88	1.22	AN34	W34
SNW3036X6-7/16	15.0	6-7/16	4.34	8.25	1.25	AN36	W36
SNW3036X6-1/2	15.0	6-1/2	4.34	8.25	1.25	AN36	W36
SNW3038X6-15/16	17.0	6-15/16	4.41	8.69	1.28	AN38	W38
SNW3038X7	17.0	7	4.41	8.69	1.28	AN38	W38
SNW3040X7-3/16	19.5	7-3/16	4.75	9.44	1.34	AN40	W40
SNW3044X7-15/16	24.5	7-15/16	5.13	10.25	1.38	N44	W44
SNW3044X8	24.5	8	5.13	10.25	1.38	N44	W44
SNP3048X8-7/16	31.0	8-7/16	5.43	11.44	1.70	N048	P48
SNP3048X8-1/2	31.0	8-1/2	5.43	11.44	1.70	N048	P48
SNP3048X8-15/16	32.0	8-15/16	5.43	11.44	1.70	N048	P48
SNP3048X9	32.0	9	5.43	11.44	1.70	N048	P48
SNP3052X9-7/16	41.0	9-7/16	6.02	12.19	1.77	N052	P52
SNP3052X9-1/2	40.0	9-1/2	6.02	12.19	1.77	N052	P52
SNP3056X9-15/16	47.0	9-15/16	6.19	13.00	1.86	N056	P56
SNP3056X10	46.0	10	6.19	13.00	1.86	N056	P56
SNP3056X10-7/16	45.0	10-7/16	6.19	13.00	1.86	N056	P56
SNP3056X10-1/2	45.0	10-1/2	6.19	13.00	1.86	N056	P56
SNP3060X10-15/16	59.0	10-15/16	6.73	14.19	1.97	N060	P60
SNP3060X11	59.0	11	6.73	14.19	1.97	N060	P60
SNP3064X11-1/2	66.0	11-1/2	6.95	15.00	2.06	N064	P64
SNP3064X12	66.0	12	6.95	15.00	2.06	N064	P64
SNP3068X12-7/16	78.0	12-7/16	7.54	15.75	2.19	N068	P68
SNP3068X12-1/2	78.0	12-1/2	7.54	15.75	2.19	N068	P68
SNP3072X13-7/16	86.0	13-7/16	7.58	16.50	2.19	N072	P72
SNP3076X13-15/16	95.0	13-15/16	7.74	17.75	2.41	N076	P76
SNP3076X14	95.0	14	7.74	17.75	2.41	N076	P76
SNP3080X15	100.0	15	8.41	18.50	2.56	N080	P80
SNP3084X15-3/4	105.0	15-3/4	8.50	19.31	2.56	N084	P84
SNP3088X16	143.0	16	8.98	20.47	2.36	N088	P88
SNP3088X16-1/2	143.0	16-1/2	8.98	20.47	2.36	N088	P88
SNP3092X17	153.0	17	9.21	21.26	2.36	N092	P92
SNP3096X18	161.0	1/18/1900	9.33	22.05	2.36	N096	P96
SNP3500X18-1/2	180.0	18-1/2	9.72	22.83	2.68	N500	P500

Inch Lock Nuts and Washer





Inch Lock Nuts

Part No.	Thread per inch	d in.	D_1 in.
N00	32	0.39	0.76
N01	32	0.47	0.88
N02	32	0.59	1.01
N03	32	0.66	1.13
N04	32	0.78	1.38
N05	32	0.97	1.57
N06	18	1.17	1.76
N07	18	1.38	2.07
N08	18	1.56	2.26
N09	18	1.77	2.54
N10	18	1.97	2.69
N11	18	2.16	2.97
N12	18	2.36	3.16
N13	18	2.55	3.38
N14	18	2.75	3.63
AN15	12	2.93	3.88
AN16	12	3.14	4.16
AN17	12	3.34	4.41
AN18	12	3.53	4.66
AN19	12	3.73	4.94
AN20	12	3.92	5.19
AN21	12	4.12	5.44
AN22	12	4.33	5.72
AN24	12	4.72	6.13
AN26	12	5.11	6.76
AN28	12	5.50	7.10
AN30	12	5.89	7.69
AN32	8	6.28	8.07
AN34	8	6.66	8.66
AN36	8	7.07	9.07
AN38	8	7.47	9.47
AN40	8	7.85	9.85
AN44	8	8.63	11.01

Inch Lock Washers

Part No.	d in.	D_1 in.	e in.
W00	0.40	0.88	0.12
W01	0.48	1.02	0.12
W02	0.60	1.16	0.12
W03	0.68	1.33	0.12
W04	0.80	1.53	0.18
W05	0.99	1.72	0.18
W06	1.19	1.92	0.18
W07	1.40	2.25	0.18
W08	1.58	2.47	0.29
W09	1.79	2.73	0.29
W10	1.99	2.92	0.29
W11	2.18	3.11	0.29
W12	2.40	3.34	0.29
W13	2.59	3.58	0.29
W14	2.79	3.83	0.29
W15	2.97	4.11	0.29
W16	3.18	4.38	0.35
W17	3.40	4.63	0.35
W18	3.58	4.94	0.35
W19	3.80	5.22	0.35
W20	3.99	5.50	0.35
W21	4.19	5.70	0.35
W22	4.40	6.06	0.35
W24	4.80	6.47	0.35
W26	5.19	7.03	0.44
W28	5.58	7.44	0.59
W30	5.98	8.06	0.59
W32	6.39	8.44	0.59
W34	6.76	9.06	0.72
W36	7.17	9.44	0.72
W38	7.58	9.88	0.72
W40	7.98	10.31	0.84
W44	8.70	11.44	0.94

Notes

Table of Contents

Super Precision Angular Contact Bearings

Series
7000
7200
7900

Contact Angle
C: 15°
A5: 25°

Cage Symbols
TR: Phenolic
TYN: Polyamide

Preload Symbols
L: Light
M: Medium
H: Heavy

70	16	C	SN24	TR	DU	L	P4Y

Bore Size
(04 and up: multiply last two numbers by 5 to get bore in mm)
00: 10 mm
01: 12 mm
02: 15 mm
03: 17 mm
04: 20 mm
05: 25 mm
12: 60 mm
20: 100 mm

Ball Material
Blank: Steel Ball
SN24: Ceramic Ball

Combination Symbols
DU: Duplex Universal
SU: Single Universal

Precision Class:
P4: ISO Class 4 (ABEC7)
P4Y*: NSK Exclusive P4 Accuracy
P3: Dimensions - ISO Class 4
Running Accuracy : ISO Class 2
P2: ISO Class 2 (ABEC9)

*P4Y indicates special ID/OD tighter tolerance for ease of matching sets.

Please refer to the bearing tables for exact part number options

Interchange

Description		Interchange								
		NSK	*OLD NSK	SKF	FAG	BARDEN	OLD BARDEN	FAF/TIMKEN	SNFA	NTN
Part No.	Ultra Light Series	79XX	79XX	719XX	719XX	19XX	-	93XXWI	EB/ESP	79XX
	Extra Light Series	70XX	70XX	70XX	70XX	1XX	1XX	91XXWI	EX/ESX	70XX
	Light Series	72XX	72XX	72XX	72XX	2XX	2XX	2XXWI	E2/ES2	72XX
Part Number Suffix	15° Contact Angle	C	C	CD	C	C	BLANK	2**	1	C
	25° Contact Angle	A5	A5	ACD	E	E	2**	3**	3	AD
	Polyamide Cage	TYN	TY	-	-	TMT	-	PRC	P	T2
	Phenolic Cage	TR	T	BLANK	T	T, TA	BLANK	CR	C	T1
	Seals	V1V	-	S**	2RSD OR S**	RR	VV, PP	-	/S	-
	Duplex Universal	DU	DU	DG	DU	DU	D	DU	DU	GD2
	Single Universal	SU	SU	G	U	U	-	SU	U	G
	Extra Light Preload	EL	EL	-	-	-	-	X	-	GL
	Light Preload	L	L	A	L	L	L	L	L	GN
	Medium Preload	M	M	B	M	M	M	M	M	GM
	Heavy Preload	H	H	C	H	H	H	H	H	-
	Ceramic Balls	SN24	SN24	HC	HCB**	C**	-	C**	/NS	5S**
	ABEC 7 Precision	P4Y	P4	P4A	P4S	BLANK	BLANK	MM/MMV**	7	P4
	ABEC 9 Precision	P2	P2	PA9A, P9	-	ABEC 9	ABEC 9	MMX**	9	P2

*TYN cage replaces TY, TR cage replaces T. Sealed (V1V) versions are a new option and P4Y tolerance specification replaces P4. P4Y tolerance specification has tighter bore and OD control than ABEC 7 (class 4 or P4). NSK supplies the following bearing series with P4Y tolerance: 7000; 7200.

**Indicates prefix not suffix.

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

Applications

Super Precision Angular Contact bearings are specifically designed for rigid, high-speed, high-precision machine tool spindles. Their state-of-the-art preload control assures consistent high performance. Super Precision Angular contacts are also available with seals – contact NSK for details.

› Lathes › Boring Machinery › Grinders › Machining Centers › Milling Machines › Slicing Machines › Drilling Machines › Gem Cutting Machines

Limiting Speeds

The limiting speeds listed in the Bearing Dimensional Tables are guideline values. They are based on a single bearing that is lightly preloaded by means of a spring and subjected to a relatively light load with good heat dissipation.

The limiting speeds with grease lubrication are determined using high quality grease in appropriate amounts. Those listed for oil lubrication are based on the use of oil-air (or oil mist) lubrication. In situations where the lubricating oil is used as a means to remove heat, higher speed can be achieved, however a large amount of oil must be pressure fed through the bearing, so there is significant loss of spindle power.

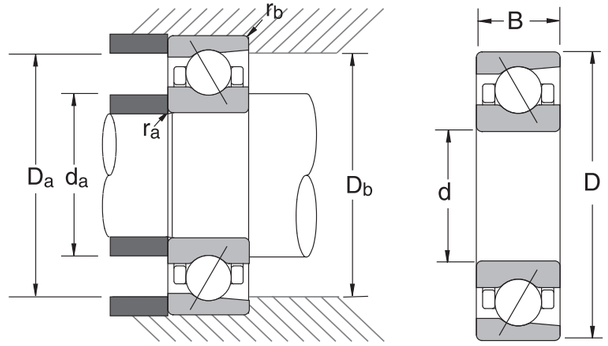
When single bearings are used in two, three or four row combinations, or the preload is increased to improve spindle rigidity, limiting speeds will be lower than those listed by the factors in the table below.

Speed Factor

Arrangement			EL	L	M	H
DB	Ø	⦰	0.85	0.80	0.65	0.55
DBB	ØØ	⦰⦰	0.80	0.75	0.60	0.45
DBD	ØØ	⦰	0.75	0.70	0.55	0.40

Super Precision Angular Contact: 7000C Series

15⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
L	Light Preload
M	Medium Preload
H	Heavy Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal
SN24	Ceramic Rolling Element

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions				
	d		D		B		d_a min	D_a max	*D_b max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
7000C	10	0.3937	26	1.0236	8	0.3150	0.492	0.925	0.976	0.012	0.006
7001C	12	0.4724	28	1.1024	8	0.3150	0.571	1.004	1.055	0.012	0.006
7002C	15	0.5906	32	1.2598	9	0.3543	0.689	1.161	1.213	0.012	0.006
7003C	17	0.6693	35	1.3780	10	0.3937	0.768	1.280	1.331	0.012	0.006
7004C	20	0.7874	42	1.6535	12	0.4724	0.984	1.457	1.555	0.024	0.012
7005C	25	0.9843	47	1.8504	12	0.4724	1.181	1.654	1.752	0.024	0.012
7006C	30	1.1811	55	2.1654	13	0.5118	1.417	1.929	1.969	0.039	0.020
7007C	35	1.3780	62	2.4409	14	0.5512	1.614	2.205	2.244	0.039	0.020
7008C	40	1.5748	68	2.6772	15	0.5906	1.811	2.441	2.480	0.039	0.020
7009C	45	1.7717	75	2.9528	16	0.6299	2.008	2.717	2.756	0.039	0.020
7010C	50	1.9685	80	3.1496	16	0.6299	2.205	2.913	2.953	0.039	0.020
7011C	55	2.1654	90	3.5433	18	0.7087	2.441	3.268	3.346	0.039	0.024
7012C	60	2.3622	95	3.7402	18	0.7087	2.638	3.465	3.543	0.039	0.024
7013C	65	2.5591	100	3.9370	18	0.7087	2.835	3.661	3.740	0.039	0.024
7014C	70	2.7559	110	4.3307	20	0.7874	3.031	4.055	4.134	0.039	0.024
7015C	75	2.9528	115	4.5276	20	0.7874	3.228	4.252	4.331	0.039	0.024
7016C	80	3.1496	125	4.9213	22	0.8661	3.425	4.646	4.724	0.039	0.024
7017C	85	3.3465	130	5.1181	22	0.8661	3.622	4.843	4.921	0.039	0.024
7018C	90	3.5433	140	5.5118	24	0.9449	3.898	5.157	5.276	0.059	0.031
7019C	95	3.7402	145	5.7087	24	0.9449	4.094	5.354	5.472	0.059	0.031
7020C	100	3.9370	150	5.9055	24	0.9449	4.291	5.551	5.669	0.059	0.031
7021C	105	4.1339	160	6.2992	26	1.0236	4.528	5.906	6.063	0.079	0.039
7022C	110	4.3307	170	6.6929	28	1.1024	4.724	6.299	6.457	0.079	0.039
7024C	120	4.7244	180	7.0866	28	1.1024	5.118	6.693	6.850	0.079	0.039
7026C	130	5.1181	200	7.8740	33	1.2992	5.512	7.480	7.638	0.079	0.039
7028C	140	5.5118	210	8.2677	33	1.2992	5.906	7.874	8.031	0.079	0.039
7030C	150	5.9055	225	8.8583	35	1.3780	6.378	8.386	8.583	0.079	0.039
7032C	160	6.2992	240	9.4488	38	1.4961	6.772	8.976	9.173	0.079	0.039
7034C	170	6.6929	260	10.2362	42	1.6535	7.165	9.764	9.961	0.079	0.039
7036C	180	7.0866	280	11.0236	46	1.8110	7.559	10.551	10.748	0.079	0.039
7038C	190	7.4803	290	11.4173	46	1.8110	7.953	10.945	11.142	0.079	0.039
7040C	200	7.8740	310	12.2047	51	2.0079	8.346	11.732	11.929	0.079	0.039

*D_b is housing diameter for low shoulder r_b is housing fillet radius for low shoulder

For application limiting speed, please refer to page H-2.

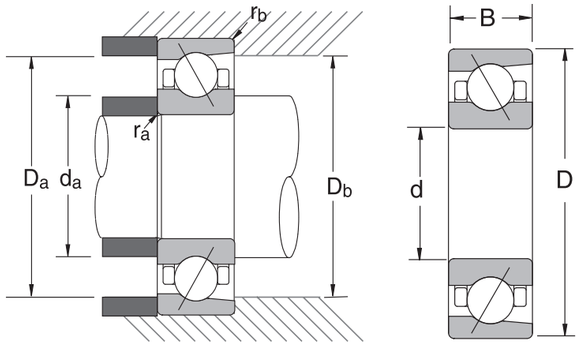
Note: When a ceramic ball is used, limiting speed value will be 1.25 times the value of the steel ball.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	
7000C	1190	560	63.9	97.3	0.05	-
7001C	1300	650	57.5	87.5	0.05	-
7002C	1400	760	49.0	74.5	0.07	-
7003C	1490	860	44.3	67.4	0.10	-
7004C	2490	1470	37.1	56.5	0.17	-
7005C	2620	1660	32.0	48.7	0.19	-
7006C	3400	2310	27.1	41.2	0.29	*
7007C	4300	3060	23.8	36.1	0.37	*
7008C	4630	3570	21.3	32.5	0.46	*
7009C	5490	4320	19.2	29.2	0.59	*
7010C	5840	4920	17.7	27.0	0.64	*
7011C	7720	6440	15.9	24.2	0.93	*
7012C	7940	6940	14.9	22.6	0.99	*
7013C	8380	7720	14.0	21.3	1.06	*
7014C	10600	9700	12.8	19.5	1.49	*
7015C	10800	10300	12.2	18.5	1.62	*
7016C	13200	12500	11.3	17.1	2.11	*
7017C	13600	13200	10.7	16.3	2.21	*
7018C	16100	15500	10.0	15.3	2.91	*
7019C	16500	16400	9.6	14.6	3.06	*
7020C	17000	17400	9.2	14.0	3.18	*
7021C	19800	20100	8.7	13.3	3.97	-
7022C	23800	23400	8.3	12.5	4.94	-
7024C	25100	26200	7.7	11.7	5.31	-
7026C	29100	30900	7.0	10.7	8.03	-
7028C	29800	32600	6.6	10.0	8.49	-
7030C	34000	37900	6.2	9.4	10.30	-
7032C	38400	43400	5.8	8.8	12.55	-
7034C	46100	52700	5.4	8.2	17.20	-
7036C	51400	61900	5.0	7.7	22.49	-
7038C	55300	69400	4.8	7.3	24.48	-
7040C	59500	76100	4.6	6.9	29.77	-

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Angular Contact: 7000A5 Series

25⁰ Contact Angle



COMMON OPTIONS	
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DU	Duplex Universal
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L	Light Preload
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H	Heavy Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal
SN24	Ceramic Rolling Element

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions				
	d		D		B		d_a min	D_a max	*D_b max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
7000A5	10	0.3937	26	1.0236	8	0.3150	0.492	0.925	0.976	0.012	0.006
7001A5	12	0.4724	28	1.1024	8	0.3150	0.571	1.004	1.055	0.012	0.006
7002A5	15	0.5906	32	1.2598	9	0.3543	0.689	1.161	1.213	0.012	0.006
7003A5	17	0.6693	35	1.3780	10	0.3937	0.768	1.280	1.331	0.012	0.006
7004A5	20	0.7874	42	1.6535	12	0.4724	0.984	1.457	1.555	0.024	0.012
7005A5	25	0.9843	47	1.8504	12	0.4724	1.181	1.654	1.752	0.024	0.012
7006A5	30	1.1811	55	2.1654	13	0.5118	1.417	1.929	1.969	0.039	0.020
7007A5	35	1.3780	62	2.4409	14	0.5512	1.614	2.205	2.244	0.039	0.020
7008A5	40	1.5748	68	2.6772	15	0.5906	1.811	2.441	2.480	0.039	0.020
7009A5	45	1.7717	75	2.9528	16	0.6299	2.008	2.717	2.756	0.039	0.020
7010A5	50	1.9685	80	3.1496	16	0.6299	2.205	2.913	2.953	0.039	0.020
7011A5	55	2.1654	90	3.5433	18	0.7087	2.441	3.268	3.346	0.039	0.024
7012A5	60	2.3622	95	3.7402	18	0.7087	2.638	3.465	3.543	0.039	0.024
7013A5	65	2.5591	100	3.9370	18	0.7087	2.835	3.661	3.740	0.039	0.024
7014A5	70	2.7559	110	4.3307	20	0.7874	3.031	4.055	4.134	0.039	0.024
7015A5	75	2.9528	115	4.5276	20	0.7874	3.228	4.252	4.331	0.039	0.024
7016A5	80	3.1496	125	4.9213	22	0.8661	3.425	4.646	4.724	0.039	0.024
7017A5	85	3.3465	130	5.1181	22	0.8661	3.622	4.843	4.921	0.039	0.024
7018A5	90	3.5433	140	5.5118	24	0.9449	3.898	5.157	5.276	0.059	0.031
7019A5	95	3.7402	145	5.7087	24	0.9449	4.094	5.354	5.472	0.059	0.031
7020A5	100	3.9370	150	5.9055	24	0.9449	4.291	5.551	5.669	0.059	0.031
7021A5	105	4.1339	160	6.2992	26	1.0236	4.528	5.906	6.063	0.079	0.039
7022A5	110	4.3307	170	6.6929	28	1.1024	4.724	6.299	6.457	0.079	0.039
7024A5	120	4.7244	180	7.0866	28	1.1024	5.118	6.693	6.850	0.079	0.039
7026A5	130	5.1181	200	7.8740	33	1.2992	5.512	7.480	7.638	0.079	0.039
7028A5	140	5.5118	210	8.2677	33	1.2992	5.906	7.874	8.031	0.079	0.039
7030A5	150	5.9055	225	8.8583	35	1.3780	6.378	8.386	8.583	0.079	0.039
7032A5	160	6.2992	240	9.4488	38	1.4961	6.772	8.976	9.173	0.079	0.039
7034A5	170	6.6929	260	10.2362	42	1.6535	7.165	9.764	9.961	0.079	0.039
7036A5	180	7.0866	280	11.0236	46	1.8110	7.559	10.551	10.748	0.079	0.039
7038A5	190	7.4803	290	11.4173	46	1.8110	7.953	10.945	11.142	0.079	0.039
7040A5	200	7.8740	310	12.2047	51	2.0079	8.346	11.732	11.929	0.079	0.012

*D_b is housing diameter for low shoulder r_b is housing fillet radius for low shoulder

For application limiting speed, please refer to page H-2..

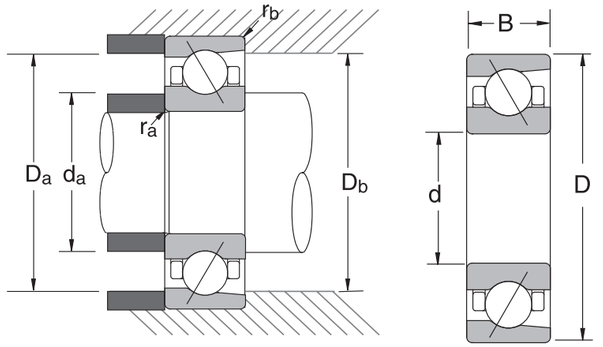
Note: When a ceramic ball is used, limiting speed value will be 1.25 times the value of the steel ball.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	
7000A5	1160	540	55.6	83.4	0.04	-
7001A5	1260	630	50.0	75.0	0.05	-
7002A5	1340	730	42.6	63.9	0.07	-
7003A5	1420	820	38.5	57.7	0.09	-
7004A5	2380	1410	37.1	56.5	0.15	-
7005A5	2510	1600	27.8	41.7	0.17	-
7006A5	3240	2190	23.6	35.3	0.25	*
7007A5	4080	2930	20.7	31.0	0.33	*
7008A5	4390	3400	18.6	27.8	0.41	*
7009A5	5200	4120	16.7	25.0	0.55	*
7010A5	5530	4670	15.4	23.1	0.60	*
7011A5	7280	6130	13.8	20.7	0.84	*
7012A5	7500	6550	13.0	19.4	0.90	*
7013A5	7940	7280	12.2	18.2	1.00	*
7014A5	10000	9150	11.2	16.7	1.38	*
7015A5	10300	9700	10.6	15.8	1.44	*
7016A5	12500	11800	9.8	14.7	1.94	*
7017A5	12800	12500	9.4	14.0	1.99	*
7018A5	15200	14800	8.7	13.1	2.58	*
7019A5	15700	15700	8.4	12.5	3.11	*
7020A5	16000	16400	8.0	12.0	3.20	*
7021A5	18700	19100	7.5	11.4	4.01	-
7022A5	22500	22300	7.2	10.8	4.98	-
7024A5	23800	24900	6.7	10.0	5.36	-
7026A5	27600	29300	6.1	9.1	8.07	-
7028A5	28000	30900	5.8	8.6	8.53	-
7030A5	32000	35900	5.4	8.0	10.34	-
7032A5	36400	41200	5.0	7.5	12.59	-
7034A5	37500	43400	4.7	7.0	17.27	-
7036A5	41700	51100	4.4	6.6	22.93	-
7038A5	45000	56900	4.2	6.3	24.70	-
7040A5	48300	63100	4.0	5.9	30.21	-

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Angular Contact: 7200C Series

15⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
L	Light Preload
M	Medium Preload
H	Heavy Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal
SN24	Ceramic Rolling Element

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions				
	d		D		B		d_a min	D_a max	*D_b max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
7200C	10	0.3937	30	1.1811	9	0.3543	0.591	0.984	1.083	0.024	0.012
7201C	12	0.4724	32	1.2598	10	0.3937	0.669	1.063	1.161	0.024	0.012
7202C	15	0.5906	35	1.3780	11	0.4331	0.787	1.181	1.280	0.024	0.012
7203C	17	0.6693	40	1.5748	12	0.4724	0.866	1.378	1.476	0.024	0.020
7204C	20	0.7874	47	1.8504	14	0.5512	1.024	1.614	1.654	0.039	0.020
7205C	25	0.9843	52	2.0472	15	0.5906	1.220	1.811	1.850	0.039	0.020
7206C	30	1.1811	62	2.4409	16	0.6299	1.417	2.205	2.244	0.039	0.024
7207C	35	1.3780	72	2.8346	17	0.6693	1.654	2.559	2.638	0.039	0.024
7208C	40	1.5748	80	3.1496	18	0.7087	1.850	2.874	2.953	0.039	0.024
7209C	45	1.7717	85	3.3465	19	0.7480	2.047	3.071	3.150	0.039	0.024
7210C	50	1.9685	90	3.5433	20	0.7874	2.244	3.268	3.346	0.039	0.031
7211C	55	2.1654	100	3.9370	21	0.8268	2.520	3.583	3.701	0.059	0.031
7212C	60	2.3622	110	4.3307	22	0.8661	2.717	3.976	4.094	0.059	0.031
7213C	65	2.5591	120	4.7244	23	0.9055	2.913	4.370	4.488	0.059	0.031
7214C	70	2.7559	125	4.9213	24	0.9449	3.110	4.567	4.685	0.059	0.031
7215C	75	2.9528	130	5.1181	25	0.9843	3.307	4.764	4.882	0.059	0.031
7216C	80	3.1496	140	5.5118	26	1.0236	3.543	5.118	5.276	0.079	0.039
7217C	85	3.3465	150	5.9055	28	1.1024	3.740	5.512	5.669	0.079	0.039
7218C	90	3.5433	160	6.2992	30	1.1811	3.937	5.906	6.063	0.079	0.039
7219C	95	3.7402	170	6.6929	32	1.2598	4.213	6.220	6.417	0.079	0.039
7220C	100	3.9370	180	7.0866	34	1.3386	4.409	6.614	6.811	0.079	0.039
7221C	105	4.1339	190	7.4803	36	1.4173	4.606	7.008	7.205	0.079	0.039
7222C	110	4.3307	200	7.8740	38	1.4961	4.803	7.402	7.598	0.079	0.039
7224C	120	4.7244	215	8.4646	40	1.5748	5.197	7.992	8.189	0.079	0.039
7226C	130	5.1181	230	9.0551	40	1.5748	5.669	8.504	8.780	0.098	0.039
7228C	140	5.5118	250	9.8425	42	1.6535	6.063	9.291	9.567	0.098	0.039
7230C	150	5.9055	270	10.6299	45	1.7717	6.457	10.079	10.354	0.098	0.039
7232C	160	6.2992	290	11.4173	48	1.8898	6.850	10.866	11.142	0.098	0.039
7234C	170	6.6929	310	12.2047	52	2.0472	7.402	11.496	11.850	0.118	0.059
7236C	180	7.0866	320	12.5984	52	2.0472	7.795	11.890	12.244	0.118	0.059
7238C	190	7.4803	340	13.3858	55	2.1654	8.189	12.677	13.031	0.118	0.059
7240C	200	7.8740	360	14.1732	58	2.2835	8.583	13.465	13.819	0.118	0.059

*D_b is housing diameter for low shoulder r_b is housing fillet radius for low shoulder

For application limiting speed, please refer to page H-2.

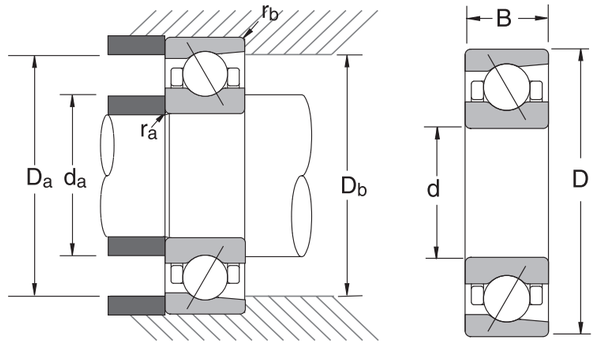
Note: When a ceramic ball is used, limiting speed value will be 1.25 times the value of the steel ball.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)
	C_r	C_{or}	Grease	Oil	lbs
7200C	1210	590	57.5	87.5	0.07
7201C	1770	870	52.3	79.6	0.08
7202C	1950	1010	46.0	70.0	0.09
7203C	2450	1310	40.4	61.5	0.14
7204C	3260	1820	34.4	52.3	0.22
7205C	3730	2290	29.9	45.5	0.28
7206C	5180	3310	25.0	38.1	0.42
7207C	6830	4480	21.5	32.8	0.60
7208C	8160	5670	19.2	29.2	0.79
7209C	9150	6480	17.7	27.0	0.87
7210C	9590	7170	16.5	25.0	0.99
7211C	11900	9040	14.9	22.6	1.29
7212C	14400	11000	13.6	20.6	1.69
7213C	16400	13200	12.5	19.0	2.19
7214C	17900	14600	11.8	18.0	2.36
7215C	18600	15700	11.3	17.1	2.58
7216C	20800	17400	10.5	16.0	3.09
7217C	24000	20400	9.8	14.9	3.90
7218C	27600	23600	9.2	14.0	4.83
7219C	29800	25100	8.7	13.3	5.73
7220C	33500	28400	8.3	12.5	6.90
7221C	36600	32200	7.8	11.9	8.22
7222C	39500	35900	7.5	11.3	9.70
7224C	44800	43200	6.9	10.5	11.84
7226C	46500	47000	6.4	9.8	13.60
7228C	53600	57100	5.9	9.0	17.29
7230C	60800	68300	5.5	8.4	24.48
7232C	64400	75000	5.2	7.8	30.65
7234C	71700	87100	4.8	7.3	38.37
7236C	75000	93700	4.6	7.0	39.25
7238C	77200	101000	4.4	6.7	48.73
7240C	82700	110000	4.2	6.3	57.77

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Angular Contact: 7200A5 Series

25⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
L	Light Preload
M	Medium Preload
H	Heavy Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal
SN24	Ceramic Rolling Element

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions				
	d		D		B		d_a min	D_a max	*D_b max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
7200A5	10	0.3937	30	1.1811	9	0.3543	0.591	0.984	1.083	0.024	0.012
7201A5	12	0.4724	32	1.2598	10	0.3937	0.669	1.063	1.161	0.024	0.012
7202A5	15	0.5906	35	1.3780	11	0.4331	0.787	1.181	1.280	0.024	0.012
7203A5	17	0.6693	40	1.5748	12	0.4724	0.866	1.378	1.476	0.024	0.012
7204A5	20	0.7874	47	1.8504	14	0.5512	1.024	1.614	1.654	0.039	0.020
7205A5	25	0.9843	52	2.0472	15	0.5906	1.220	1.811	1.850	0.039	0.020
7206A5	30	1.1811	62	2.4409	16	0.6299	1.417	2.205	2.244	0.039	0.020
7207A5	35	1.3780	72	2.8346	17	0.6693	1.654	2.559	2.638	0.039	0.024
7208A5	40	1.5748	80	3.1496	18	0.7087	1.850	2.874	2.953	0.039	0.024
7209A5	45	1.7717	85	3.3465	19	0.7480	2.047	3.071	3.150	0.039	0.024
7210A5	50	1.9685	90	3.5433	20	0.7874	2.244	3.268	3.346	0.039	0.024
7211A5	55	2.1654	100	3.9370	21	0.8268	2.520	3.583	3.701	0.059	0.031
7212A5	60	2.3622	110	4.3307	22	0.8661	2.717	3.976	4.094	0.059	0.031
7213A5	65	2.5591	120	4.7244	23	0.9055	2.913	4.370	4.488	0.059	0.031
7214A5	70	2.7559	125	4.9213	24	0.9449	3.110	4.567	4.685	0.059	0.031
7215A5	75	2.9528	130	5.1181	25	0.9843	3.307	4.764	4.882	0.059	0.031
7216A5	80	3.1496	140	5.5118	26	1.0236	3.543	5.118	5.276	0.079	0.039
7217A5	85	3.3465	150	5.9055	28	1.1024	3.740	5.512	5.669	0.079	0.039
7218A5	90	3.5433	160	6.2992	30	1.1811	3.937	5.906	6.063	0.079	0.039
7219A5	95	3.7402	170	6.6929	32	1.2598	4.213	6.220	6.417	0.079	0.039
7220A5	100	3.9370	180	7.0866	34	1.3386	4.409	6.614	6.811	0.079	0.039
7221A5	105	4.1339	190	7.4803	36	1.4173	4.606	7.008	7.205	0.079	0.039
7222A5	110	4.3307	200	7.8740	38	1.4961	4.803	7.402	7.598	0.079	0.039
7224A5	120	4.7244	215	8.4646	40	1.5748	5.197	7.992	8.189	0.079	0.039
7226A5	130	5.1181	230	9.0551	40	1.5748	5.669	8.504	8.780	0.098	0.039
7228A5	140	5.5118	250	9.8425	42	1.6535	6.063	9.291	9.567	0.098	0.039
7230A5	150	5.9055	270	10.6299	45	1.7717	6.457	10.079	10.354	0.098	0.039
7232A5	160	6.2992	290	11.4173	48	1.8898	6.850	10.866	11.142	0.098	0.039
7234A5	170	6.6929	310	12.2047	52	2.0472	7.402	11.496	11.850	0.118	0.059
7236A5	180	7.0866	320	12.5984	52	2.0472	7.795	11.890	12.244	0.118	0.059
7238A5	190	7.4803	340	13.3858	55	2.1654	8.189	12.677	13.031	0.118	0.059
7240A5	200	7.8740	360	14.1732	58	2.2835	8.583	13.465	13.819	0.118	0.059

*D_b is housing diameter for low shoulder r_b is housing fillet radius for low shoulder

For application limiting speed, please refer to page H-2.

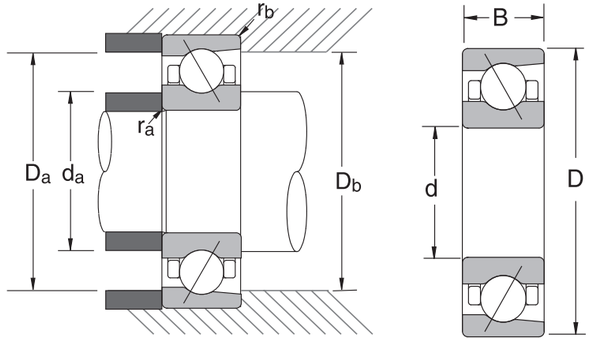
Note: When a ceramic ball is used, limiting speed value will be 1.25 times the value of the steel ball.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)
	C_r	C_{or}	Grease	Oil	lbs
7200A5	1140	550	50.0	87.5	0.07
7201A5	1720	840	45.5	68.2	0.08
7202A5	1870	980	40.0	60.0	0.10
7203A5	2360	1260	35.1	52.7	0.14
7204A5	3150	1740	29.9	44.8	0.22
7205A5	3570	2190	26.0	39.0	0.29
7206A5	4960	3150	21.8	32.7	0.43
7207A5	6550	4300	18.7	28.1	0.61
7208A5	7830	5420	16.7	25.0	0.80
7209A5	8820	6190	15.4	23.1	0.89
7210A5	9150	6830	14.3	21.5	1.00
7211A5	11400	8600	13.0	19.4	1.31
7212A5	13800	10600	11.8	17.7	1.70
7213A5	15700	12600	10.9	16.3	2.21
7214A5	17100	13900	10.3	15.4	2.38
7215A5	17700	15000	9.8	14.7	2.60
7216A5	19800	16600	9.1	13.7	3.13
7217A5	22900	19400	8.6	12.8	3.95
7218A5	26200	22500	8.0	12.0	4.87
7219A5	28400	24000	7.6	11.4	5.80
7220A5	32000	27300	7.2	10.8	6.97
7221A5	34800	30600	6.8	10.2	8.31
7222A5	37700	34400	6.5	9.7	9.81
7224A5	42500	41200	6.0	9.0	11.95
7226A5	44100	44800	5.6	8.4	13.72
7228A5	50900	54500	5.2	7.7	17.44
7230A5	58000	65000	4.8	7.2	24.48
7232A5	61300	71700	3.6	4.8	30.87
7234A5	68300	83800	3.4	4.5	37.93
7236A5	71700	89300	3.2	4.5	39.47
7238A5	73900	95900	3.0	4.3	49.17
7240A5	78300	105000	2.8	4.0	58.21

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Angular Contact: 7900C Series

15⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
L	Light Preload
M	Medium Preload
H	Heavy Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal
SN24	Ceramic Rolling Element

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions				
	d		D		B		d_a min	D_a max	*D_b max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
7900C	10	0.3937	22	0.8661	6	0.2362	0.492	0.768	0.819	0.012	0.006
7901C	12	0.4724	24	0.9449	6	0.2362	0.571	0.846	0.898	0.012	0.006
7902C	15	0.5906	28	1.1024	7	0.2756	0.689	1.004	1.055	0.012	0.006
7903C	17	0.6693	30	1.1811	7	0.2756	0.768	1.083	1.134	0.012	0.006
7904C	20	0.7874	37	1.4567	9	0.3543	0.886	1.358	1.409	0.012	0.006
7905C	25	0.9843	42	1.6535	9	0.3543	1.083	1.555	1.606	0.012	0.006
7906C	30	1.1811	47	1.8504	9	0.3543	1.280	1.752	1.803	0.012	0.006
7907C	35	1.3780	55	2.1654	10	0.3937	1.575	1.969	2.067	0.024	0.012
7908C	40	1.5748	62	2.4409	12	0.4724	1.772	2.244	2.343	0.024	0.012
7909C	45	1.7717	68	2.6772	12	0.4724	1.969	2.480	2.579	0.024	0.012
7910C	50	1.9685	72	2.8346	12	0.4724	2.165	2.638	2.736	0.024	0.012
7911C	55	2.1654	80	3.1496	13	0.5118	2.402	2.913	2.953	0.039	0.020
7912C	60	2.3622	85	3.3465	13	0.5118	2.598	3.110	3.150	0.039	0.020
7913C	65	2.5591	90	3.5433	13	0.5118	2.795	3.307	3.346	0.039	0.020
7914C	70	2.7559	100	3.9370	16	0.6299	2.992	3.701	3.740	0.039	0.020
7915C	75	2.9528	105	4.1339	16	0.6299	3.189	3.898	3.937	0.039	0.020
7916C	80	3.1496	110	4.3307	16	0.6299	3.386	4.094	4.134	0.039	0.020
7917C	85	3.3465	120	4.7244	18	0.7087	3.622	4.449	4.528	0.039	0.024
7918C	90	3.5433	125	4.9213	18	0.7087	3.819	4.646	4.724	0.039	0.024
7919C	95	3.7402	130	5.1181	18	0.7087	4.016	4.843	4.921	0.039	0.024
7920C	100	3.9370	140	5.5118	20	0.7874	4.213	5.236	5.315	0.039	0.024
7921C	105	4.1339	145	5.7087	20	0.7874	4.409	5.433	5.512	0.039	0.024
7922C	110	4.3307	150	5.9055	20	0.7874	4.606	5.630	5.709	0.039	0.024
7924C	120	4.7244	165	6.4961	22	0.8661	5.000	6.220	6.299	0.039	0.024
7926C	130	5.1181	180	7.0866	24	0.9449	5.472	6.732	6.850	0.059	0.031
7928C	140	5.5118	190	7.4803	24	0.9449	5.866	7.126	7.244	0.059	0.031
7930C	150	5.9055	210	8.2677	28	1.1024	6.299	7.874	8.031	0.079	0.039
7932C	160	6.2992	220	8.6614	28	1.1024	6.693	8.268	8.425	0.079	0.039
7934C	170	6.6929	230	9.0551	28	1.1024	7.087	8.661	8.819	0.079	0.039
7936C	180	7.0866	250	9.8425	33	1.2992	7.480	9.449	9.606	0.079	0.039
7938C	190	7.4803	260	10.2362	33	1.2992	7.874	9.843	10.000	0.079	0.039
7940C	200	7.8740	280	11.0236	38	1.4961	8.346	10.551	10.748	0.079	0.039

*D_b is housing diameter for low shoulder r_b is housing fillet radius for low shoulder

For application limiting speed, please refer to page H-2.

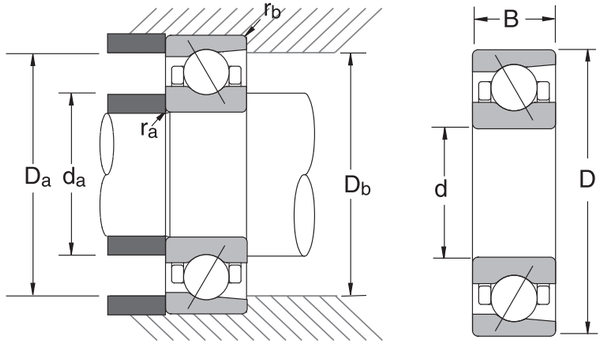
Note: When a ceramic ball is used, limiting speed value will be 1.25 times the value of the steel ball.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	
7900C	670	340	71.9	109.4	0.02	–
7901C	750	420	63.9	97.3	0.02	–
7902C	1070	600	53.5	81.4	0.03	–
7903C	1120	660	49.0	74.5	0.04	–
7904C	1570	950	40.4	61.5	0.08	–
7905C	1760	1220	34.4	52.3	0.09	–
7906C	1860	1410	29.9	45.5	0.11	*
7907C	2710	2050	25.6	38.9	0.16	*
7908C	3400	2650	22.6	34.4	0.24	*
7909C	3590	3000	20.4	31.0	0.28	*
7910C	3790	3370	18.9	28.7	0.28	*
7911C	4300	3990	17.1	26.0	0.39	*
7912C	4370	4210	15.9	24.2	0.42	*
7913C	4540	4610	14.9	22.6	0.45	*
7914C	6330	6240	13.6	20.6	0.73	*
7915C	6420	6570	12.8	19.5	0.78	*
7916C	6530	6940	12.2	18.5	0.82	*
7917C	8710	9150	11.3	17.1	1.15	*
7918C	9370	10400	10.7	16.3	1.22	*
7919C	9480	10800	10.3	15.6	1.28	*
7920C	11200	12200	9.6	14.6	1.73	*
7921C	11500	12800	9.2	14.0	1.79	–
7922C	11700	13300	8.9	13.5	1.87	–
7924C	16100	18300	8.1	12.3	2.51	–
7926C	17600	20400	7.5	11.3	3.31	–
7928C	17900	21400	7.0	10.7	3.55	–
7930C	22900	27300	6.4	9.8	6.54	–
7932C	23800	29800	6.1	9.3	6.81	–
7934C	25400	33300	5.8	8.8	7.34	–
7936C	32600	41400	5.4	8.2	10.80	–
7938C	33100	43200	5.2	7.8	11.16	–
7940C	42500	54900	4.8	7.3	15.10	–

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Angular Contact: 7900A5 Series

25⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
L	Light Preload
M	Medium Preload
H	Heavy Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal
SN24	Ceramic Rolling Element

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions				
	d		D		B		d_a min	D_a max	*D_b max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
7900A5	10	0.3937	22	0.8661	6	0.2362	0.492	0.768	0.819	0.012	0.006
7901A5	12	0.4724	24	0.9449	6	0.2362	0.571	0.846	0.898	0.012	0.006
7902A5	15	0.5906	28	1.1024	7	0.2756	0.689	1.004	1.055	0.012	0.006
7903A5	17	0.6693	30	1.1811	7	0.2756	0.768	1.083	1.134	0.012	0.006
7904A5	20	0.7874	37	1.4567	9	0.3543	0.886	1.358	1.409	0.012	0.006
7905A5	25	0.9843	42	1.6535	9	0.3543	1.083	1.555	1.606	0.012	0.006
7906A5	30	1.1811	47	1.8504	9	0.3543	1.280	1.752	1.803	0.012	0.006
7907A5	35	1.3780	55	2.1654	10	0.3937	1.575	1.969	2.067	0.024	0.012
7908A5	40	1.5748	62	2.4409	12	0.4724	1.772	2.244	2.343	0.024	0.012
7909A5	45	1.7717	68	2.6772	12	0.4724	1.969	2.480	2.579	0.024	0.012
7910A5	50	1.9685	72	2.8346	12	0.4724	2.165	2.638	2.736	0.024	0.012
7911A5	55	2.1654	80	3.1496	13	0.5118	2.402	2.913	2.953	0.039	0.020
7912A5	60	2.3622	85	3.3465	13	0.5118	2.598	3.110	3.150	0.039	0.020
7913A5	65	2.5591	90	3.5433	13	0.5118	2.795	3.307	3.346	0.039	0.020
7914A5	70	2.7559	100	3.9370	16	0.6299	2.992	3.701	3.740	0.039	0.020
7915A5	75	2.9528	105	4.1339	16	0.6299	3.189	3.898	3.937	0.039	0.020
7916A5	80	3.1496	110	4.3307	16	0.6299	3.386	4.094	4.134	0.039	0.020
7917A5	85	3.3465	120	4.7244	18	0.7087	3.622	4.449	4.528	0.039	0.024
7918A5	90	3.5433	125	4.9213	18	0.7087	3.819	4.646	4.724	0.039	0.024
7919A5	95	3.7402	130	5.1181	18	0.7087	4.016	4.843	4.921	0.039	0.024
7920A5	100	3.9370	140	5.5118	20	0.7874	4.213	5.236	5.315	0.039	0.024
7921A5	105	4.1339	145	5.7087	20	0.7874	4.409	5.433	5.512	0.039	0.024
7922A5	110	4.3307	150	5.9055	20	0.7874	4.606	5.630	5.709	0.039	0.024
7924A5	120	4.7244	165	6.4961	22	0.8661	5.000	6.220	6.299	0.039	0.024
7926A5	130	5.1181	180	7.0866	24	0.9449	5.472	6.732	6.850	0.059	0.031
7928A5	140	5.5118	190	7.4803	24	0.9449	5.866	7.126	7.244	0.059	0.031
7930A5	150	5.9055	210	8.2677	28	1.1024	6.299	7.874	8.031	0.079	0.039
7932A5	160	6.2992	220	8.6614	28	1.1024	6.693	8.268	8.425	0.079	0.039
7934A5	170	6.6929	230	9.0551	28	1.1024	7.087	8.661	8.819	0.079	0.039
7936A5	180	7.0866	250	9.8425	33	1.2992	7.480	9.449	9.606	0.079	0.039
7938A5	190	7.4803	260	10.2362	33	1.2992	7.874	9.843	10.000	0.079	0.039
7940A5	200	7.8740	280	11.0236	38	1.4961	8.346	10.551	10.748	0.079	0.039

*D_b is housing diameter for low shoulder r_b is housing fillet radius for low shoulder

For application limiting speed, please refer to page H-2.

Note: When a ceramic ball is used, limiting speed value will be 1.25 times the value of the steel ball.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	
7900A5	650	330	62.5	93.8	0.02	–
7901A5	720	400	55.6	83.4	0.02	–
7902A5	1030	570	46.6	69.8	0.03	–
7903A5	1070	630	42.6	63.9	0.04	–
7904A5	1490	900	35.1	52.7	0.08	–
7905A5	1680	1160	29.9	44.8	0.09	–
7906A5	1760	1330	26.0	39.0	0.11	*
7907A5	2580	1950	22.3	33.4	0.16	*
7908A5	3220	2510	19.7	29.5	0.24	*
7909A5	3400	2840	17.7	26.6	0.28	*
7910A5	3590	3200	16.4	24.6	0.29	*
7911A5	4060	3770	14.9	22.3	0.40	*
7912A5	4120	3990	13.8	20.7	0.38	*
7913A5	4280	4370	13.0	19.4	0.45	*
7914A5	5970	5910	11.8	17.7	0.74	*
7915A5	6060	6220	11.2	16.7	0.78	*
7916A5	6150	6530	10.6	15.8	0.83	*
7917A5	8270	8600	9.8	14.7	1.16	*
7918A5	8820	9810	9.4	14.0	1.23	*
7919A5	8930	10300	8.9	13.4	1.30	*
7920A5	10700	11600	8.4	12.5	1.75	*
7921A5	10800	12100	8.0	12.0	1.81	–
7922A5	11000	12700	7.7	11.6	1.89	–
7924A5	15200	17300	7.1	10.6	2.54	–
7926A5	16600	19300	6.5	9.7	3.35	–
7928A5	16900	20300	6.1	9.1	3.59	–
7930A5	21700	26000	5.6	8.4	6.55	–
7932A5	22500	28200	5.3	7.9	6.88	–
7934A5	23800	31500	5.0	7.5	7.41	–
7936A5	30600	39200	4.7	7.0	10.89	–
7938A5	31100	40800	4.5	6.7	11.29	–
7940A5	40100	52000	4.2	6.3	15.26	–

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact Ball Bearings

Bearing Bore
Diameter (mm)

65

Bearing Type
BNR: 18° Contact Angle (Robust Series)
BER: 25° Contact Angle (Robust Series)
BGR: 15° Contact Angle (Robust Grinding Series)

BNR

Dimension Series
10: ISO 10 Size
19: ISO 19 Size

10

Material Symbol
X: SHX Steel Rings and Ceramic Balls
S: Steel Ball (Robust Series)
H: Ceramic Ball (Robust Series)

H

Cage Symbols
TYN: Polyamide
T: Phenolic

T

Combination Symbols
SU: Single Universal
DU: Duplex Universal

DU

Preload Symbols
EL: Extra Light
L: Light

EL

Precision Class:
P4: ISO Class 4 (ABEC7)
P4Y*: NSK Exclusive P4 Accuracy
P3: Dimensions - ISO Class 4 Running Accuracy : ISO Class 2
P2: ISO Class 2 (ABEC9)

*P4Y indicates special ID/OD tighter tolerance for ease of matching sets.

P4Y

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

Interchange

Description		Interchange						
		NSK	*OLD NSK	SKF	BARDEN	FAF/TIMKEN	SNFA	NTN
Part No.	Ultra Light Robust High Speed Series	XXBNR19	XXBNC19	719XXCE	ZSB19XX	93XXWO,WN,HX	VEBXX	HSB9XX
	Extra Light Robust High Speed Series	XXBNR10	XXBNC10	70XXCE	ZSB1XX	91XXWO,WN,HX	VEXXX	HSB0XX
	Ultra Light Robust High Speed Series for Grinding Spindles	XXBGR19	XXBNT19	-	-	-	-	BNT9XX
	Extra Light Robust High Speed Series for Grinding Spindles	XXBGR10	XXBNT10	-	XXBX48	-	-	BNT0XX
Part Number Suffix	Polyamide Cage	TYN	TY	BLANK, TNH	TMT	PRC	P	T2
	Phenolic Cage	TR	T	-	T, TA	CR	C	T1
	Duplex Universal	DU	DU	DG	DU	DU	DU	D
	Single Universal	SU	SU	G	U	SU	U	BLANK
	Extra Light Preload	EL	EL	A	-	X	-	GL
	Light Preload	L	L	B	L	L	L	GN
	Ceramic Balls	H	SN24	HC	C**	C**	/NS	5S**
	Steel Balls	S	BLANK	BLANK	BLANK	BLANK	BLANK	BLANK
	ABEC 7 Precision	P4Y	P4	P4	BLANK	MM/MMV**	7	P4
	ABEC 9 Precision	P2	P2	P2	ABEC 9	MMX**	9	P2

*BNR has replaced BNC series. P4Y tolerance specification replaces P4. P4Y tolerance specification has tighter bore and OD control than ABEC 7 (class 4 or P4). NSK supplies the following bearing series with P4Y tolerance: 7000; 7200; 7900; and BNR.
** Indicates prefix not suffix

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

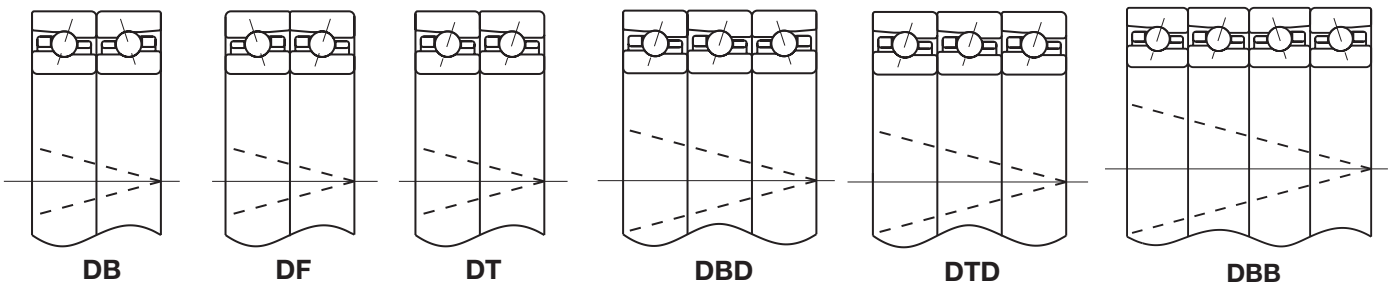
Applications

High Speed Super Precision Angular Contact bearings are now available due to NSK's new optimized design, under the ROBUST name. Allowing increased speeds and improved performance, these series are available in applications specific designs for machining center applications (BNR), and high speed grinding applications (BGR) – both allowing customers to push the limits of existing speeds.

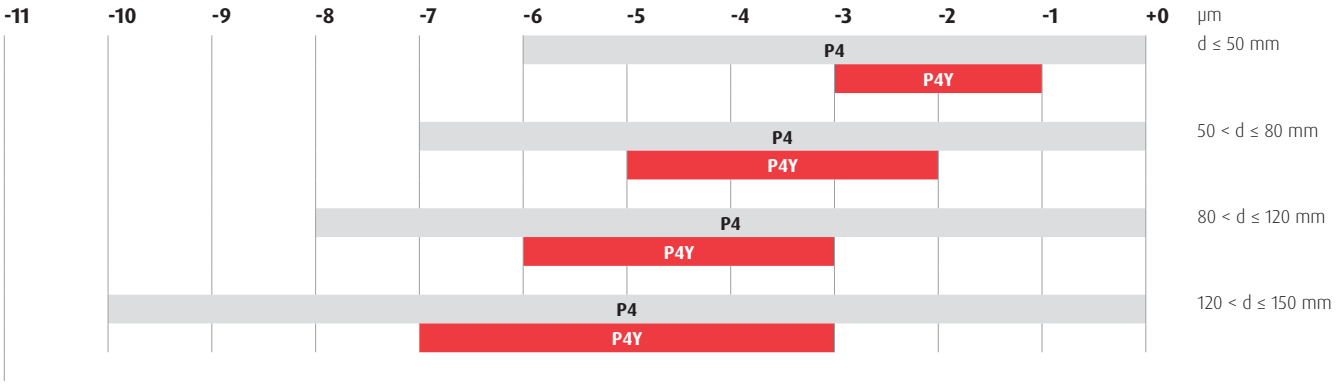
› Machining Centers › Grinding Machines › High Frequency Spindles › Lathes › Milling Machines

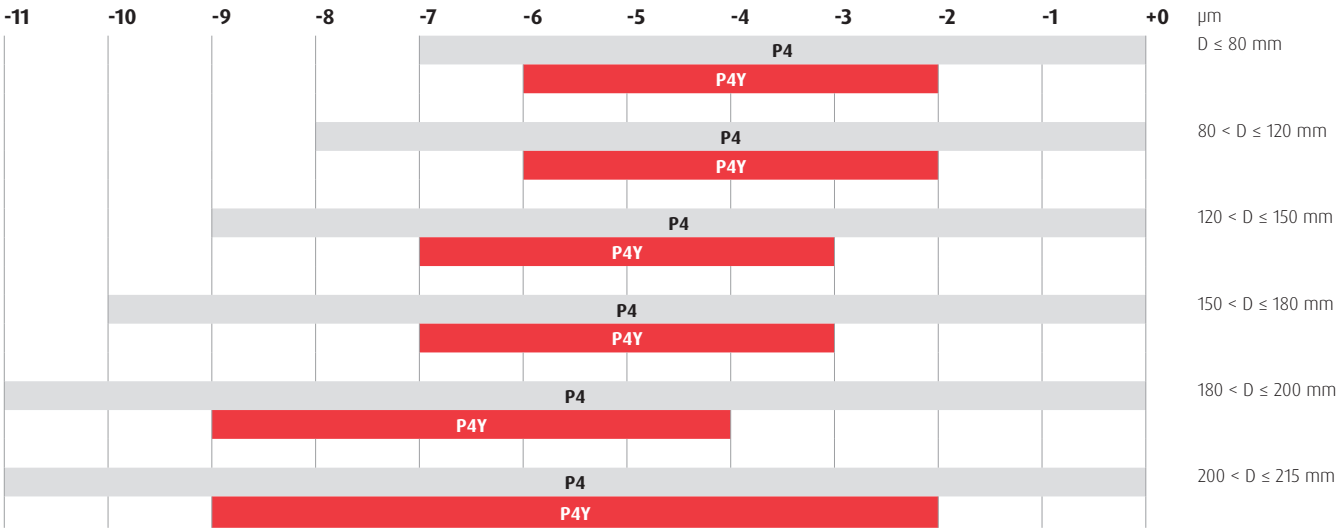
High Speed Super Precision Angular Contact Ball Bearings

Example of Outer and Inner Ring Face Arrangements for a Variety of Matching Combinations



P4Y Bore and OD Tolerance - Exclusive to NSK





Recommended Grease Quantities

The Recommended Grease Quantities for High-Speed Spindle Bearings

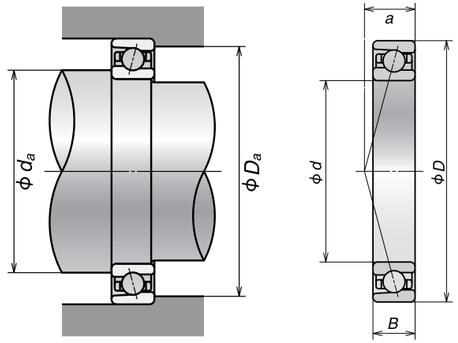
Unit: cc/bearing

Bore Number	Bore Diameter (mm)	Angular Contact Ball Bearing : 15% of internal space				Cylindrical Roller Bearing: 10% of internal space			
		BNR19 BGR19 79xx	BGR10 70xx	BGR02 72xx	BNR10 BAR10 BTR10	NN49	NN39	NN30	N10
		X-quantity	X-quantity	X-quantity	X-quantity	X-quantity	X-quantity	X-quantity	X-quantity
5	5	–	–	0.03	–	–	–	–	–
6	6	–	0.04	0.07	–	–	–	–	–
7	7	–	0.07	–	–	–	–	–	–
8	8	–	0.12	0.10	–	–	–	–	–
00	10	0.06	0.13	0.16	–	–	–	–	–
01	12	0.06	0.14	0.23	–	–	–	–	–
02	15	0.11	0.18	0.29	–	–	–	–	–
03	17	0.13	0.24	0.41	–	–	–	–	–
04	20	0.23	0.44	0.68	–	–	–	–	–
05	25	0.27	0.52	0.85	–	–	–	0.4	–
06	30	0.31	0.69	1.20	0.58	–	–	0.6	0.4
07	35	0.48	0.98	1.70	0.78	–	–	0.8	0.6
08	40	0.75	1.20	2.10	0.92	–	–	1.0	0.7
09	45	0.83	1.50	2.60	1.20	–	–	1.3	1.0
10	50	0.91	1.60	3.00	1.20	–	–	1.4	1.1
11	55	1.10	2.40	3.90	1.70	–	–	2.0	1.5
12	60	1.20	2.60	4.80	1.80	–	–	2.1	1.6
13	65	1.30	2.60	5.70	1.90	–	–	2.2	1.6
14	70	2.10	3.60	6.50	2.80	–	–	3.2	2.4
15	75	2.30	3.60	7.00	2.90	–	–	3.5	2.5
16	80	2.40	5.10	8.70	3.80	–	–	4.7	3.5
17	85	3.50	5.30	11.00	4.00	–	–	4.9	3.7
18	90	3.60	6.60	13.00	5.50	–	–	6.5	4.5
19	95	3.60	6.80	16.00	5.70	–	–	6.6	4.7
20	100	4.90	7.20	19.00	6.10	5.4	4.5	6.8	4.9
21	105	5.10	9.00	23.00	7.60	5.6	4.6	9.3	5.9
22	110	5.20	12.00	27.00	9.10	5.7	4.8	11.0	7.5
24	120	7.90	12.00	31.00	9.80	8.4	6.5	12.5	8.1
26	130	9.00	18.00	34.00	15.00	11.0	8.5	18.0	12.4
28	140	9.90	20.00	42.00	17.00	12.0	9.3	20.0	12.9
30	150	14.00	25.00	53.00	22.00	24.0	14.0	23.0	–
32	160	16.00	34.00	–	26.00	20.0	15.0	29.0	–
34	170	14.00	42.00	–	33.00	21.0	15.0	38.0	–
36	180	22.00	51.00	–	46.00	28.0	23.0	51.0	–
38	190	27.00	47.00	–	50.00	30.0	24.0	54.0	–
40	200	39.00	76.00	–	61.00	44.0	35.0	69.0	–
44	220	42.00	–	–	–	–	37.0	–	–
48	240	41.00	–	–	–	–	40.0	–	–
52	260	77.00	–	–	–	–	70.0	–	–
56	280	80.00	–	–	–	–	75.0	–	–

The grease quantity of "xxTAC20(29)X(D)" should be the same as the double row cylindrical roller bearing's, which is assmbled with this bearing together.

High Speed Super Precision Angular Contact
BER Series - ROBUST (Steel Ball)

25⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal

Bearing Number	Basic Bearing Dimensions					Preferred Shoulder Dimensions					
	d		D		B	d_a min	D_a max	*D_b max	r_a max	*r_b max	
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
30BER10S	30	1.1811	55	2.1654	13	0.5118	1.417	1.929	1.969	0.039	0.020
35BER10S	35	1.3780	62	2.4409	14	0.5512	1.614	2.205	2.244	0.039	0.020
40BER10S	40	1.5748	68	2.6772	15	0.5906	1.811	2.441	2.480	0.039	0.020
45BER10S	45	1.7717	75	2.9528	16	0.6299	2.008	2.717	2.756	0.039	0.020
50BER10S	50	1.9685	80	3.1496	16	0.6299	2.205	2.913	2.953	0.039	0.020
55BER10S	55	2.1654	90	3.5433	18	0.7087	2.441	3.268	3.346	0.039	0.024
60BER10S	60	2.3622	95	3.7402	18	0.7087	2.638	3.465	3.543	0.039	0.024
65BER10S	65	2.5591	100	3.9370	18	0.7087	2.835	3.661	3.740	0.039	0.024
70BER10S	70	2.7559	110	4.3307	20	0.7874	0.433	4.055	4.134	0.039	0.024
75BER10S	75	2.9528	115	4.5276	20	0.7874	3.228	4.252	4.331	0.039	0.024
80BER10S	80	3.1496	125	4.9213	22	0.8661	3.425	4.646	4.724	0.039	0.024
85BER10S	85	3.3465	130	5.1181	22	0.8661	3.622	4.843	4.921	0.039	0.024
90BER10S	90	3.5433	140	5.5118	24	0.9449	3.898	5.157	5.276	0.059	0.031
95BER10S	95	3.7402	145	5.7087	24	0.9449	4.094	5.354	5.472	0.059	0.031
100BER10S	100	3.9370	150	5.9055	24	0.9449	4.291	5.551	5.669	0.059	0.031

*D_b is housing diameter for low shoulder. r_b is housing fillet radius for low shoulder.

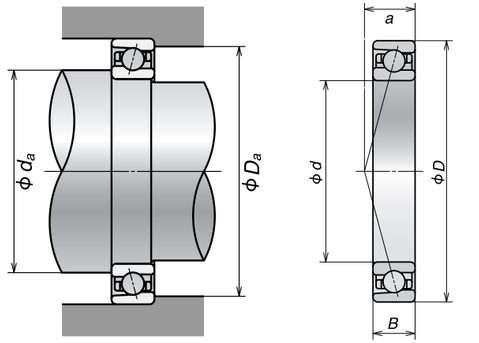
For application limiting speed, please refer to page H-2.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	lbs	
30BER10S	1866	1236	28300	40000	0.273	11.24	*
35BER10S	2181	1540	28900	41300	0.361	11.24	*
40BER10S	2270	1720	22300	31500	0.450	11.24	*
45BER10S	2518	1933	20000	28400	0.571	11.24	*
50BER10S	2608	2136	18500	26200	0.619	11.24	*
55BER10S	3237	2698	16600	23500	0.912	11.24	*
60BER10S	3372	2945	15500	22000	0.976	11.24	*
65BER10S	3484	3192	14600	20700	1.040	11.24	*
70BER10S	4788	4249	13400	18900	1.422	11.24	*
75BER10S	4856	4451	12700	17900	1.497	11.24	*
80BER10S	5687	5283	11800	16600	2.030	22.48	*
85BER10S	5755	5530	11200	15900	2.120	22.48	*
90BER10S	7531	7081	10500	14800	2.735	22.48	*
95BER10S	7643	7418	10000	14200	2.861	22.48	*
100BER10S	7756	7756	9600	13600	2.744	22.48	*

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact
BER Series - ROBUST (Ceramic Ball)

25⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions				
	d		D		B		d_a min	D_a max	*D_b max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
30BER10H	30	1.1811	55	2.1654	13	0.5118	1.417	1.929	1.969	0.039	0.020
35BER10H	35	1.3780	62	2.4409	14	0.5512	1.614	2.205	2.244	0.039	0.020
40BER10H	40	1.5748	68	2.6772	15	0.5906	1.811	2.441	2.480	0.039	0.020
45BER10H	45	1.7717	75	2.9528	16	0.6299	2.008	2.717	2.756	0.039	0.020
50BER10H	50	1.9685	80	3.1496	16	0.6299	2.205	2.913	2.953	0.039	0.020
55BER10H	55	2.1654	90	3.5433	18	0.7087	2.441	3.268	3.346	0.039	0.024
60BER10H	60	2.3622	95	3.7402	18	0.7087	2.638	3.465	3.543	0.039	0.024
65BER10H	65	2.5591	100	3.9370	18	0.7087	2.835	3.661	3.740	0.039	0.024
70BER10H	70	2.7559	110	4.3307	20	0.7874	0.433	4.055	4.134	0.039	0.024
75BER10H	75	2.9528	115	4.5276	20	0.7874	3.228	4.252	4.331	0.039	0.024
80BER10H	80	3.1496	125	4.9213	22	0.8661	3.425	4.646	4.724	0.039	0.024
85BER10H	85	3.3465	130	5.1181	22	0.8661	3.622	4.843	4.921	0.039	0.024
90BER10H	90	3.5433	140	5.5118	24	0.9449	3.898	5.157	5.276	0.059	0.031
95BER10H	95	3.7402	145	5.7087	24	0.9449	4.094	5.354	5.472	0.059	0.031
100BER10H	100	3.9370	150	5.9055	24	0.9449	4.291	5.551	5.669	0.059	0.031

*D_b is housing diameter for low shoulder. r_b is housing fillet radius for low shoulder.

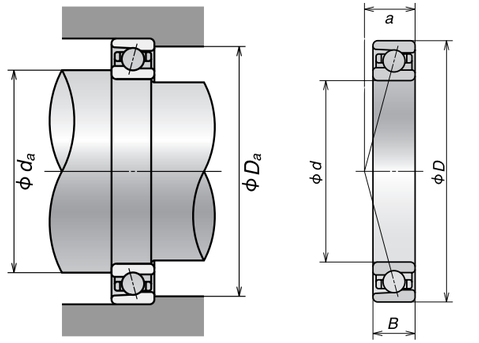
For application limiting speed, please refer to page H-2.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	lbs	
30BER10H	1866	1236	37700	58900	0.256	11.24	*
35BER10H	2181	1540	33000	51600	0.339	11.24	*
40BER10H	2270	1720	29700	46300	0.425	11.24	*
45BER10H	2518	1933	26700	41700	0.542	11.24	*
50BER10H	2608	2136	24700	38500	0.586	11.24	*
55BER10H	3237	2698	22100	34500	0.866	11.24	*
60BER10H	3372	2945	20700	32300	0.923	11.24	*
65BER10H	3484	3192	19400	30400	0.985	11.24	*
70BER10H	4788	4249	17800	27800	1.333	11.24	*
75BER10H	4856	4451	16900	26400	1.406	11.24	*
80BER10H	5687	5283	15700	24400	1.911	22.48	*
85BER10H	5755	5530	14900	23300	1.997	22.48	*
90BER10H	7531	7081	14000	21800	2.546	22.48	*
95BER10H	7643	7418	13400	20900	2.665	22.48	*
100BER10H	7756	7756	12800	20000	2.762	22.48	*

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact
BER Series - ROBUST (Steel Ball)

25⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal

Bearing Number	Basic Bearing Dimensions					Preferred Shoulder Dimensions					
	d		D		B	d_a min	D_a max	*D_b max	r_a max	*r_b max	
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
30BER19S	30	1.1811	47	1.8504	9	0.3543	1.2795	1.7520	1.8031	0.0118	0.0059
35BER19S	35	1.3780	55	2.1654	10	0.3937	1.5748	1.9685	2.0669	0.0236	0.0118
40BER19S	40	1.5748	62	2.4409	12	0.4724	1.7717	2.2441	2.3425	0.0236	0.0118
45BER19S	45	1.7717	68	2.6772	12	0.4724	1.9685	2.4803	2.5787	0.0236	0.0118
50BER19S	50	1.9685	72	2.8346	12	0.4724	2.1654	2.6378	2.7362	0.0236	0.0118
55BER19S	55	2.1654	80	3.1496	13	0.5118	2.4016	2.9134	2.9528	0.0394	0.0197
60BER19S	60	2.3622	85	3.3465	13	0.5118	2.5984	3.1102	3.1496	0.0394	0.0197
65BER19S	65	2.5591	90	3.5433	13	0.5118	2.7953	3.3071	3.3465	0.0394	0.0197
70BER19S	70	2.7559	100	3.9370	16	0.6299	2.9921	3.7008	3.7402	0.0394	0.0197
75BER19S	75	2.9528	105	4.1339	16	0.6299	3.1890	3.8976	3.9370	0.0394	0.0197
80BER19S	80	3.1496	110	4.3307	16	0.6299	3.3858	4.0945	4.1339	0.0394	0.0197
85BER19S	85	3.3465	120	4.7244	18	0.7087	3.6220	4.4488	4.5276	0.0394	0.0236
90BER19S	90	3.5433	125	4.9213	18	0.7087	3.8189	4.6457	4.7244	0.0394	0.0236
95BER19S	95	3.7402	130	5.1181	18	0.7087	4.0157	4.8425	4.9213	0.0394	0.0236
100BER19S	100	3.9370	140	5.5118	20	0.7874	4.2126	5.2362	5.3150	0.0394	0.0236

*D_b is housing diameter for low shoulder. r_b is housing fillet radius for low shoulder.

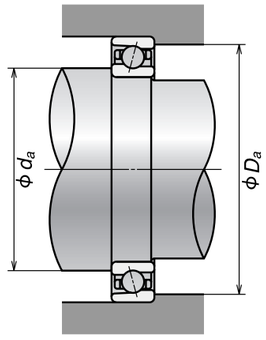
For application limiting speed, please refer to page H-2..

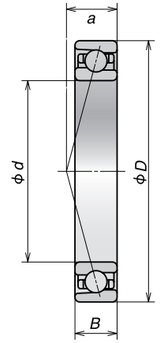
Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	lbs	
30BER19S	1349	877	31200	44200	0.106	11.24	*
35BER19S	1978	1293	26700	37800	0.159	11.24	*
40BER19S	2473	1652	23600	33400	0.231	11.24	*
45BER19S	2608	1877	21300	30100	0.276	11.24	*
50BER19S	2765	2102	19700	27900	0.280	11.24	*
55BER19S	3102	2450	17800	25200	0.392	11.24	*
60BER19S	3147	2585	16600	23500	0.419	11.24	*
65BER19S	3260	2832	15500	22000	0.450	11.24	*
70BER19S	4586	3889	14200	20000	0.723	11.24	*
75BER19S	4653	4091	13400	18900	0.767	11.24	*
80BER19S	4721	4294	12700	17900	0.807	22.48	*
85BER19S	6317	5665	11800	16600	1.162	22.48	*
90BER19S	6744	6407	11200	15900	1.217	22.48	*
95BER19S	6856	6677	10700	15200	1.258	22.48	*
100BER19S	8093	7531	10000	14200	1.697	22.48	*

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact
BER Series - ROBUST (Ceramic Ball)

25⁰ Contact Angle





COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal

Bearing Number	Basic Bearing Dimensions					Preferred Shoulder Dimensions					
	d		D		B	d_a min	D_a max	*D_b max	r_a max	*r_b max	
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
30BER19H	30	1.1811	47	1.8504	9	0.3543	1.2795	1.7520	1.8031	0.0118	0.0059
35BER19H	35	1.3780	55	2.1654	10	0.3937	1.5748	1.9685	2.0669	0.0236	0.0118
40BER19H	40	1.5748	62	2.4409	12	0.4724	1.7717	2.2441	2.3425	0.0236	0.0118
45BER19H	45	1.7717	68	2.6772	12	0.4724	1.9685	2.4803	2.5787	0.0236	0.0118
50BER19H	50	1.9685	72	2.8346	12	0.4724	2.1654	2.6378	2.7362	0.0236	0.0118
55BER19H	55	2.1654	80	3.1496	13	0.5118	2.4016	2.9134	2.9528	0.0394	0.0197
60BER19H	60	2.3622	85	3.3465	13	0.5118	2.5984	3.1102	3.1496	0.0394	0.0197
65BER19H	65	2.5591	90	3.5433	13	0.5118	2.7953	3.3071	3.3465	0.0394	0.0197
70BER19H	70	2.7559	100	3.9370	16	0.6299	2.9921	3.7008	3.7402	0.0394	0.0197
75BER19H	75	2.9528	105	4.1339	16	0.6299	3.1890	3.8976	3.9370	0.0394	0.0197
80BER19H	80	3.1496	110	4.3307	16	0.6299	3.3858	4.0945	4.1339	0.0394	0.0197
85BER19H	85	3.3465	120	4.7244	18	0.7087	3.6220	4.4488	4.5276	0.0394	0.0236
90BER19H	90	3.5433	125	4.9213	18	0.7087	3.8189	4.6457	4.7244	0.0394	0.0236
95BER19H	95	3.7402	130	5.1181	18	0.7087	4.0157	4.8425	4.9213	0.0394	0.0236
100BER19H	100	3.9370	140	5.5118	20	0.7874	4.2126	5.2362	5.3150	0.0394	0.0236

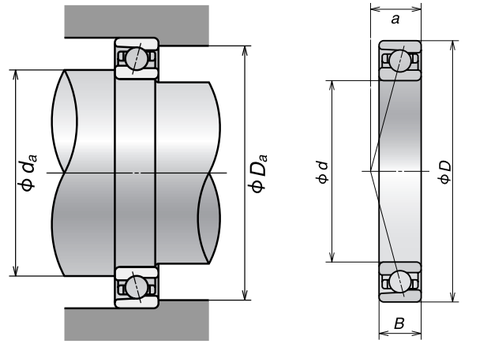
*D_b is housing diameter for low shoulder. r_b is housing fillet radius for low shoulder.

For application limiting speed, please refer to page H-2.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	lbs	
30BER19H	1349	877	41600	65000	0.095	11.24	*
35BER19H	1978	1293	35600	55600	0.139	11.24	*
40BER19H	2473	1652	31400	49100	0.203	11.24	*
45BER19H	2608	1877	28400	44300	0.245	11.24	*
50BER19H	2765	2102	26300	41000	0.245	11.24	*
55BER19H	3102	2450	23800	37100	0.348	11.24	*
60BER19H	3147	2585	22100	34500	0.375	11.24	*
65BER19H	3260	2832	20700	32300	0.399	11.24	*
70BER19H	4586	3889	18900	29500	0.644	11.24	*
75BER19H	4653	4091	17800	27800	0.683	11.24	*
80BER19H	4721	4294	16900	26400	0.719	22.48	*
85BER19H	6317	5665	15700	24400	1.005	22.48	*
90BER19H	6744	6407	14900	23300	1.058	22.48	*
95BER19H	6856	6677	14300	22300	1.095	22.48	*
100BER19H	8093	7531	13400	20900	1.483	22.48	*

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact
BNR Series – ROBUST (Steel Ball)
18⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions				
	d		D		B		d_a min	D_a max	*D_b max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
30BNR10S	30	1.1811	55	2.1654	13	0.5118	1.417	1.929	1.969	0.039	0.020
35BNR10S	35	1.3780	62	2.4409	14	0.5512	1.614	2.205	2.244	0.039	0.020
40BNR10S	40	1.5748	68	2.6772	15	0.5906	1.811	2.441	2.480	0.039	0.020
45BNR10S	45	1.7717	75	2.9528	16	0.6299	2.008	2.717	2.756	0.039	0.020
50BNR10S	50	1.9685	80	3.1496	16	0.6299	2.205	2.913	2.953	0.039	0.020
55BNR10S	55	2.1654	90	3.5433	18	0.7087	2.441	3.268	3.346	0.039	0.024
60BNR10S	60	2.3622	95	3.7402	18	0.7087	2.638	3.465	3.543	0.039	0.024
65BNR10S	65	2.5591	100	3.9370	18	0.7087	2.835	3.661	3.740	0.039	0.024
70BNR10S	70	2.7559	110	4.3307	20	0.7874	0.433	4.055	4.134	0.039	0.024
75BNR10S	75	2.9528	115	4.5276	20	0.7874	3.228	4.252	4.331	0.039	0.024
80BNR10S	80	3.1496	125	4.9213	22	0.8661	3.425	4.646	4.724	0.039	0.024
85BNR10S	85	3.3465	130	5.1181	22	0.8661	3.622	4.843	4.921	0.039	0.024
90BNR10S	90	3.5433	140	5.5118	24	0.9449	3.898	5.157	5.276	0.059	0.031
95BNR10S	95	3.7402	145	5.7087	24	0.9449	4.094	5.354	5.472	0.059	0.031
100BNR10S	100	3.9370	150	5.9055	24	0.9449	4.291	5.551	5.669	0.059	0.031

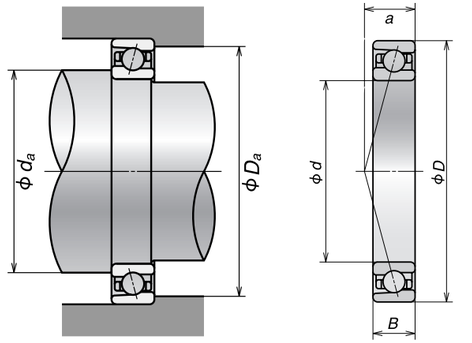
*D_b is housing diameter for low shoulder. r_b is housing fillet radius for low shoulder.

For application limiting speed, please refer to page H-2.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	lbs	
30BNR10S	1940	1290	33000	47100	0.273	11.24	*
35BNR10S	2270	1600	28900	41300	0.362	11.24	*
40BNR10S	2380	1790	26000	37100	0.450	11.24	*
45BNR10S	2630	2020	23400	33400	0.571	11.24	*
50BNR10S	2740	2230	21600	30800	0.620	11.24	*
55BNR10S	3390	2810	19400	27600	0.913	11.24	*
60BNR10S	3510	3080	18100	25900	0.977	11.24	*
65BNR10S	3640	3330	17000	24300	1.041	11.24	*
70BNR10S	5010	4450	15600	22300	1.422	11.24	*
75BNR10S	5080	4650	14800	21100	1.497	11.24	*
80BNR10S	5960	5510	13700	19600	2.031	22.48	*
85BNR10S	6020	5780	13100	18700	2.121	22.48	*
90BNR10S	7870	7420	12200	17400	2.736	22.48	*
95BNR10S	7980	7760	11700	16700	2.862	22.48	*
100BNR10S	8090	8090	11200	16000	2.745	22.48	*

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact
BNR Series – ROBUST (Ceramic Ball)
18^0 Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions				
	d		D		B		d_a min	D_a max	*D_b max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
30BNR10H	30	1.1811	55	2.1654	13	0.5118	1.417	1.929	1.969	0.039	0.020
35BNR10H	35	1.3780	62	2.4409	14	0.5512	1.614	2.205	2.244	0.039	0.020
40BNR10H	40	1.5748	68	2.6772	15	0.5906	1.811	2.441	2.480	0.039	0.020
45BNR10H	45	1.7717	75	2.9528	16	0.6299	2.008	2.717	2.756	0.039	0.020
50BNR10H	50	1.9685	80	3.1496	16	0.6299	2.205	2.913	2.953	0.039	0.020
55BNR10H	55	2.1654	90	3.5433	18	0.7087	2.441	3.268	3.346	0.039	0.024
60BNR10H	60	2.3622	95	3.7402	18	0.7087	2.638	3.465	3.543	0.039	0.024
65BNR10H	65	2.5591	100	3.9370	18	0.7087	2.835	3.661	3.740	0.039	0.024
70BNR10H	70	2.7559	110	4.3307	20	0.7874	0.433	4.055	4.134	0.039	0.024
75BNR10H	75	2.9528	115	4.5276	20	0.7874	3.228	4.252	4.331	0.039	0.024
80BNR10H	80	3.1496	125	4.9213	22	0.8661	3.425	4.646	4.724	0.039	0.024
85BNR10H	85	3.3465	130	5.1181	22	0.8661	3.622	4.843	4.921	0.039	0.024
90BNR10H	90	3.5433	140	5.5118	24	0.9449	3.898	5.157	5.276	0.059	0.031
95BNR10H	95	3.7402	145	5.7087	24	0.9449	4.094	5.354	5.472	0.059	0.031
100BNR10H	100	3.9370	150	5.9055	24	0.9449	4.291	5.551	5.669	0.059	0.031

*D_b is housing diameter for low shoulder. r_b is housing fillet radius for low shoulder.

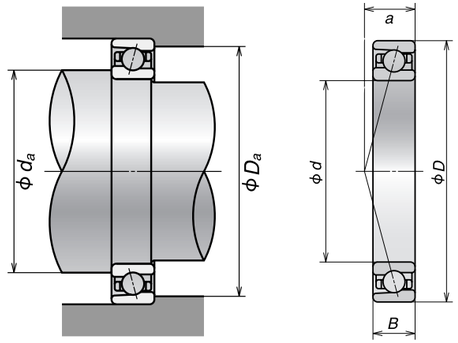
For application limiting speed, please refer to page H-2.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	lbs	
30BNR10H	1940	1290	42400	65900	0.273	11.24	*
35BNR10H	2270	1600	37200	57800	0.362	11.24	*
40BNR10H	2380	1790	33400	51900	0.450	11.24	*
45BNR10H	2630	2020	30000	46700	0.571	11.24	*
50BNR10H	2740	2230	27700	43100	0.620	11.24	*
55BNR10H	3390	2810	24900	38700	0.913	11.24	*
60BNR10H	3510	3080	23300	36200	0.977	11.24	*
65BNR10H	3640	3330	21900	34000	1.041	11.24	*
70BNR10H	5010	4450	20000	31200	1.422	11.24	*
75BNR10H	5080	4650	19000	29500	1.497	11.24	*
80BNR10H	5960	5510	17600	27400	2.031	22.48	*
85BNR10H	6020	5780	16800	26100	2.121	22.48	*
90BNR10H	7870	7420	15700	24400	2.736	22.48	*
95BNR10H	7980	7760	15000	23400	2.862	22.48	*
100BNR10H	8090	8090	14400	22400	2.745	22.48	*

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact
BNR Series - ROBUST (Steel Ball)

18⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal

Bearing Number	Basic Bearing Dimensions					Preferred Shoulder Dimensions					
	d		D		B	d_a min	D_a max	*D_b max	r_a max	*r_b max	
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
30BNR19S	30	1.1811	47	1.8504	9	0.3543	1.2795	1.7520	1.8031	0.0118	0.0059
35BNR19S	35	1.3780	55	2.1654	10	0.3937	1.5748	1.9685	2.0669	0.0236	0.0118
40BNR19S	40	1.5748	62	2.4409	12	0.4724	1.7717	2.2441	2.3425	0.0236	0.0118
45BNR19S	45	1.7717	68	2.6772	12	0.4724	1.9685	2.4803	2.5787	0.0236	0.0118
50BNR19S	50	1.9685	72	2.8346	12	0.4724	2.1654	2.6378	2.7362	0.0236	0.0118
55BNR19S	55	2.1654	80	3.1496	13	0.5118	2.4016	2.9134	2.9528	0.0394	0.0197
60BNR19S	60	2.3622	85	3.3465	13	0.5118	2.5984	3.1102	3.1496	0.0394	0.0197
65BNR19S	65	2.5591	90	3.5433	13	0.5118	2.7953	3.3071	3.3465	0.0394	0.0197
70BNR19S	70	2.7559	100	3.9370	16	0.6299	2.9921	3.7008	3.7402	0.0394	0.0197
75BNR19S	75	2.9528	105	4.1339	16	0.6299	3.1890	3.8976	3.9370	0.0394	0.0197
80BNR19S	80	3.1496	110	4.3307	16	0.6299	3.3858	4.0945	4.1339	0.0394	0.0197
85BNR19S	85	3.3465	120	4.7244	18	0.7087	3.6220	4.4488	4.5276	0.0394	0.0236
90BNR19S	90	3.5433	125	4.9213	18	0.7087	3.8189	4.6457	4.7244	0.0394	0.0236
95BNR19S	95	3.7402	130	5.1181	18	0.7087	4.0157	4.8425	4.9213	0.0394	0.0236
100BNR19S	100	3.9370	140	5.5118	20	0.7874	4.2126	5.2362	5.3150	0.0394	0.0236

*D_b is housing diameter for low shoulder. r_b is housing fillet radius for low shoulder.

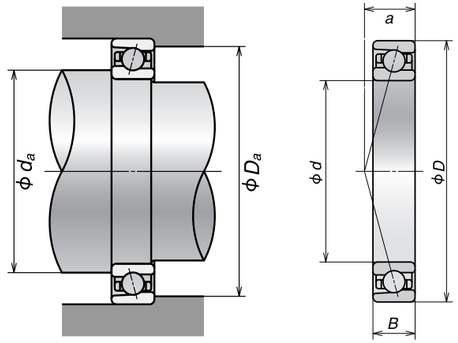
For application limiting speed, please refer to page H-2.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	lbs	
30BNR19S	1416	910	36400	52000	0.106	11.24	*
35BNR19S	2068	1349	31200	44500	0.159	11.24	*
40BNR19S	2585	1720	27500	39300	0.231	11.24	*
45BNR19S	2720	1956	24800	35400	0.276	11.24	*
50BNR19S	2877	2192	23000	32800	0.280	11.24	*
55BNR19S	3237	2563	20800	29700	0.392	11.24	*
60BNR19S	3282	2698	19400	27600	0.419	11.24	*
65BNR19S	3417	2967	18100	25900	0.450	11.24	*
70BNR19S	4788	4069	16500	23600	0.723	11.24	*
75BNR19S	4856	4271	15600	22300	0.767	11.24	*
80BNR19S	4946	4474	14800	21100	0.807	11.24	*
85BNR19S	6609	5912	13700	19600	1.162	11.24	*
90BNR19S	7081	6677	13100	18700	1.217	22.48	*
95BNR19S	7194	6969	12500	17800	1.258	22.48	*
100BNR19S	8542	7868	11700	16700	1.697	22.48	*

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact
BNR Series - ROBUST (Ceramic Ball)

18⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4	ISO 4 (ABEC 7) Precision
P4Y	NSK Exclusive P4 Accuracy
V1V	Non-contacting Seal

Bearing Number	Basic Bearing Dimensions					Preferred Shoulder Dimensions					
	d		D		B	d_a min	D_a max	*D_b max	r_a max	*r_b max	
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch	inch
30BNR19H	30	1.1811	47	1.8504	9	0.3543	1.2795	1.7520	1.8031	0.0118	0.0059
35BNR19H	35	1.3780	55	2.1654	10	0.3937	1.5748	1.9685	2.0669	0.0236	0.0118
40BNR19H	40	1.5748	62	2.4409	12	0.4724	1.7717	2.2441	2.3425	0.0236	0.0118
45BNR19H	45	1.7717	68	2.6772	12	0.4724	1.9685	2.4803	2.5787	0.0236	0.0118
50BNR19H	50	1.9685	72	2.8346	12	0.4724	2.1654	2.6378	2.7362	0.0236	0.0118
55BNR19H	55	2.1654	80	3.1496	13	0.5118	2.4016	2.9134	2.9528	0.0394	0.0197
60BNR19H	60	2.3622	85	3.3465	13	0.5118	2.5984	3.1102	3.1496	0.0394	0.0197
65BNR19H	65	2.5591	90	3.5433	13	0.5118	2.7953	3.3071	3.3465	0.0394	0.0197
70BNR19H	70	2.7559	100	3.9370	16	0.6299	2.9921	3.7008	3.7402	0.0394	0.0197
75BNR19H	75	2.9528	105	4.1339	16	0.6299	3.1890	3.8976	3.9370	0.0394	0.0197
80BNR19H	80	3.1496	110	4.3307	16	0.6299	3.3858	4.0945	4.1339	0.0394	0.0197
85BNR19H	85	3.3465	120	4.7244	18	0.7087	3.6220	4.4488	4.5276	0.0394	0.0236
90BNR19H	90	3.5433	125	4.9213	18	0.7087	3.8189	4.6457	4.7244	0.0394	0.0236
95BNR19H	95	3.7402	130	5.1181	18	0.7087	4.0157	4.8425	4.9213	0.0394	0.0236
100BNR19H	100	3.9370	140	5.5118	20	0.7874	4.2126	5.2362	5.3150	0.0394	0.0236

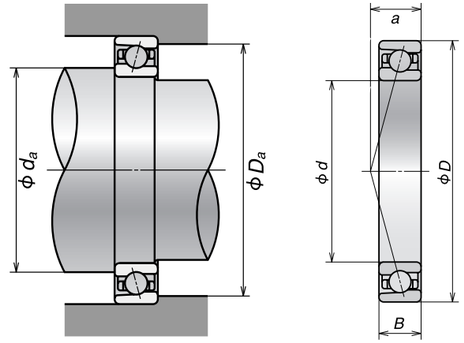
*D_b is housing diameter for low shoulder. r_b is housing fillet radius for low shoulder.

For application limiting speed, please refer to page H-2.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Sealed Design Available
	C_r	C_{or}	Grease	Oil	lbs	lbs	
30BNR19H	1416	910	46800	72800	0.095	11.24	*
35BNR19H	2068	1349	40000	62300	0.139	11.24	*
40BNR19H	2585	1720	35300	55000	0.203	11.24	*
45BNR19H	2720	1956	31900	49600	0.245	11.24	*
50BNR19H	2877	2192	29600	46000	0.245	11.24	*
55BNR19H	3237	2563	26700	41500	0.348	11.24	*
60BNR19H	3282	2698	24900	38700	0.375	11.24	*
65BNR19H	3417	2967	23300	36200	0.399	11.24	*
70BNR19H	4788	4069	21200	33000	0.644	11.24	*
75BNR19H	4856	4271	20000	31200	0.683	11.24	*
80BNR19H	4946	4474	19000	29500	0.719	11.24	*
85BNR19H	6609	5912	17600	27400	1.005	11.24	*
90BNR19H	7081	6677	16800	26100	1.058	22.48	*
95BNR19H	7194	6969	16000	24900	1.095	22.48	*
100BNR19H	8542	7868	15000	23400	1.483	22.48	*

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact
BGR Series Robust (Steel Ball)
15⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P2	IS0 2 (ABEC 9) Precision
P4	ISO 4 (ABEC 7) Precision

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions			
	d		D		B		d_a min	D_a max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch
6BGR10S	6	0.2362	17	0.6693	6	0.2362	0.335	0.571	0.012	-
7BGR10S	7	0.2756	19	0.7480	6	0.2362	0.374	0.650	0.012	-
8BGR10S	8	0.3150	22	0.8661	7	0.2756	0.413	0.768	0.012	-
10BGR10S	10	0.3937	26	1.0236	8	0.3150	0.492	0.925	0.012	0.0059
12BGR10S	12	0.4724	28	1.1024	8	0.3150	0.571	1.004	0.012	0.0059
15BGR10S	15	0.5906	32	1.2598	9	0.3543	0.689	1.161	0.012	0.0059
17BGR10S	17	0.6693	35	1.3780	10	0.3937	0.768	1.280	0.012	0.0059
20BGR10S	20	0.7874	42	1.6535	12	0.4724	0.984	1.457	0.024	0.0118
25BGR10S	25	0.9843	47	1.8504	12	0.4724	1.181	1.654	0.024	0.0118

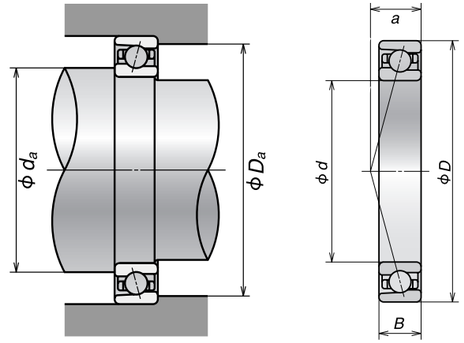
r_b is housing fillet radius for low shoulder.

For application limiting speed, please refer to page H-2.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (1000 RPM)		Bearing Weight (Approx.)
	C_r	C_{or}	Grease	Oil	lbs
6BGR10S	320	100	140.0	192.0	0.01
7BGR10S	370	120	124.0	170.0	0.02
8BGR10S	530	180	107.0	147.0	0.03
10BGR10S	800	290	88.9	123.0	0.04
12BGR10S	880	330	80.0	110.0	0.05
15BGR10S	940	390	68.1	93.7	0.06
17BGR10S	1010	440	61.6	84.7	0.08
20BGR10S	1690	750	51.7	71.0	0.15
25BGR10S	1790	850	44.5	61.2	0.17

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

High Speed Super Precision Angular Contact
BGR Series Robust (Ceramic Ball)
15⁰ Contact Angle



COMMON OPTIONS	
TR	Phenolic Cage
TYN	Polyamide Cage
DU	Duplex Universal
SU	Single Universal
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P2	ISO 2 (ABEC 9) Precision
P4	ISO 4 (ABEC 7) Precision

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions			
	d		D		B		d_a min	D_a max	r_a max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch	inch
6BGR10H	6	0.2362	17	0.6693	6	0.2362	0.335	0.571	0.012	-
7BGR10H	7	0.2756	19	0.7480	6	0.2362	0.374	0.650	0.012	-
8BGR10H	8	0.3150	22	0.8661	7	0.2756	0.413	0.768	0.012	-
10BGR10H	10	0.3937	26	1.0236	8	0.3150	0.492	0.925	0.012	0.0059
12BGR10H	12	0.4724	28	1.1024	8	0.3150	0.571	1.004	0.012	0.0059
15BGR10H	15	0.5906	32	1.2598	9	0.3543	0.689	1.161	0.012	0.0059
17BGR10H	17	0.6693	35	1.3780	10	0.3937	0.768	1.280	0.012	0.0059
20BGR10H	20	0.7874	42	1.6535	12	0.4724	0.984	1.457	0.024	0.0118
25BGR10H	25	0.9843	47	1.8504	12	0.4724	1.181	1.654	0.024	0.0118

r_b is housing fillet radius for low shoulder.

For application limiting speed, please refer to page H-2.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Single or Tandem (1000 RPM)		Bearing Weight (Approx.)
	C_r	C_{or}	Grease	Oil	lbs
6BGR10H	320	100	166.0	244.0	0.01
7BGR10H	370	120	147.0	216.0	0.02
8BGR10H	530	180	127.0	187.0	0.03
10BGR10H	800	290	106.0	156.0	0.04
12BGR10H	880	330	95.0	140.0	0.05
15BGR10H	940	390	80.9	120.0	0.06
17BGR10H	1010	440	73.1	108.0	0.08
20BGR10H	1690	750	61.3	90.4	0.15
25BGR10H	1790	850	52.8	77.8	0.17

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Angular Contact Thrust Ball Bearings

Bearing Bore
Diameter (mm)

100

Bearing Type
BAR: 30° Contact Angle
BTR: 40° Contact Angle

BAR

Dimension Series
10: Arranged with NN30XX Series

10

Material
S: Steel Ball
H: Ceramic Ball

S

Retainer
TYN: Polyamide Cage

TYN

Combination
DB: Back to Back Duplex

DB

Preload
L: Standard Preload
EL: Extra Light Preload
CPxx: Special Preload
CAxx: Special Axial Clearance

L

Precision Class
P4A: ISO Class 4, O.D. is Special
P2A: ISO Class 2, O.D. is Special

P4A

Please refer to the bearing tables for exact part number options

Interchange

Description		Interchange			
		NSK	*OLD NSK	SKF	NTN
Part No.	30° Angular Contact Thrust Bearings	XXBAR10	XXBA10	BTMXXA	HTA0XXA
	40° Angular Contact Thrust Bearings	XXBTR10	XXBT10	BTMXXB	HTA0XX
Part Number Suffix	Polyamide Cage	TYN	TY	BLANK	T2
	Phenolic Cage	TR	T	-	BLANK
	Duplex Universal	DU	DU	DB	GD2
	Single Universal	SU	SU	-	G
	Extra Light Preload	EL	EL	-	-
	Light Preload	L	L	A	GN
	Ceramic Balls	H	SN24	HC	5S**
	Steel Balls	S	BLANK	BLANK	BLANK
	ABEC 7 Precision	P4A	P4A	PC	P4
	ABEC 9 Precision	P2A	P2A	PA9A	P2

*BAR and BTR series have replaced BA and BT series.
** Indicates prefix not suffix

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

Applications

Super Precision Angular Contact Thrust bearings are designed to work together with high speed super precision cylindrical roller bearings where high speed, and high rigidity are required. Offered in a 30^0 and 40^0 series, this offering allows flexibility for meeting the rigidity requirements seen in many machine tool applications.

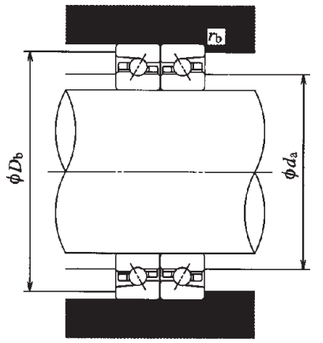
› **Lathes**

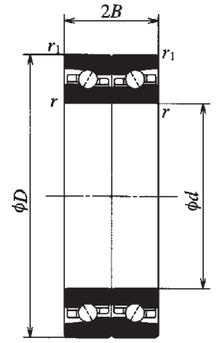
Features

All of these bearings have special outside diameter tolerances (P4A and P2A) to provide clearance between the outer ring periphery and housing bore in order to avoid supporting radial loads.

Super Precision Thrust Angular Contact: BAR Series

30⁰ Contact Angle





COMMON OPTIONS	
TYN	Polyamide Cage
DU	Duplex Universal
DB	Back to Back Duplex
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4A	ISO 4 (ABEC 7) Precision - O.D. is Special
P2A	ISO 2 (ABEC 9) Precision - O.D. is Special

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions		
	d		D*		B		d_a min	D_b max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch
60BAR10S	60	2.3622	95	3.7402	16.50	0.6496	2.6378	3.54331	0.02362
65BAR10S	65	2.5591	100	3.9370	16.50	0.6496	2.8346	3.74015	0.02362
70BAR10S	70	2.7559	110	4.3307	18.00	0.7087	3.0315	4.13385	0.02362
75BAR10S	75	2.9528	115	4.5276	18.00	0.7087	3.2283	4.33070	0.02362
80BAR10S	80	3.1496	125	4.9213	20.25	0.7972	3.4252	4.72440	0.02362
85BAR10S	85	3.3465	130	5.1181	20.25	0.7972	3.6220	4.92125	0.02362
90BAR10S	90	3.5433	140	5.5118	22.50	0.8858	3.8976	5.27559	0.03937
95BAR10S	95	3.7402	145	5.7087	22.50	0.8858	4.0945	5.47244	0.03937
100BAR10S	100	3.9370	150	5.9055	22.50	0.8858	4.2913	5.66929	0.03937
105BAR10S	105	4.1339	160	6.2992	24.75	0.9744	4.5276	6.06299	0.03937
110BAR10S	110	4.3307	170	6.6929	27.00	1.0630	4.7244	6.45669	0.03937
120BAR10S	120	4.7244	180	7.0866	27.00	1.0630	5.1181	6.85039	0.03937
130BAR10S	130	5.1181	200	7.8740	31.50	1.2402	5.5118	7.63779	0.03937

r_b is housing fillet radius for low shoulder.

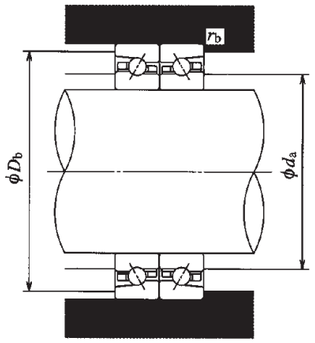
* Special outer ring outside diameter tolerance (class P4A or P2A) to provide clearance between the outer ring periphery and housing bore in order to avoid support of radial loads.

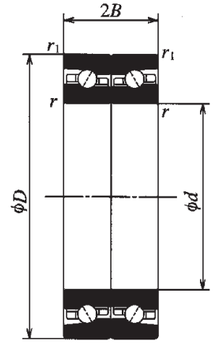
Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Duplex (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Axial Rigidity Duplex (EL)
	C_r	C_{or}	Grease	Oil	lbs	lbs	lbs/.001 inch
60BAR10S	4249	8543	9 700	12 300	0.93	53.95	1084.9
65BAR10S	4384	9330	9 100	11 600	0.99	56.20	1142.0
70BAR10S	6047	12364	8 400	10 600	1.32	56.20	1142.0
75BAR10S	6137	13039	7 900	10 000	1.40	58.45	1199.1
80BAR10S	7194	15399	7 400	9 300	1.93	76.44	1370.4
85BAR10S	73064	16074	7 000	8 900	2.14	78.68	1370.4
90BAR10S	95544	20795	6 600	8 300	2.64	80.93	1427.5
95BAR10S	9667	21694	6 300	8 000	2.91	80.93	1484.6
100BAR10S	9779	22481	6 000	7 600	3.08	83.18	1541.7
105BAR10S	11128	25853	5 700	7 200	3.83	85.43	1598.8
110BAR10S	12477	29450	5 400	6 800	4.65	87.68	1598.8
120BAR10S	12814	31698	5 000	6 400	4.99	87.68	1713.0
130BAR10S	16299	38667	4 600	5 800	7.41	87.68	1713.0

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Thrust Angular Contact: BTR Series

40⁰ Contact Angle





COMMON OPTIONS	
TYN	Polyamide Cage
DU	Duplex Universal
DB	Back to Back Duplex
EL	Extra Light Preload
L	Light Preload
M	Medium Preload
P4A	ISO 4 (ABEC 7) Precision - O.D. is Special
P2A	ISO 2 (ABEC 9) Precision - O.D. is Special

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions		
	d		D*		B		d_a min	D_b max	*r_b max
	mm	inch	mm	inch	mm	inch	inch	inch	inch
60BTR10S	60	2.3622	95	3.7402	16.50	0.6496	2.6378	3.5433	0.02362
65BTR10S	65	2.5591	100	3.9370	16.50	0.6496	2.8346	3.7402	0.02362
70BTR10S	70	2.7559	110	4.3307	18.00	0.7087	3.0315	4.1339	0.02362
75BTR10S	75	2.9528	115	4.5276	18.00	0.7087	3.2283	4.3307	0.02362
80BTR10S	80	3.1496	125	4.9213	20.25	0.7972	3.4252	4.7244	0.02362
85BTR10S	85	3.3465	130	5.1181	20.25	0.7972	3.6220	4.9213	0.02362
90BTR10S	90	3.5433	140	5.5118	22.50	0.8858	3.8976	5.2756	0.03937
95BTR10S	95	3.7402	145	5.7087	22.50	0.8858	4.0945	5.4724	0.03937
100BTR10S	100	3.9370	150	5.9055	22.50	0.8858	4.2913	5.6693	0.03937
105BTR10S	105	4.1339	160	6.2992	24.75	0.9744	4.5276	6.0630	0.03937
110BTR10S	110	4.3307	170	6.6929	27.00	1.0630	4.7244	6.4567	0.03937
120BTR10S	120	4.7244	180	7.0866	27.00	1.0630	5.1181	6.8504	0.03937
130BTR10S	130	5.1181	200	7.8740	31.50	1.2402	5.5118	7.6378	0.03937

r_b is housing fillet radius for low shoulder.

* Special outer ring outside diameter tolerance (class P4A or P2A) to provide clearance between the outer ring periphery and housing bore in order to avoid support of radial loads.

Bearing Number	Basic Load Ratings (lbs)		Limiting Speed Duplex (RPM)		Bearing Weight (Approx.)	Preload Value Duplex (EL)	Axial Rigidity Duplex (EL)
	C_r	C_{or}	Grease	Oil	lbs	lbs	lbs/.001 inch
60BTR10S	5036	9779	8 400	11 000	0.93	83.18	1884300
65BTR10S	5193	10566	7 900	10 400	0.99	87.68	1998500
70BTR10S	7194	14163	7 300	9 500	1.32	87.68	1998500
75BTR10S	7306	14725	6 900	9 000	1.40	89.92	2055600
80BTR10S	8543	17535	6 400	8 300	1.93	114.65	2284000
85BTR10S	8655	18322	6 100	8 000	2.14	116.90	2398200
90BTR10S	11240	23605	5 700	7 400	2.64	119.15	2455300
95BTR10S	11465	24729	5 500	7 100	2.91	123.64	2569500
100BTR10S	11578	25628	5 200	6 800	3.08	125.89	2626600
105BTR10S	13151	29450	5 000	6 500	3.84	128.14	2683700
110BTR10S	14837	33272	4 700	6 100	4.65	130.39	2797900
120BTR10S	15287	35969	4 400	5 700	4.99	137.13	2969200
130BTR10S	19334	43838	4 000	5 200	7.41	137.13	2969200

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Cylindrical Roller Bearings

Double Row

Bearing Type
NN: Double Row Cylindrical Roller Bearing with Triple-Ribbed Inner Ring
NNU: Double Row Cylindrical Roller Bearing with Triple-Ribbed Outer Ring

Diameter Series
9: Extra Light
0: Light

Cage
T: Polyamide
TB: Roller Guided PPS Resin
MB: Roller Guided Machined Brass

Lubrication Holes
E44: Outer Ring with Machined Lubriction Groove and Lubrication Holes
Blank: No Lubrication Holes

Precision Class
P4: ISO Class 4 (ABEC7)
P2: ISO Class 2 (ABEC9)

NN	3	0	17	MB	KR	E44	CCO	P4

Dimension Series
1: Thin
3: Medium
4: Wide

Bore Number
Bearing Bore = Bore Number x5 (mm)

Tapered Bore
KR: 1/12 Tapered Bore
Blank: Cylindrical Bore

Radial Clearance
CC1: Standard Clearance for Cylindrical Bore
CCO: Standard Clearance for Tapered Bore
CCGxx*: Special Radial Clearance

* Median clearance in microns
Please refer to the bearing tables for exact part number options

Single Row

Bearing Type
N: Single Row Cylindrical Roller Bearing with Double-Ribbed Inner Ring

Diameter Series
0: Light

Type	Material	
	Rings	Rolling element
RS	Bearing Steel (SUJ2)	Bearing Steel (SUJ2)
RX	Heat Resistant Steel (SHX) to 300°C	Heat Resistant Steel (SHX) to 300°C

Tapered Bore
KR: 1/12 Tapered Bore
Blank: Cylindrical Bore

Precision Class
P4: ISO Class 4 (ABEC7)
P2: ISO Class 2 (ABEC9)

N	1	0	12	RX	TP	KR	CCO	P4

Dimension Series
1: Thin

Bore Number
Bearing Bore = Bore Number x5 (mm)

Cage
TP: Outer Ring Guided PEEK Resin
MR: Roller Guided Machined Brass
BT: Polyamide
Blank: Machined Brass

Radial Clearance
CC1: Standard Clearance for Cylindrical Bore
CCO: Standard Clearance for Tapered Bore
CCGxx*: Special Radial Clearance

* Median clearance in microns
Please refer to the bearing tables for exact part number options

Interchange

	Description	Interchange				
		NSK	*OLD NSK	SKF	FAG	NTN
Part No.	Ultra Light Double Row Cylindrical Series	NN39XX	NN39XX	-	-	-
	Extra Light Double Row Cylindrical Series	NN30XX	NN30XX	NN30XX	NN30XX	NN30XX
	Extra Light Single Row Cylindrical Series	N10XX	N10XX	N10XX	N10XX	N10XX
Part Number Suffix	Non-Metallic Cage	TB	T	TN,TN9, TNHA	-	T6
	Brass Cage	MB	M	BLANK	M, MI	BLANK
	Tapered Bore	KR	K	UPK	K	K
	Lube Groove And Holes On Outer Ring	E44	-	W33, U33X	AS	-
	Matched Clearance, Rings Not To Be Mixed	CCX	CCX	CX	CX	CXNA
	ABEC 7 Precision	P4	P4	SP	SP	P4

*The outer ring machined lubrication groove and holes (E44) is now a standard feature. TB cage replaces T cage, MB replaces M and KR replaces K.

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 contact NSK. NSK assumes no liability with respect to errors or omissions.

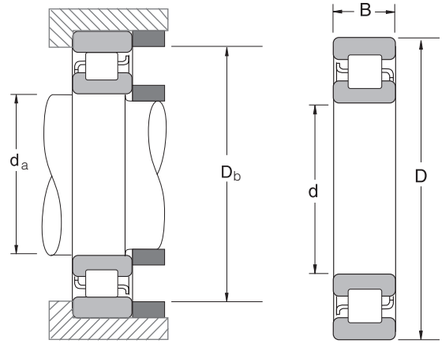
Applications

Super Precision Cylindrical roller bearings are designed to specifically handle large radial loads in high speed applications. They are available in a variety of designs, including double row and single row options, to suit various applications. In addition, a standard lube groove and hole feature is available along with tapered and non-tapered bores. When combined with Super Precision Angular Contact Thrust bearings, the Super Precision Cylindrical meets the high rigidity requirements of many machine tool spindle applications

› **Lathes** › **Machining Centers** › **(NN) Double Row Design for High Radial Rigidity**
› **(N) Single Row Design for Radial Rigidity and High Speed**

Super Precision Cylindrical Roller Bearings: N1000 Series

Single Row



COMMON OPTIONS	
M	One piece brass cage; inner ring guided
MB	Split type brass cage; roller guided
MR	Riveted brass cage; roller guided
T	Polyamide cage; roller guided
KR	Precision Tapered Bore 1:12
CCx	Matched Clearance (9, 1, ...)
CCGxx*	Special radial clearance
P4	ISO 4 (ABEC7) Precision

* Median clearance in microns

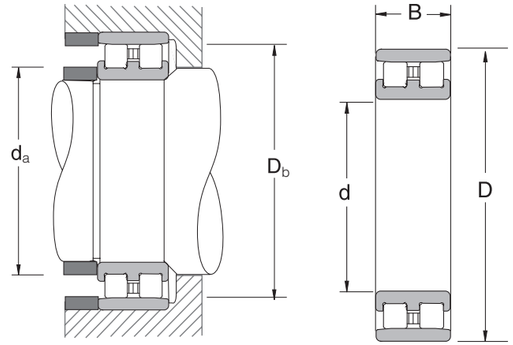
Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions			
	d		D		B		r_a (inch)	d_a (inch)	D_b (inch)	
	mm	inch	mm	inch	mm	inch	max	max	min	max
N1006	30	1.1811	55	2.1654	13	0.5118	0.0197	1.3780	2.0079	1.9291
N1007	35	1.3780	62	2.4409	14	0.5512	0.0197	1.5748	2.2835	2.2047
N1008	40	1.5748	68	2.6772	15	0.5906	0.0236	1.7717	2.5197	2.4409
N1009	45	1.7717	75	2.9528	16	0.6299	0.0236	1.9685	2.7953	2.6772
N1010	50	1.9685	80	3.1496	16	0.6299	0.0236	2.1654	2.9921	2.8740
N1011	55	2.1654	90	3.5433	18	0.7087	0.0394	2.4213	3.3465	3.2283
N1012	60	2.3622	95	3.7402	18	0.7087	0.0394	2.6181	3.5433	3.4252
N1013	65	2.5591	100	3.9370	18	0.7087	0.0394	2.8150	3.7402	3.6220
N1014	70	2.7559	110	4.3307	20	0.7874	0.0394	3.0118	4.1339	3.9764
N1015	75	2.9528	115	4.5276	20	0.7874	0.0394	3.2087	4.3307	4.1732
N1016	80	3.1496	125	4.9213	22	0.8661	0.0394	3.4055	4.7244	4.5276
N1017	85	3.3465	130	5.1181	22	0.8661	0.0394	3.6024	4.9213	4.7244
N1018	90	3.5433	140	5.5118	24	0.9449	0.0394	3.8583	5.2559	5.0787
N1019	95	3.7402	145	5.7087	24	0.9449	0.0394	4.0551	5.4528	5.2756
N1020	100	3.9370	150	5.9055	24	0.9449	0.0394	4.2520	5.6496	5.4724
N1021	105	4.1339	160	6.2992	26	1.0236	0.0394	4.4882	6.0433	5.7874
N1022	110	4.3307	170	6.6929	28	1.1024	0.0394	4.6850	6.4370	6.1811
N1024	120	4.7244	180	7.0866	28	1.1024	0.0394	5.0787	6.8307	6.5748
N1026	130	5.1181	200	7.8740	33	1.2992	0.0394	5.4724	7.6181	7.2441
N1028	140	5.5118	210	8.2677	33	1.2992	0.0394	5.8661	8.0118	7.6378

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)
	C_r	C_{or}	Grease	Oil	lbs
N1006	4400	4400	20.0	22.0	0.29
N1007	5100	5200	18.0	20.0	0.40
N1008	6100	6500	16.5	27.5	0.49
N1009	7300	8000	15.4	24.2	0.60
N1010	7300	8200	14.3	22.0	0.64
N1011	8500	9800	13.2	19.8	0.96
N1012	9000	10900	12.1	18.7	1.02
N1013	9300	11500	11.0	17.6	1.10
N1014	13100	15900	9.9	16.5	1.49
N1015	13400	16800	9.4	15.1	1.58
N1016	16300	20400	8.7	14.0	2.09
N1017	16800	21500	8.3	13.3	2.19
N1018	19800	25800	7.7	12.5	2.86
N1019	20400	27100	7.4	12.0	3.01
N1020	20900	28200	7.0	11.4	3.15
N1021	24500	33500	6.3	7.1	3.98
N1022	29500	39000	6.0	6.7	4.95
N1024	31100	43000	5.6	6.3	5.24
N1026	38600	53500	5.3	5.6	7.94
N1028	39500	56000	4.8	5.3	8.38

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Cylindrical Roller Bearings: NN3000 Series

Double Row



COMMON OPTIONS	
M	One piece brass cage; inner ring guided
MB	Split type brass cage; roller guided
MR	Riveted brass cage; roller guided
T	Polyamide cage; roller guided
TB	Roller guided PPS resin cage
KR	Precision Tapered Bore 1:12
E44	Lube groove and holes, outer ring
CCx	Matched Clearance (9, 1, ...)
CCGxx*	Special radial clearance
P4	ISO 4 (ABEC7) Precision

* Median clearance in microns

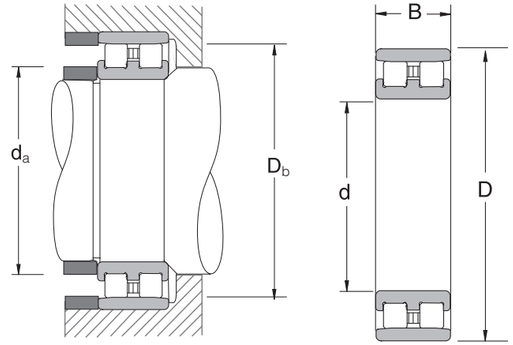
Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions			
	d		D		B		r_a (inch)	d_a (inch)	D_b (inch)	
	mm	inch	mm	inch	mm	inch	max	max	min	max
NN3005	25	0.9843	47	1.8504	16	0.6299	0.0236	1.1417	1.6929	1.6535
NN3006	30	1.1811	55	2.1654	19	0.7480	0.0394	1.3780	1.9685	1.9685
NN3007	35	1.3780	62	2.4409	20	0.7874	0.0394	1.5748	2.2441	2.2047
NN3008	40	1.5748	68	2.6772	21	0.8268	0.0394	1.7717	2.4803	2.4409
NN3009	45	1.7717	75	2.9528	23	0.9055	0.0394	1.9685	2.7559	2.7165
NN3010	50	1.9685	80	3.1496	23	0.9055	0.0394	2.1654	2.9528	2.9134
NN3011	55	2.1654	90	3.5433	26	1.0236	0.0394	2.4213	3.2874	3.2677
NN3012	60	2.3622	95	3.7402	26	1.0236	0.0394	2.6181	3.4843	3.4646
NN3013	65	2.5591	100	3.9370	26	1.0236	0.0394	2.8150	3.6811	3.6614
NN3014	70	2.7559	110	4.3307	30	1.1811	0.0394	3.0118	4.0748	4.0157
NN3015	75	2.9528	115	4.5276	30	1.1811	0.0394	3.2087	4.2717	4.2126
NN3016	80	3.1496	125	4.9213	34	1.3386	0.0394	3.4055	4.6654	4.5276
NN3017	85	3.3465	130	5.1181	34	1.3386	0.0394	3.6024	4.8622	4.7244
NN3018	90	3.5433	140	5.5118	37	1.4567	0.0591	3.8583	5.1969	5.0787
NN3019	95	3.7402	145	5.7087	37	1.4567	0.0591	4.0551	5.3937	5.2756
NN3020	100	3.9370	150	5.9055	37	1.4567	0.0591	4.2520	5.5906	5.4724
NN3021	105	4.1339	160	6.2992	41	1.6142	0.0787	4.4882	5.9449	5.8268
NN3022	110	4.3307	170	6.6929	45	1.7717	0.0787	4.6850	6.3386	6.1811
NN3024	120	4.7244	180	7.0866	46	1.8110	0.0787	5.0787	6.7323	6.5748
NN3026	130	5.1181	200	7.8740	52	2.0472	0.0787	5.4724	7.5197	7.2835
NN3028	140	5.5118	210	8.2677	53	2.0866	0.0787	5.8661	7.9134	7.6772
NN3030	150	5.9055	225	8.8583	56	2.2047	0.0787	6.3386	8.4252	8.2283
NN3032	160	6.2992	240	9.4488	60	2.3622	0.0787	6.7323	9.0157	8.7402
NN3034	170	6.6929	260	10.2362	67	2.6378	0.0787	7.1260	9.8031	9.4094
NN3036	180	7.0866	280	11.0236	74	2.9134	0.0787	7.5197	10.5906	10.1575
NN3038	190	7.4803	290	11.4173	75	2.9528	0.0787	7.9134	10.9843	10.5512
NN3040	200	7.8740	310	12.2047	82	3.2283	0.0787	8.3071	11.7717	11.2205

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)
	C_r	C_{or}	Grease	Oil	lbs
NN3005	5800	6700	19.0	22.0	0.28
NN3006	6900	8400	16.0	19.0	0.43
NN3007	8800	11200	14.0	16.0	0.56
NN3008	9700	12500	13.9	16.7	0.67
NN3009	11700	15400	12.5	13.9	0.88
NN3010	11900	16300	11.6	13.9	0.95
NN3011	15500	21700	10.4	12.5	1.40
NN3012	16400	23800	9.7	11.7	1.50
NN3013	17300	26000	9.1	11.0	1.61
NN3014	21900	33300	8.0	10.0	2.31
NN3015	21800	34000	7.9	9.5	2.42
NN3016	26900	41900	7.4	8.8	3.37
NN3017	28200	45200	7.0	8.4	3.54
NN3018	32200	51100	6.6	7.9	4.53
NN3019	33700	55300	6.3	7.5	4.73
NN3020	35300	59500	6.0	7.2	4.95
NN3021	44500	73000	5.7	6.8	6.27
NN3022	51500	84000	5.4	6.5	8.10
NN3024	54000	91000	5.0	6.0	8.82
NN3026	64000	107000	4.6	5.5	12.87
NN3028	67200	116000	4.0	4.5	13.93
NN3030	75000	132000	3.8	4.3	16.92
NN3032	84000	149000	3.6	4.0	20.55
NN3034	101000	181000	3.2	3.8	28.16
NN3036	127000	225000	3.0	3.4	36.74
NN3038	133000	242000	3.0	3.4	38.94
NN3040	147000	262000	2.8	3.2	49.72

C_r = Dynamic Radial Load Rating C_{or} = Static Radial Load Rating

Super Precision Cylindrical Roller Bearings: NN3900 Series

Double Row



COMMON OPTIONS	
M	One piece brass cage; inner ring guided
MB	Split type brass cage; roller guided
MR	Riveted brass cage; roller guided
T	Polyamide cage; roller guided
TB	Roller guided PPS resin cage
KR	Precision Tapered Bore 1:12
E44	Lube groove and holes, outer ring
CCx	Matched Clearance (9, 1, ...)
CCGxx*	Special radial clearance
P4	ISO 4 (ABEC7) Precision

* Median clearance in microns

Bearing Number	Basic Bearing Dimensions						Preferred Shoulder Dimensions			
	d		D		B		r_a (inch)	d_a (inch)	D_b (inch)	
	mm	inch	mm	inch	mm	inch			min	max
NN3920	100	3.9370	140	5.5118	30	1.1811	0.0394	4.1929	5.2559	5.1575
NN3921	105	4.1339	145	5.7087	30	1.1811	0.0394	4.3898	5.4528	5.3543
NN3922	110	4.3307	150	5.9055	30	1.1811	0.0394	4.5866	5.6496	5.5512
NN3924	120	4.7244	165	6.4961	34	1.3386	0.0394	4.9803	6.2402	6.0827
NN3926	130	5.1181	180	7.0866	37	1.4567	0.0591	5.4331	6.7717	6.6535
NN3928	140	5.5118	190	7.4803	37	1.4567	0.0591	5.8268	7.1654	7.0866
NN3930	150	5.9055	210	8.2677	45	1.7717	0.0787	6.2598	7.9134	7.7559
NN3932	160	6.2992	220	8.6614	45	1.7717	0.0787	6.6535	8.3071	8.1496
NN3934	170	6.6929	230	9.0551	45	1.7717	0.0787	7.0472	8.7008	8.5433
NN3936	180	7.0866	250	9.8425	52	2.0472	0.0787	7.4409	9.4882	9.2126
NN3938	190	7.4803	260	10.2362	52	2.0472	0.0787	7.8346	9.8819	9.6654
NN3940	200	7.8740	280	11.0236	60	2.3622	0.0787	8.3071	10.5906	10.2756
NN3944	220	8.6614	300	11.8110	60	2.3622	0.0787	9.0945	11.378	11.063
NN3948	240	9.4488	320	12.5984	60	2.3622	0.0787	9.8819	12.1654	11.8898
NN3952	260	10.2362	360	14.1732	75	2.9528	0.0787	10.6693	13.7402	13.3071
NN3956	280	11.0236	380	14.9606	75	2.9528	0.0787	11.4567	14.5276	14.0945

Bearing Number	Basic Load Ratings (lbs)		Limiting Speeds (1000 RPM)		Bearing Weight (Approx.)
	C_r	C_{or}	Grease	Oil	lbs
NN3920	23800	40800	6.0	6.7	2.84
NN3921	24700	43600	5.6	6.3	3.30
NN3922	25800	46500	5.3	6.3	3.43
NN3924	30900	56000	5.0	5.6	4.40
NN3926	39000	72500	4.5	5.3	5.65
NN3928	45200	85000	4.3	4.8	6.07
NN3930	59000	109000	3.8	4.5	9.77
NN3932	61000	117000	3.6	4.3	11.33
NN3934	63000	123000	3.6	4.0	12.03
NN3936	76000	148000	3.2	3.8	15.71
NN3938	77000	152000	3.2	3.6	16.35
NN3940	93500	184000	3.0	3.4	23.10
NN3944	99000	202000	2.6	3.0	25.08
NN3948	104000	218000	2.6	2.8	26.62
NN3952	151000	311000	2.2	2.6	47.08
NN3956	155000	328000	2.2	2.4	49.94

C_r = Dynamic Radial Load Rating
C_{or} = Static Radial Load Rating

Ball Screw Support Bearings

30 **TAC** **62** **B** **SU** **C10** **PN7B**

Bearing Bore Diameter (mm)
For inch series bearings, the figures to the right of the decimal point are omitted when converted to millimeters.

Bearing Type Symbol
(Contact Angle 60°)

Bearing Outside Diameter (mm)
For inch series bearings, the figures to the right of the decimal point are omitted when converted to millimeters.

Internal Specification Symbol
A: Standard Capacity
B: High Capacity (Replaces A)

Combination Symbols
SU: Single Universal
DF: Duplex Face to Face
DB: Duplex Back to Back
DT: Duplex Tandem
DBD: 3 Row Combinations
DFF: 4 Row Combinations
DFT: 4 Row Combinations
DTT: 4 Row Combinations

Preload Symbol
C10: Heavy Preload (Metric Series)
C11: Heavy Preload (Inch Series)

Accuracy Symbol
PN7A: Corresponds to ISO Class 4
PN7B: Tighter Bore and O.D. Accuracy for Universally Ground (SU) Bearings

Please refer to the bearing tables for exact part number options

Interchange

Description		Interchange				
		NSK	SKF	FAF/TIMKEN	MRC	NTN
Part No.	Metric Type	xxTACxxx	BDAB6342xx	MMxxBSxxx	--	BSTxxXxx
	Inch Type	xxTACxxx	BDAB6342xx	MM93xxWI xH	Jxxx	--
Part Number Suffix	Internal Specifications (Standard Capacity)	A	--	--	--	X
	Internal Specifications (High Capacity)	B	C	--	--	-1B
	Single Universal	SU	G	SU	DS	G
	Duplex Universal	DU	DG	DU	DU	GD2
	Duplex Face to Face	DF	DF	DU	DF	DF
	Duplex Back to Back	DB	DB	DU	DB	DB
	Duplex Tandem	DT	DT	DU	DT	DT
	Quad Set \ \ / /	DFF	QFC	QU	--	DTFT
	Quad Set \ / / /	DFT	QFT	QU	DFDT	--
	Quad Set / / \ \	DBB	QBC	QU	--	--
	Quad Set / \ \ \	DBT	QBT	QU	--	DTBT
	Quad Set / / / /	DTT	QT	QU	--	--
	Metric Series Preload	C10	BLANK	H	--	BLANK
	Inch Series Preload	C11	BLANK	H	BLANK	--
	Corresponds to ISO Class 4	PN7A	P4(PA7)	MM	BLANK	P4
	Tighter Bore and O.D. Acccuracy for SU Bearings	PN7B	P4(PA7)	MM	BLANK	UP

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.

Applications

Ball Screw Support bearings are designed specifically to provide maximum axial rigidity and improved feeding accuracy for use with precision ball screws. They are high accuracy angular contact thrust bearings, which are superior to combinations of standard angular contact bearings or arrangements of radial and thrust bearings for ball screw applications. Both Metric and Inch series are available.

› **Precision Ball Screws** › **Rolled Ball Screws** › **Heavy Duty Ball Screw Support Units**

Ball Screw Support Bearings: Major Dimensions

Inch Series

Bearing Number	Boundary Dimensions							
	Bore Diameter d		Outside Diameter D		Width B		Ball Complement	Sealed Design Available
	mm	inch	mm	inch	mm	inch	no.-inch	
20TAC47XB	20.000	0.7874	47.0	1.8504	15.875	0.6250	15-1/4	-
23TAC62B	23.838	0.9385	62.0	2.4409	15.875	0.6250	21-1/4	-
38TAC72B	38.100	1.5000	72.0	2.8346	15.875	0.6250	24-1/4	-
44TAC76B	44.475	1.7510	76.2	3.0000	15.875	0.6250	26-1/4	-
57TAC90B	57.150	2.2500	90.0	3.5433	15.875	0.6250	32-1/4	-
76TAC110B	76.200	3.0000	110.0	4.3307	15.875	0.6250	41-1/4	-
101TAC145B	101.600	4.0000	145.0	5.7087	22.225	0.8750	37-3/8	-

Metric Series

Bearing Number	Boundary Dimensions							
	Bore Diameter d		Outside Diameter D		Width B		Ball Complement	Sealed Design Available
	mm	inch	mm	inch	mm	inch	no.-inch	
17TAC47B	17	0.6693	47	1.8504	15	0.5906	15-1/4	*
20TAC47B	20	0.7874	47	1.8504	15	0.5906	15-1/4	*
25TAC62B	25	0.9843	62	2.4409	15	0.5906	21-1/4	*
30TAC62B	30	1.1811	62	2.4409	15	0.5906	21-1/4	*
35TAC72B	35	1.3780	72	2.8346	15	0.5906	24-1/4	*
40TAC72B	40	1.5748	72	2.8346	15	0.5906	24-1/4	*
40TAC90B	40	1.5748	90	3.5433	20	0.7874	20-1/4	*
45TAC75B	45	1.7717	75	2.9528	15	0.5906	26-1/4	*
45TAC100B	45	1.7717	100	3.9370	20	0.7874	23-3/8	*
50TAC100B	50	1.9685	100	3.9370	20	0.7874	23-3/8	-
55TAC100B	55	2.1654	100	3.9370	20	0.7874	23-3/8	-
55TAC120B	55	2.1654	120	4.7244	20	0.7874	27-3/8	-
60TAC120B	60	2.1654	120	4.7244	20	0.7874	27-3/8	-

Ball Screw Support Bearings: Load Ratings

COMMON OPTIONS	
DDG	Contact Rubber Seal
SU	Single Universal
DU	Duplex Universal
QU	Quad Set Universal
C10	Heavy preload (metric series)
C11	Heavy preload (inch series)
PN7B	Tighter bore and O.D. accuracy for universally ground (SU) bearings

Inch Series

Bearing Number	Dynamic Axial Load Rating Ca						Limited Axial Capacity					
	One Row Loaded DF		Two Rows Loaded DFD • DFF • DT		Three Rows Loaded DFT • DTD		One Row Loaded DF		Two Rows Loaded DFD • DFF • DT		Three Rows Loaded DFT • DTD	
	daN	lbf	daN	lbf	daN	lbf	daN	lbf	daN	lbf	daN	lbf
20TAC47XB	2190	4920	3550	7980	4750	10700	2660	5980	5300	11900	7950	17900
23TAC62B	2850	6410	4650	10500	6150	13800	4050	9110	8150	18300	12200	27400
38TAC72B	3150	7080	5150	11600	6850	15400	5200	11700	10400	23400	15700	35300
44TAC76B	3300	7420	4350	12000	7100	16000	5700	12800	11400	25600	17000	38200
57TAC90B	3550	7980	5750	12900	7600	17100	6850	15400	13700	30800	20500	46100
76TAC110B	3900	8770	6300	14200	8350	18800	8650	19400	17300	38900	26000	58500
101TAC145B	7600	17100	12300	27700	16400	36900	16600	37300	33000	74200	50000	112000

Metric Series

Bearing Number	Dynamic Axial Load Rating Ca						Limited Axial Capacity					
	One Row Loaded DF		Two Rows Loaded DFD • DFF • DT		Three Rows Loaded DFT • DTD		One Row Loaded DF		Two Rows Loaded DFD • DFF • DT		Three Rows Loaded DFT • DTD	
	daN	lbf	daN	lbf	daN	lbf	daN	lbf	daN	lbf	daN	lbf
17TAC47B	2190	4920	3550	7980	4750	10700	2660	5980	5300	11900	7950	17900
20TAC47B	2190	4920	3550	7980	4750	10700	2660	5980	5300	11900	7950	17900
25TAC62B	2850	6410	4650	10500	6150	13800	4050	9110	8150	18300	12200	27400
30TAC62B	2920	6570	4750	10700	6300	14200	4300	9670	8600	19300	12900	29000
35TAC72B	3100	6970	5050	11400	6700	15100	5000	11200	10000	22500	15000	33700
40TAC72B	3150	7080	5150	11600	6850	15400	5200	11700	10400	23400	15700	35300
40TAC90B	5900	1330	9550	21500	12700	28600	8950	20100	17900	40200	26900	60500
45TAC75B	3300	7420	5350	12000	7100	16000	5700	12800	11400	25600	17000	38200
45TAC100B	6150	13800	10000	22500	13300	29900	9900	22300	19800	44500	29800	67000
50TAC100B	6300	14200	10200	22900	13600	30600	10400	23400	20800	46800	31000	69700
55TAC100B	6300	14200	10200	22900	13600	30600	10400	23400	20800	46800	31000	69700
55TAC120B	6750	15200	10900	24500	14500	32600	12300	27700	24600	55300	37000	83200
60TAC120B	6750	15200	10900	24500	14500	32600	12300	27700	24600	55300	37000	83200

Ball Screw Support Bearings: Preloads

Inch Series (Preload Symbol C11)

Bearing Number	Duplex Combinations (DF) Preload	Triplex Combinations (DFD) Preload	Quadruplex Combinations (DFF) Preload
	lbf	lbf	lbf
20TAC47XB	750	1000	1500
23TAC62B	1000	1350	2000
38TAC72B	1500	2100	3000
44TAC76B	1500	2100	3000
57TAC90B	1750	2300	3500
76TAC110B	2250	3000	4500
101TAC145B	3000	4100	6000

Metric Series (Preload Symbol C10)

Bearing Number	Duplex Combinations (DF) Preload	Triplex Combinations (DFD) Preload	Quadruplex Combinations (DFF) Preload
	lbf	lbf	lbf
17TAC47B	490	680	990
20TAC47B	490	680	990
25TAC62B	680	930	1390
30TAC62B	680	930	1390
35TAC72B	790	1080	1590
40TAC72B	790	1080	1590
40TAC90B	1010	1390	2050
45TAC75B	790	1080	1590
45TAC100B	1170	590	2300
50TAC100B	1170	1590	2300
55TAC100B	1170	1590	2300
55TAC120B	1390	1870	2750
60TAC120B	1390	1870	2750

Precision Deep Groove Ball Bearings

Type
6: Single Row Radial Ball Bearing

Bore Code
(04 upwards, multiply by 5 to obtain bore size in mm)
00: 10 mm **02:** 15 mm
01: 12 mm **03:** 17 mm

Cage Material
T: Phenolic Resin
M: Brass
TN/TNH: Polyamide

Radial Internal Clearance
Standard R.I.C.: C1, C2, CN, C3, C4
Special R.I.C.: R**
Special Axial fit: A**

6	0	10		T	B	CN	P4

Dimension Series

RHP	ISO	RHP	ISO
		2	02
0	10	3	03

Construction
Blank: Normal Type
S: Ceramic Ball Type

Location
B: Inner Ring Guided
A: Outer Ring Guided
BH: Inner Ring Guided

Precision Grade

RHP	ISO	ABEC
P5	5	5
P4	4	7
P3	Dimensional Accuracy P4	Running Accuracy P2
P2	2	9

· Denotes standard feature, no indicator necessary
** Denotes mean figure given in µm

Please refer to the bearing tables for exact part number options

Interchange

	Description	Interchange		
		NSK	FAF/TIMKEN	Barden
Part Number	ISO 19	69xx	---	---
	ISO 10	60xx	91xxK	1xx
	ISO 02	62xx	2xxK	2xx
	ISO 03	63xx	3xxK	---
Prefixes / Suffixes	Polyamide Cage	T1X	PRB	TMT
	High Speed Polyamide Cage	TYA	---	---
	Phenolic Cage	T	CR	T
	Shield	Z	---	S
	Non-contact Seal	V	V	A
	Contact Seal	(D)DU	---	Y
	Radial Clearance (Loose)	C3	P	(K)5
	ABEC 7 Precision	P4	MM	---

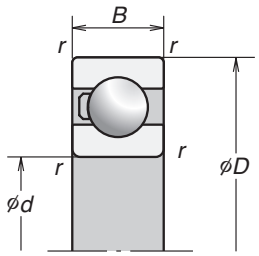
The competitive manufacturers are provided for a convenient source of unit substitution. They can be considered interchangeable in most instances, but for special applications, please contact NSK. NSK assumes no liability with respect to errors or omissions.

Applications

› Woodworking Spindles › Light Duty Precision Vertical Milling Spindles › Machining Center Spindles

Precision Deep Groove Ball Bearings: 60 & 62 Series

Bore Diameter 20-120mm



Bearing Number	Boundary Dimensions (mm)				Basic Load Ratings (lbs)		Limiting Speeds (RPM)	
	d	D	B	r	Cr	Cor	Grease	Oil
6004T	20	42	12	0.6	2109	1131	32000	48000
6204T	20	47	14	1.0	2878	1479	35000	44000
6005T	25	47	12	0.6	2271	1315	27000	45200
6205T	25	52	15	1.0	3147	1760	26000	42800
6006T	30	55	13	1.0	2968	1859	23000	40000
6206T	30	62	16	1.0	4384	2540	21000	37300
6007T	35	62	14	1.0	3597	2316	22000	35800
6207T	35	72	17	1.0	5778	3440	18500	32700
6008T	40	68	15	1.0	3777	2585	21000	32400
6208T	40	80	18	1.0	6542	4024	16600	26700
6009T	45	75	16	1.0	4474	3147	18800	29000
6209T	45	85	19	1.0	7352	4586	15300	26000
6010T	50	80	16	1.0	4676	3462	17300	26700
6210T	50	90	20	1.0	7891	5216	14300	24200
6011T	55	90	18	1.0	6362	4766	16700	23800
6211T	55	100	21	1.5	9757	6565	12000	21900
6012T	60	95	18	1.0	6610	5216	15700	21900
6212T	60	110	22	1.5	11803	8094	11700	19700
6013T	65	100	18	1.0	6565	5283	13300	20600
6213T	65	120	23	1.5	12927	8993	10800	17800
6014T	70	110	20	1.0	8566	6947	11900	18400
6214T	70	125	24	1.5	13939	9892	10200	16700
6015T	75	115	20	1.0	8498	7014	11100	17200
6215T	75	130	25	1.5	14838	11016	10200	15600
6016T	80	125	22	1.0	10701	8925	10200	15700
6216T	80	140	26	2.0	16299	11915	9200	14300
6017T	85	130	22	1.0	10679	8993	9500	14700
6217T	85	150	28	2.0	18885	13939	8500	13100
6018T	90	140	24	1.5	13085	11151	8700	13500
6019T	95	145	24	1.5	13040	11241	8100	12600
6020T	100	150	24	1.5	13489	12140	7800	12000
6022T	110	170	28	2.0	19110	16412	6500	10100
6024T	120	180	28	2.0	19784	17986	6100	9400

C_r = Dynamic Radial Load Rating

C_{or} = Static Radial Load Rating

Precision Deep Groove Ball Bearings: 63 Series

Bore Diameter 20-90mm

Single Row Radial Ball Bearings

Boundary Dimensions			Basic Bearing	Limiting Speeds		Load Ratings (lbs)		Abutment Dimensions			Grease Volume	PCD of Lubrication Jets
								max. fillet radius	d_1	D_1		
d	D	B		oil/air	grease	dynamic	static	r	min	max	30%	P
mm	mm	mm		rev/min	rev/min	C_r	C_{or}	mm	mm	mm	cm^3	mm
20	52	15	6304 TB	41000	27000	3575	1754	1.0	25.0	47.0	1.3	40.1
25	62	17	6305 TB	31600	23000	4631	2630	1.0	30.0	57.0	2.0	48.9
30	72	19	6306 TB	26800	19500	6655	3732	1.0	35.0	67.0	2.9	58.1
35	80	21	6307 TB	23000	15000	7487	4294	1.5	42.5	72.5	4.0	63.8
40	90	23	6308 TB	20700	13500	9982	5868	1.5	47.5	82.5	6.0	72.4
45	100	25	6309 TB	18500	12000	1187	7127	1.5	52.5	92.5	7.3	80.1
50	110	27	6310 TB	16600	10800	13894	8521	2.0	60.0	100.0	10.0	88.3
55	120	29	6311 TB	15100	9800	16075	10027	2.0	65.0	110.0	15.0	96.6
60	130	31	6312 TB	13800	9000	18390	11691	2.0	70.0	120.0	16.0	106.8
65	140	33	6313 TB	12700	8300	20818	13377	2.0	75.0	130.0	18.0	113.8
70	150	35	6314 TB	11700	7600	23381	15288	2.0	80.0	140.0	22.0	122.1
75	160	37	6315 TB	10900	7100	25405	17311	2.0	85.0	150.0	28.0	130.5
80	170	39	6316 TB	10200	6600	25630	17873	2.0	90.0	160.0	32.0	135.1
85	180	41	6317 TB	9500	6200	29901	21695	2.5	97.5	167.5	40.0	145.0
90	190	43	6318 TB	9000	5800	32149	24056	2.5	102.5	177.5	50.0	156.5

C_r = Dynamic Radial Load Rating

C_{or} = Static Radial Load Rating

Notes

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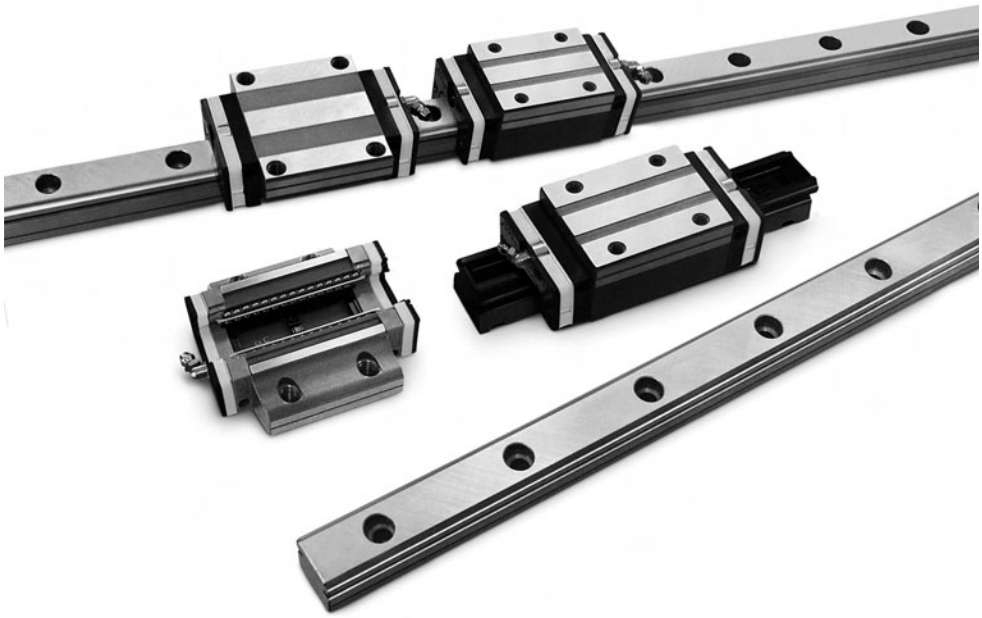
Linear Guides



Linear Guides are designed for high precision motion and control applications. They provide greater rigidity and higher load capacity than shaft and bushing designs.

Some of the industries served - machine tool, robotics, medical and aerospace - require smooth travel and high accuracy.

Applications

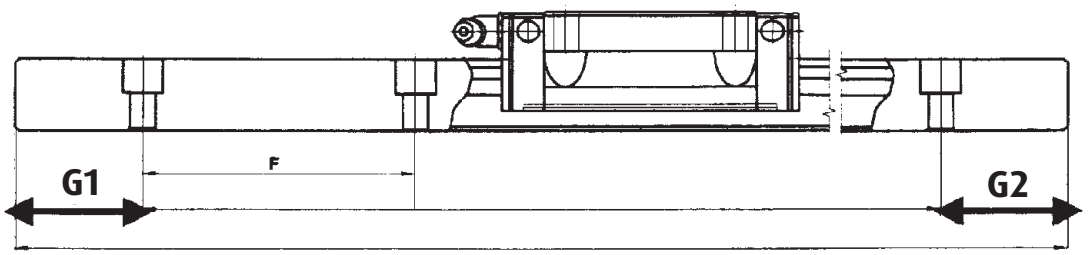
› Machine Tool (CNC, EDM, Laser Cutting, Water Jet, Lathes) › Woodworking (Routers) › Glasscutting › Testing Equipment
› Medical (Diagnostic Equipment, Lab Automation, Genomics, Biotechnology) › CMM › Factory Automation
› Semiconductor (Wafer Handling, PCB Drilling, LCD Etching, Testing Equipment)

Linear Guide Product Selection Tips

To help in the selection of linear guides, NSK has come up with a series of questions that need to be asked in order to determine the appropriate NSK product.

- What is the application?
- What is the NSK or competitor parts number?
- What type of carriage or bearing style is needed for this application: Tapped or Through Hole, Square or Flange style?
- What is the rail length required for this application?
- How many carriages or bearings are needed per rail?
- Are there any special accuracy and preload requirements?
- What are the loading conditions of the application? Please provide both Static & Dynamic loads.
- What are the delivery requirements?
- Can you provide us with a drawing of the part to be purchased?
- Lubrication Method - Is the K1 lubrication system of interest for this application?
- What is the G dimension of rail?

G Dimension Information: A G dimension is required to assure proper mounting to existing application. The G dimension is the measurement from start of the rail to the center of the first bolt hole. In instances where rail will be butted together, please contact NSK for assistance.



Linear Guides Interchange

Description	Interchange																													
	NSK								THK							THOMSON						SKF								
Carriage Part Number	LAH		20		AN		Z		HSR		20		R		C1	511	H	20	C	1		LLRHC	20		A-		T1			
	1		2		3		7		1		2		3		7	1	6	2	3	7		1	2		3		7			
Rail Part Number	L1H		20		XXXX		Z		HSR		20+		XXXXL			521	H	20	A	+XXXX		LLRHR	20x		XXXX		P5			
	1		2		4		7		1		2		4		6	1	6	2		4		1	2		4		6			
Assembly Part Number	LH	25	XXXX	AN	C	X	PC	Z	HSR	20	R	2	SS	C1	+XXXXL							LLRHS	20	A	2	T1	XXXX	P5		
	1	2	3	4	5	6	7	8	1	2	3	5	8	7	4	6						1	2	3	5	7	4	6		

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.

1 - Linear Guide Series

NSK	THK	THOMSON		SKF
		Old	New	
LH	HSR	CG	511	LLRHS/LLTHS
SH	SHS			
LS	SR			LLRHS
SS	SSR			
LW	HRW			
PU	RSR	CD	TSR-Z	LLMHS
PE	RSR W	LLMWS	TSR-WZ	LLMWS

2 - Linear Guide Series (rail width)

NSK	THK	THOMSON	SKF
Number indicated rail width	Same as NSK	Same as NSK with the exception of the CD series	Same as NSK

3 - Linear Guide Carriage Styles ## = size (rail width)

NSK	THK		THOMSON		SKF
	Common	Less Common	Old	New	
LAH##AN	HSR##R	HSR##TR/TRX/CR	CG##CE	511H##E	LLRHC##R/U (20,45)
LAH##BN	HSR##LR	HSR##HTR/HR	CG##DE	511H##F	LLRHC##LR
LAH##EM	HSR##A/B/CA/CB	HSR##TA	CG##AA	511H##A	LLRHC##A
LAH##GM	HSR##HA/LA/HB/LB	HSR##HTA/HTB	CG##BA	511H##B	LLRHC##LA
LAH##AL				511H##C (25,30,35)	LLRHC##U (25,30,35)
LAH##BL				511H##D (25,30,35)	
SAH##AN	SHS##R/V (20,45,55,65)				
SAH##AL	SHS##V (15,25,30,35)				
SAH##BN	SHS##LR/LV (20,45,55,65)				
SAH##BL	SHS##LV (25,30,35)				
SAH##EM	SHS##C				
SAH##GM	SHS##LC				
LAS##FL		SR##TBY			
LAS##EM	SR##TB				
LAS##AL	SR##W	SR##TX/WY			LLRHC15U
LAS##AN	SR##W (45,55)				
LAS##KL/JM	SR##SB	SR##SBY			
LAS##CL	SR##V	SR##SX/VY			LLRHC##SU (15,30,35)
SAS##AL	SSR##XW	SSR##XWY			
SAS##CL	SSR##XV	SSR##XVY			
SAS##FL		SSR##XTBY/TBY			
SAS##EM	SSR##XTB				
LAW##EL	HRW##CA/CR				
PAU##AR	RSR07M/RSR07N				LLMHC##TA
PAU##TR	RSR05M/##N (5,9)	RSR09KM/RSR12VM			LLMHC##TA
PAU##UR	RSR12N				
PAU##AL	RSR15VM				
PAE##AR	RSR05WM/##WN (5,12,15)	RSR12WVM/RSR15WVN			LLMWC##TA
PAE##TR	RSR07WM/##WN (7,9)	RSR09WVM			LLMWC##TA

4 - Linear Guide Rail Length (mm) ## = size (rail width) XXXX = length

NSK	THK	THOMSON		SKF
		Old	New	
L1H##XXXXZ	HSR##+XXXXL	RG##NLXXXX	521H##A+XXXX	LLRHR##xXXXXP5
L1H##XXXXZ (For SH series)	HSR##+XXXXL			
L1S##XXXXZ	SR##+XXXXL			LLRHR##xXXXXP5
L1S##XXXXZ (For SS series)	SR##+XXXXL			
L1W##XXXXZ	HRW##+XXXXL			
P1U##XXXXZ	RSR##+XXXXL	RD##HLXXXX	TSR##Z+XXXX	LLMHR##xXXXXP5
P1E##XXXXZ	RSR##W+XXXXL		TSR##WZ+XXXX	LLMWR##xXXXXP5

5 - Carriages

The number following the carriage style equals the number of carriages per rail.

6 - Accuracy Class

NSK	THK	THOMSON	SKF
PC (interchangeable)	BLANK	N	P5
P6	H	H	P3
P5	P	P	P1
P4	SP	S	P01
P3	UP	U	P001

7 - Preload

NSK (Matched Assembly)	THK	THOMSON		SKF
		Old	New	
T or (0)	BLANK	A	0	T0
Z or (1)	C1	B	1	T1
(2)	C1	B	1	T1
H or (3)	C0	C	2	T2
(4)	C0	C	3	T3

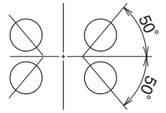
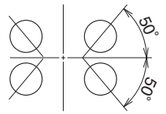
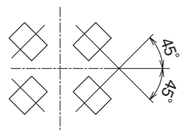
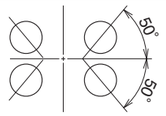
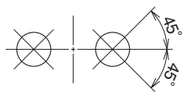
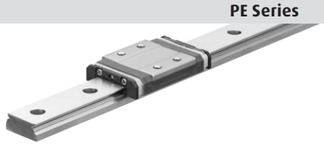
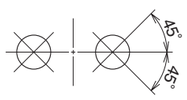
8 - Seals

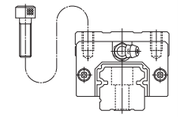
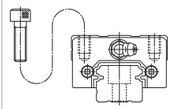
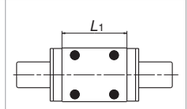
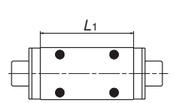
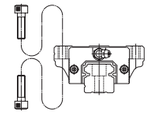
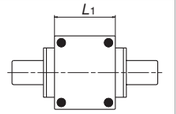
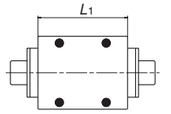
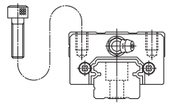
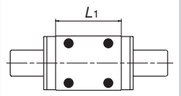
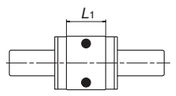
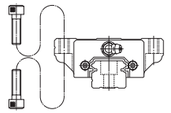
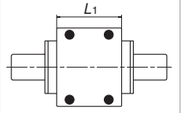
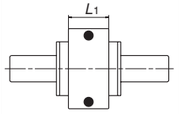
NSK	THK	THOMSON		SKF
		Old	New	
Standard (End Seals)	UU-End Seals		Standard	Standard
Standard (Side Seals)	SS-Side Seals+End Seals	LDS	Standard	Standard
-P (Protector/Scraper)	ZZ-End, Side, Inner Seals and Scraper	ZZ	Z	S1
-D (Double End Seals)	DD-Double End, Side, and Inner Seals	DD	W	S2
-DP (Double End Seals, Protector)	KK-Double End, Side, Inner Seals and Scraper	KK	WZ	S3

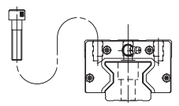
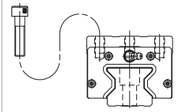
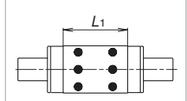
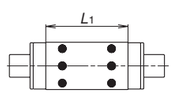
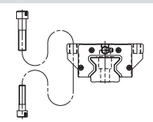
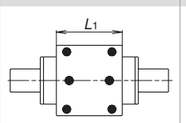
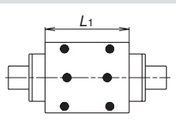
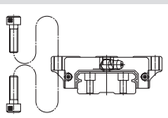
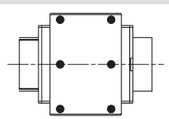
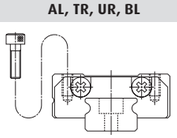
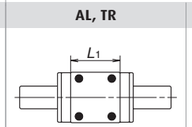
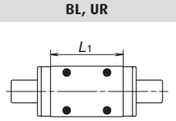
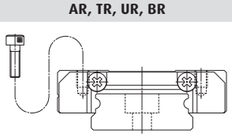
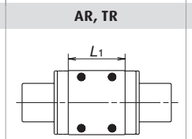
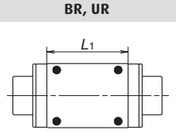
Lubrication Systems

NSK	THK	THOMSON	SKF
-K1 External to the Carriage	QZ External to the Carriage	LL External to the Carriage	Standard Internal Foam Insert

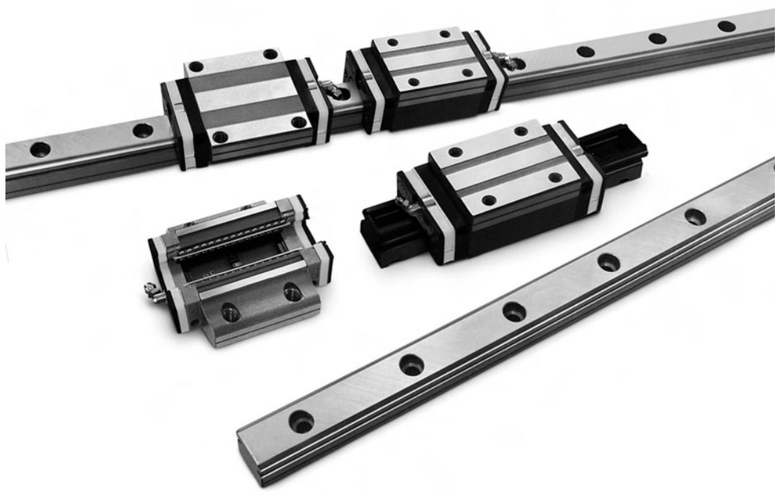
Types of Linear Guides

Series		Features
LH/SH Series		
		LH Series ・NSK basic series ・General versatility for heavy-duty applications ・Large load carrying capacity against vertical direction Stainless steel is available (#15–30). SH Series ・Silent and smooth featured LH incorporated with retainer piece
LS/SS Series		
		LS Series ・Compact designed NSK basic series ・General versatility for fine application ・Large load carrying capacity against vertical direction Stainless steel is available (#15–35). SS Series ・Silent and smooth featured LS incorporated with retainer piece
RA Series		
		・A roller guide with super high load capacity and rigidity ・Super high accuracy and smooth motion ・Highly dust proof and maintenance free
LW Series		
		・Wide rail type linear guide ・Ideal for use of single rail ・Large load carrying capacity against vertical direction
PU Series		
		・Lightweight designed miniature linear guide ・Reduced noise and smooth motion ・High corrosion resistance (stainless steel)
PE Series		
		・Lightweight designed wide rail miniature linear guide ・Ideal for use of single rail ・Reduced noise and smooth motion ・High corrosion resistance (stainless steel)

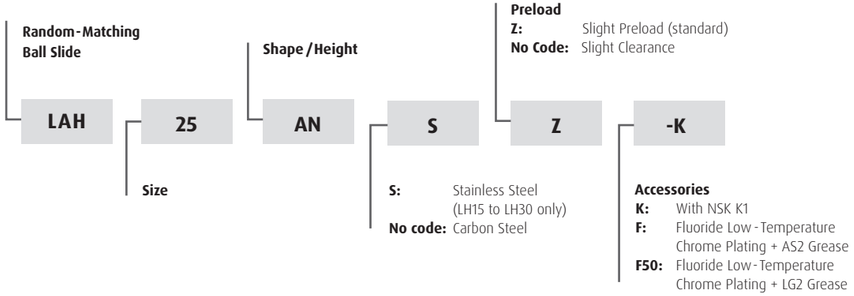
Ball Slide Model				Size & Preload		Dimension Table
AN, BN	**AL, BL**	**AN, AL**	**BN, BL**	**Size**	**Preload**	
				LH/SH15 LH/SH20 LH/SH25 LH/SH30 LH/SH35 LH/SH45 LH/SH55 LH65	Slight preload ZZ	Page I-9 - I-12
EM, GM		**EM**	**GM**			
						
AL, CL		**AL**	**CL**	**Size**	**Preload**	
				LS/SS15 LS/SS20 LS/SS25 LS/SS30 LS/SS35	Slight preload ZZ	Page I-15 - I-18
EM, JM		**EM**	**JM**			
						

AL , BL	**AN, BN**	**AL, AN**	**BL, BN**	**Size**	**Preload**	
				RA15 RA20 RA25 RA30 RA35 RA45 RA55 RA65	Medium preload Z	Page I-33 - I-38
EM, GM		**EM**	**GM**			
						
EL		**EL**		**Size**	**Preload**	
				LW17 LW21 LW27 LW35 LW50	Slight preload ZZ	Page I-29 - I-30
AL, TR, UR, BL		**AL, TR**	**BL, UR**	**Size**	**Preload**	
				PU05 PU07 PU09 PU12 PU15	Maximum clearance 3 μm ZT	Page I-21 - I-22
AR, TR, UR, BR		**AR, TR**	**BR, UR**	**Size**	**Preload**	
				PE05 PE07 PE09 PE12 PE15	Maximum clearance 3 μm ZT	Page I-25 - I-26

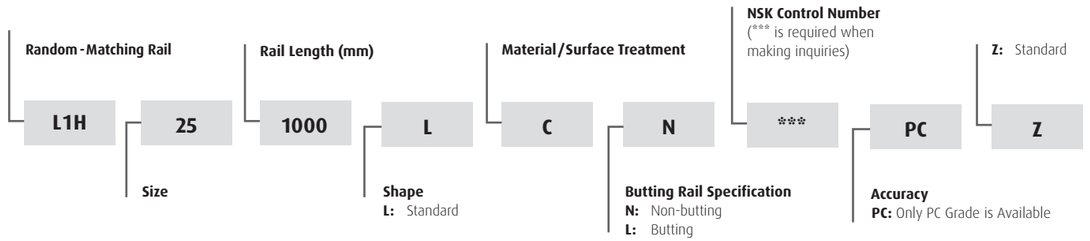
Linear Guides: LH Series



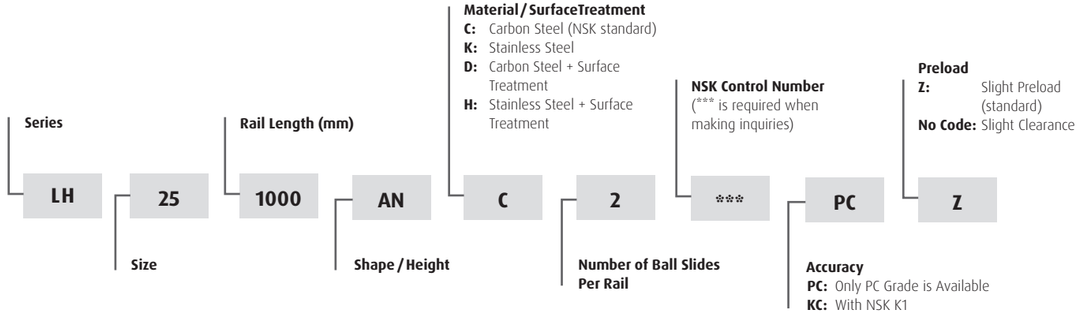
Part Number Example for Ball Slide Only



Reference Part Number for Rail Only



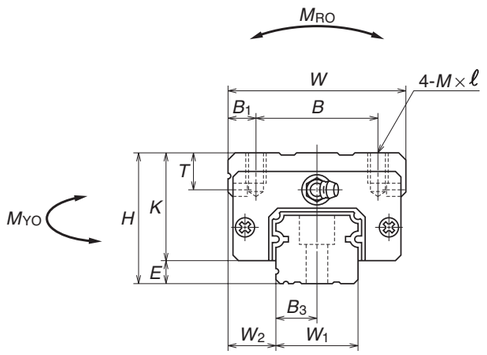
Reference Part Number for Interchangeable Assembly (Ball Slide + Rail)



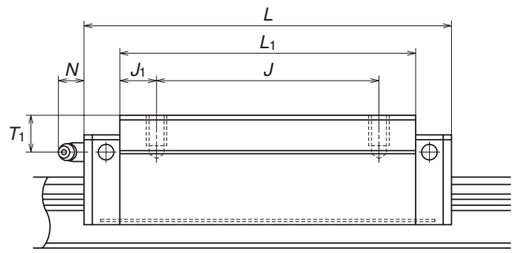
Linear Guides: LH Series

Ball Slide Models: AL, AN, BL, BN

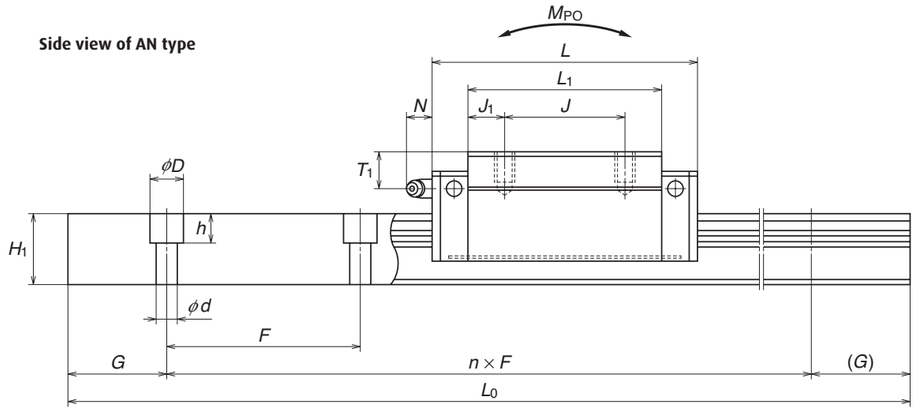
Front View of AL and AN, BL and BN Types



Side View of BN Type



Side view of AN type



n = (number of holes)-1

Unit: mm

Model No.	Assembly			Ball Slide												Rail							Basic Load Rating					Ball Diameter	Weight	
	Height			Width	Length	Mounting Hole								Grease Fitting			Width	Height	Pitch	Mounting Bolt Hole			Max. Length (Single Rail)	Dynamic	Static	Static Moment				Ball Slide	Rail
	H	E	W_2	W	L	B	J	M × pitch × ℓ	B_1	L_1	J_1	K	T	Mounting Hole Size	T_1	N	W_1	H_1	F	d × D × h	B_3	G	L_{0max} ( ) for stainless	C (N)	C_0 (N)	M_{RO} (N·m)	M_{PO} (N·m)	M_{YO} (N·m)	D_W	(kg)	(kg/m)
LH15AN	28	4.6	9.5	34	55.0	26	26	M4×0.7×6	4.0	39	6.5	23.4	8	ϕ3	8.5	3.3	15	15	60	4.5×7.5×5.3	7.5	20.0	2 000	10 800	20 700	108	95	80	3.175	0.18	1.6
LH15BN					74.0					58	16.0												(1 800)	14 600	32 000	166	216	181		0.26	
LH20AN	30	5.0	12.0	44	69.8	32	36	M5×0.8×6	6.0	50	7.0	25.0	12	M6×0.75	5.0	11.0	20	18	60	6×9.5×8.5	10.0	20.0	3 960	17 400	32 500	219	185	155	3.968	0.33	2.6
LH20BN					91.8		50			72	11.0												(3 500)	23 500	50 500	340	420	355		0.48	
LH25AL	36	7.0	12.5	48	79.0	35	35	M6×1×6	6.5	58	11.5	29.0	12	M6×0.75	6.0	11.0	23	22	60	7×11×9	11.5	20.0	3 960	25 600	46 000	360	320	267	4.762	0.46	3.6
LH25AN	40							M6×1×9				33.0			10.0														0.55	
LH25BL	36				107.0		50	M6×1×6		86	18.0	29.0			6.0								(3 500)	34 500	71 000	555	725	610		0.69	
LH25BN	40							M6×1×9				33.0			10.0														0.82	
LH30AL	42	9.0	16.0	60	85.6	40	40	M8×1.25×8	10.0	59	9.5	33.0	14	M6×0.75	7.0	11.0	28	26	80	9×14×12	14.0	20.0	4 000	31 000	51 500	490	350	292	5.556	0.69	5.2
LH30AN	45							M8×1.25×10				36.0			10.0														0.77	
LH30BL	42				124.6		60	M8×1.25×8		98	19.0	33.0			7.0								(3 500)	46 000	91 500	870	1 030	865		1.16	
LH30BN	45							M8×1.25×10				36.0			10.0														1.30	
LH35AL	48	9.5	18.0	70	109.0	50	50	M8×1.25×8	10.0	80	15.0	38.5	15	M6×0.75	8.0	11.0	34	29	80	9×14×12	17.0	20.0	4 000	47 500	80 500	950	755	630	6.350	1.20	7.2
LH35AN	55							M8×1.25×12				45.5			15.0									61 500	117 000	1 380	1 530	1 280		1.50	
LH35BL	48				143.0		72	M8×1.25×8		114	21.0	38.5			8.0														1.70	
LH35BN	55							M8×1.25×12				45.5			15.0														2.10	
LH45AN	70	14.0	20.5	86	139.0	60	60	M10×1.5×17	13.0	105	22.5	56.0	17	Rc1/8	20.0	13.0	45	38	105	14×20×17	22.5	22.5	3 990	81 000	140 000	2 140	1 740	1 460	7.937	3.00	12.3
LH45BN					171.0		80			137	28.5													99 000	187 000	2 860	3 000	2 520		3.90	
LH55AN	80	15.0	23.5	100	163.0	75	75	M12×1.75×18	12.5	126	25.5	65.0	18	Rc1/8	21.0	13.0	53	44	120	16×23×20	26.5	30.0	3 960	119 000	198 000	3 600	3 000	2 510	9.525	4.70	16.9
LH55BN					201.0		95			164	34.5													146 000	264 000	4 850	5 150	4 350		6.10	
LH65AN	90	16.0	31.5	126	193.0	76	70	M16×2×20	25.0	147	38.5	74.0	23	Rc1/8	19.0	13.0	63	53	150	18×26×22	31.5	35.0	3 900	181 000	281 000	6 150	4 950	4 150	11.906	7.70	24.3
LH65BN					253.0		120			207	43.5													235 000	410 000	8 950	10 100	8 450		10.80	

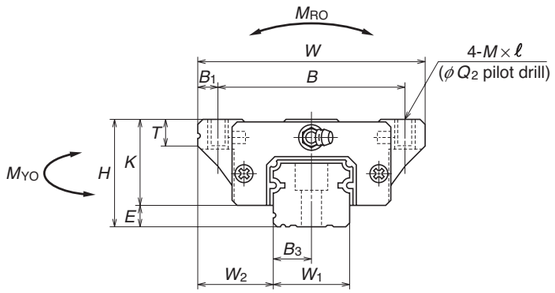
Note 1: External appearance of stainless steel ball slides differs from those of carbon steel ball slides.

Note 2: Basic dynamic load rating C is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface.
To convert C to C_{100} for a 100-km fatigue life, divide C by 1.26.

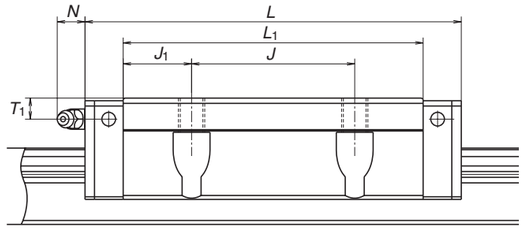
Linear Guides: LH Series

Ball Slide Models: EM, GM

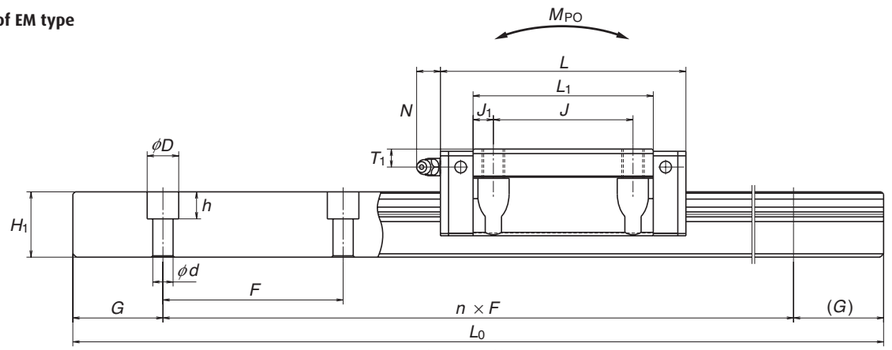
Front View of EM and GM Types



Side View of GM Type



Side view of EM type



n = (number of holes)-1

Unit: mm

Model No.	Assembly			Ball Slide															
	Height			Width	Length	Mounting Hole									Grease Fitting				
	H	E	W_2	W	L	B	J	$M \times \text{pitch} \times \ell$	Q_2	B_1	L_1	J_1	K	T	Mounting Hole Size	T_1	N		
LH15EM	24	4.6	16	47	55.0	38	30	M5×0.8×7	4.4	4.5	39	4.5	19.4	8	φ3	4.5	3.3		
LH15GM					74.0						58	14.0							
LH20EM	30	5.0	21.5	63	69.8	53	40	M6×1×9.5	5.3	5.0	50	5.0	25.0	10	M6×0.75	5.0	11.0		
LH20GM					91.8						72	16.0							
LH25EM	36	7.0	23.5	70	79.0	57	45	M8×1.25×10	6.8	6.5	58	6.5	29.0	11	M6×0.75	6.0	11.0		
LH25GM					107.0			(M8×1.25×11.5)			86	20.5		(12)					
LH30EM	42	9.0	31	90	98.6	72	52	M10×1.5×12	8.6	9.0	72	10.0	33.0	11	M6×0.75	7.0	11.0		
LH30GM					124.6			(M10×1.5×14.5)			98	23.0		(15)					
LH35EM	48	9.5	33	100	109.0	82	62	M10×1.5×13	8.6	9.0	80	9.0	38.5	12	M6×0.75	8.0	11.0		
LH35GM					143.0						114	26.0							
LH45EM	60	14.0	37.5	120	139.0	100	80	M12×1.75×15	10.5	10.0	105	12.5	46.0	13	Rc1/8	10.0	13.0		
LH45GM					171.0						137	28.5							
LH55EM	70	15.0	43.5	140	163.0	116	95	M14×2×18	12.5	12.0	16	15.5	55.0	15	Rc1/8	11.0	13.0		
LH55GM					201.0						164	34.5							
LH65EM	90	16.0	53.5	170	193.0	142	110	M16×2×24	14.6	14.0	147	18.5	74.0	23	Rc1/8	19.0	13.0		
LH65GM					253.0						207	48.5							

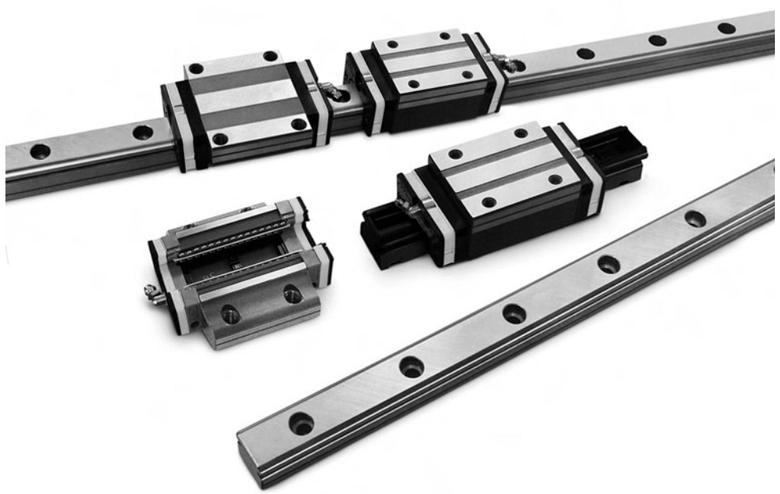
Note 1: Parenthesized dimensions are for items made of stainless steel.

Note 2: External appearance of stainless steel ball slides differs from those of carbon steel ball slides.

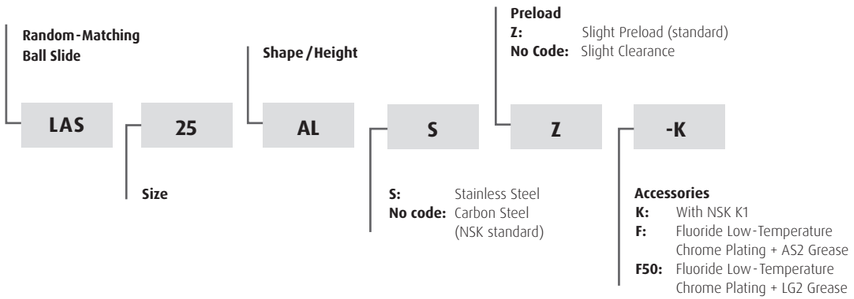
Rail							Basic Load Rating					Ball Diameter	Weight	
Width	Height	Pitch	Mounting Bolt Hole d x D x h			Max Length (Single Rail) L_{0max} ( ) for stainless	Dynamic	Static	Static Moment					
W_1	H_1	F		B_3	G		C (N)	C_0 (N)	M_{R0} (N•m)	M_{P0} (N•m)	M_{Y0} (N•m)	D_w	Ball Slide (kg)	Rail (kg/m)
15	15	60	4.5×7.5×5.3	7.5	20.0	2000	10800	20700	108	94.5	79.5	3.175	0.17	1.6
						(1800)	14600	32000	166	216.0	181.0		0.25	
20	18	60	6×9.5×8.5	10.0	20.0	3960	17400	32500	219	185.0	155.0	3.968	0.45	2.6
						(3500)	23500	50500	340	420.0	355.0		0.65	
23	22	60	7×11×9	11.5	20.0	3960	25600	46000	360	320.0	267.0	4.762	0.63	3.6
						(3500)	34500	71000	555	725.0	610.0		0.93	
28	26	80	9×14×12	14.0	20.0	4000	35500	63000	600	505.0	425.0	5.556	1.20	5.2
						(3500)	46000	91500	870	1030.0	865.0		1.60	
34	29	80	9×14×12	17.0	20.0	4000	47500	80500	950	755.0	630.0	6.350	1.70	7.2
							61500	117000	1380	1530.0	1280.0		2.40	
45	38	105	14×20×17	22.5	22.5	3990	81000	140000	2140	1740.0	1460.0	7.937	3.00	12.3
							99000	187000	2860	3000.0	2520.0		3.90	
53	44	120	16×23×20	26.5	30.0	3990	119000	198000	3600	3000.0	2510.0	9.525	5.00	16.9
							146000	264000	4850	5150.0	4350.0		6.50	
63	53	150	18×26×22	31.5	35.0	3900	181000	281000	6150	4950.0	4150.0	11.906	10.00	24.3
							235000	410000	8950	10100.0	8450.0		14.10	

Note 3: Basic dynamic load rating C is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface.
To convert C to C_{100} for a 100-km fatigue life, divide C by 1.26.

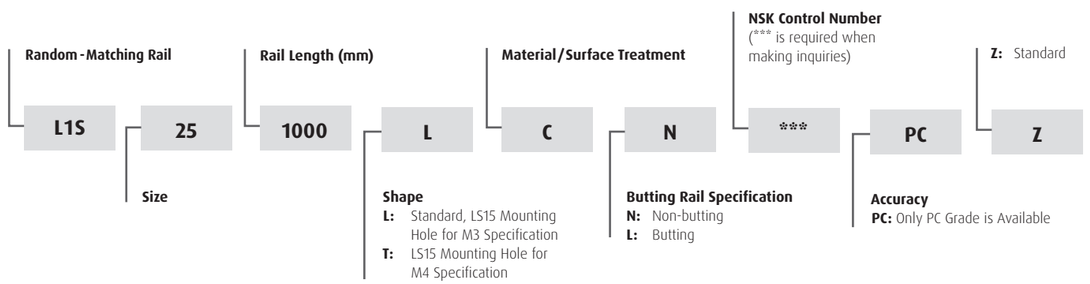
Linear Guides: LS Series



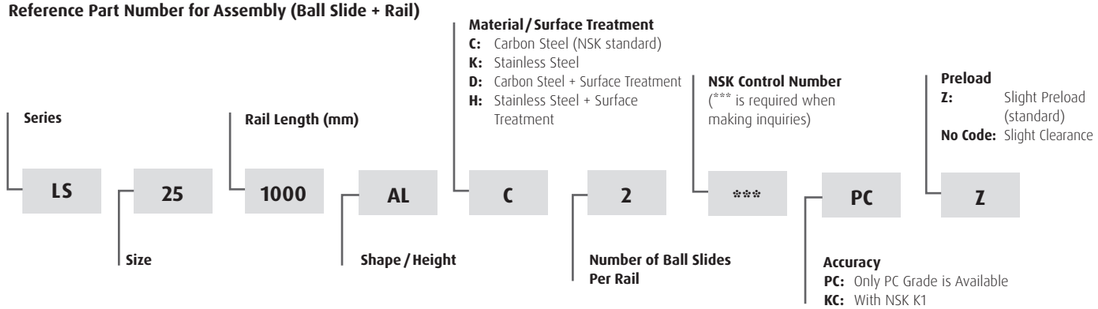
Part Number Example for Ball Slide Only



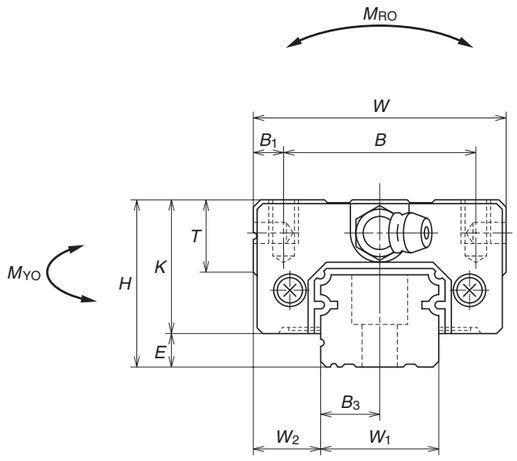
Reference Part Number for Rail Only



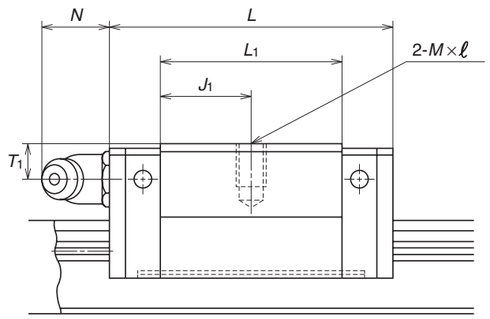
Reference Part Number for Assembly (Ball Slide + Rail)



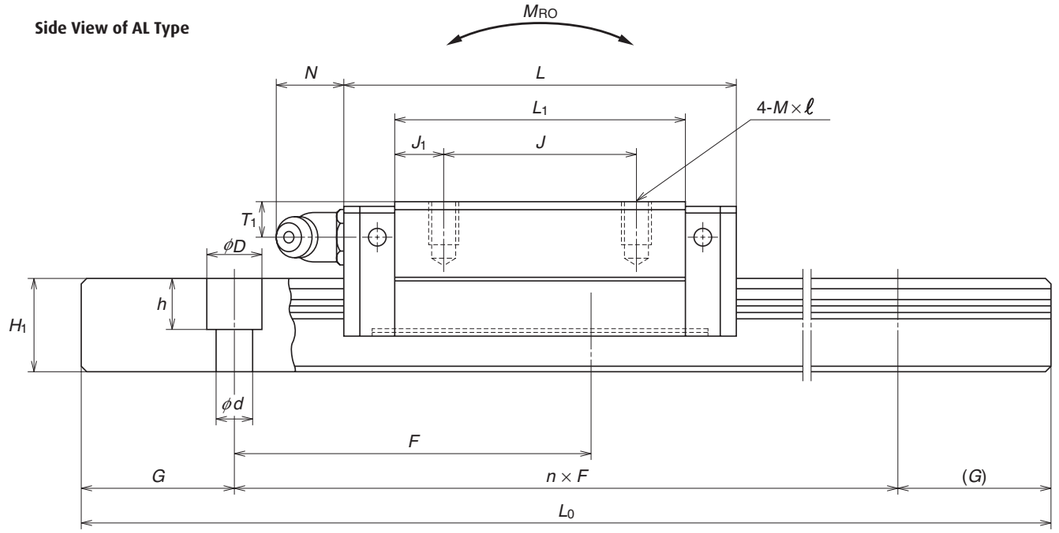
Front View of AL and CL Types



Side View of CL Type



Side View of AL Type



n = (number of holes)-1

Unit: mm

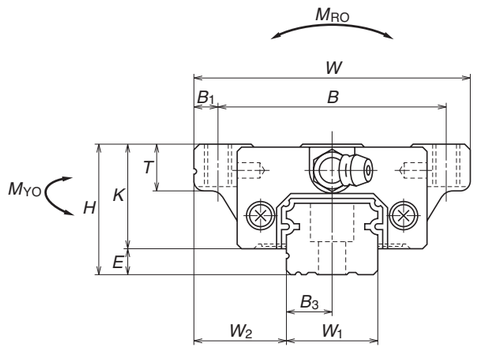
Model No.	Assembly			Ball Slide											
	Height			Width	Length	Mounting Hole							Grease Fitting		
	H	E	W_2	W	L	B	J	M x pitch x ℓ	B_1	L_1	J_1	K	T	Mounting Hole Size	T_1	N
LS15CL	24	4.6	9.5	34	40.4	26	—	M4×0.7×6	4.0	23.6	11.8	19.4	10	ϕ3	6.0	3
LS15AL					56.8		26			40.0	7.0					
LS20CL	28	6.0	11.0	42	47.2	32	—	M5×0.8×7	5.0	30.0	15.0	22.0	12	M6×0.75	5.5	11
LS20AL					65.2		32			48.0	8.0					
LS25CL	33	7.0	12.5	48	59.6	35	—	M6×1×9	6.5	38.0	19.0	26.0	12	M6×0.75	7.0	11
LS25AL					81.6		35			60.0	12.5					
LS30CL	42	9.0	16.0	60	67.4	40	—	M8×1.25×12	10.0	42.0	21.0	33.0	13	M6×0.75	8.0	11
LS30AL					96.4		40			71.0	15.5					
LS35CL	48	10.5	18.0	70	77.0	50	—	M8×1.25×12	10.0	49.0	24.5	37.5	14	M6×0.75	8.5	11
LS35AL					108.0		50			80.0	15.0					

Note 1: External appearance of stainless steel ball slides differs from those of carbon steel ball slides.

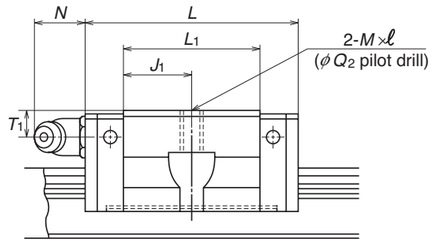
Rail							Basic Load Rating					Ball Diameter	Weight	
Width	Height	Pitch	Mounting Bolt Hole d x D x h			Max Length (Single rail) L_{0max} ( ) for stainless	Dynamic	Static	Static Moment					
W_1	H_1	F		B_3	G		C (N)	C_0 (N)	M_{RO} (N•m)	M_{PO} (N•m)	M_{YO} (N•m)	D_w	Ball Slide (kg)	Rail (kg/m)
15	12.5	60	*3.5×6×4.5	7.5	20	2000	5400	9100	45.5	24.5	20.5	2.778	0.14	1.4
			4.5×7.5×5.3			(1700)	8350	16900	84.5	77.0	64.5		0.20	
20	15.5	60	6×9.5×8.5	10.0	20	3960	7900	13400	91.5	46.5	39.0	3.175	0.19	2.3
						(3500)	11700	23500	160.0	133.0	111.0		0.28	
23	18.0	60	7×11×9	11.5	20	3960	12700	20800	164.0	91.0	76.0	3.968	0.34	3.1
						(3500)	18800	36500	286.0	258.0	217.0		0.51	
28	23.0	80	7×11×9	14.0	20	4000	18700	29600	282.0	139.0	116.0	4.762	0.58	4.8
						(3500)	28800	55000	520.0	435.0	365.0		0.85	
34	27.5	80	9×14×12	17.0	20	4000	26000	40000	465.0	220.0	185.0	5.556	0.86	7.0
						(3500)	40000	74500	865.0	695.0	580.0		1.30	

Note 2: Basic dynamic load rating C is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface.
To convert C to C_{100} for a 100-km fatigue life, divide C by 1.26.
*Standard mounting hole of LS15 rail is for M3 bolts (Hole size: 3.5×6×4.5).
If you require mounting hole for M4 bolts (Hole size: 4.5×7.5×5.3), please specify when ordering.

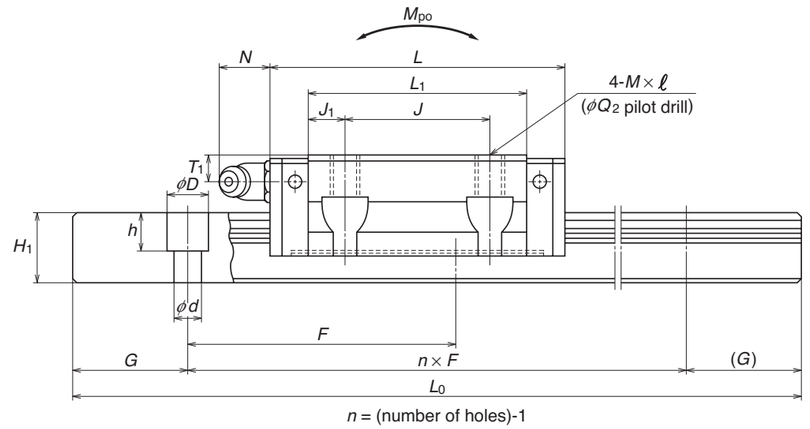
Front View of JM and EM Types



Side View of JM Type



Side View of EM Type



n = (number of holes)-1

Unit: mm

Model No.	Assembly			Ball Slide																
	Height			Width	Length	Mounting Hole									Grease Fitting					
	H	E	W_2	W	L	B	J	Q_1 x ℓ	Q_2	B_1	L_1	J_1	K	T	Mounting Hole Size	T_1	N			
LS15JM LS15EM	24	4.6	18.5	52	40.4 56.8	41	— 26	M5×0.8×7	4.4	5.5	23.6 40.0	11.8 7.0	19.4	8	ϕ3	6.0	3			
LS20JM LS20EM	28	6.0	19.5	59	47.2 65.2	49	— 32	M6×1×9 (M6×1×9.5)	5.3	5.0	30.0 48.0	15.0 8.0	22.0	10	M6×0.75	5.5	11			
LS25JM LS25EM	33	7.0	25.0	73	59.6 81.6	60	— 35	M8×1.25×10 (M8×1.25×11.5)	6.8	6.5	38.0 60.0	19.0 12.5	26.0	11 (12)	M6×0.75	7.0	11			
LS30JM LS30EM	42	9.0	31.0	90	67.4 96.4	72	— 40	M10×1.5×12 (M10×1.5×14.5)	8.6	9.0	42.0 71.0	21.0 15.5	33.0	11 (15)	M6×0.75	8.0	11			
LS35JM LS35EM	48	10.5	33.0	100	77.0 108.0	82	— 50	M10×1.5×13 (M10×1.5×14.5)	8.6	9.0	49.0 80.0	24.5 15.0	37.5	12 (15)	M6×0.75	8.5	11			

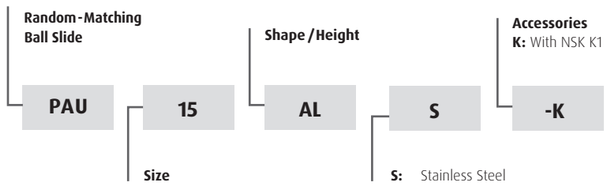
Note 1: Parenthesized dimensions are for items made of stainless steel.
Note 2: External appearance of stainless steel ball slides differs from those of carbon steel ball slides.

Rail						Basic Load Rating			Ball Diameter	Weight	
Width	Height	Pitch	Mounting Bolt Hole d x D x h	B_3	G	Max Length (Single rail) L_{0max} ( ) for stainless	Dynamic	Static	Static Moment					
W_1	H_1	F					C (N)	C_0 (N)	M_{R0} (N•m)	M_{P0} (N•m)	M_{Y0} (N•m)	D_w	Ball slide (kg)	Rail (kg/m)
15	12.5	60	*3.5×6×4.5 4.5×7.5×5.3	7.5	20	2000 (1700)	5400 8350	9100 16900	45.5 84.5	24.5 77.0	20.5 64.5	2.778	0.17 0.26	1.4
20	15.5	60	6×9.5×8.5	10.0	20	3960 (3500)	7900 11700	13400 23500	91.5 160.0	46.5 133.0	39.0 111.0	3.175	0.24 0.35	2.3
23	18.0	60	7×11×9	11.5	20	3960 (3500)	12700 18800	20800 36500	164.0 286.0	91.0 258.0	76.0 217.0	3.968	0.44 0.66	3.1
28	23.0	80	7×11×9	14.0	20	4000 (3500)	18700 28800	29600 55000	282.0 520.0	139.0 435.0	116.0 365.0	4.762	0.76 1.20	4.8
34	27.5	80	9×14×12	17.0	20	4000 (3500)	26000 40000	40000 74500	465.0 865.0	220.0 695.0	185.0 580.0	5.556	1.20 1.70	7.0

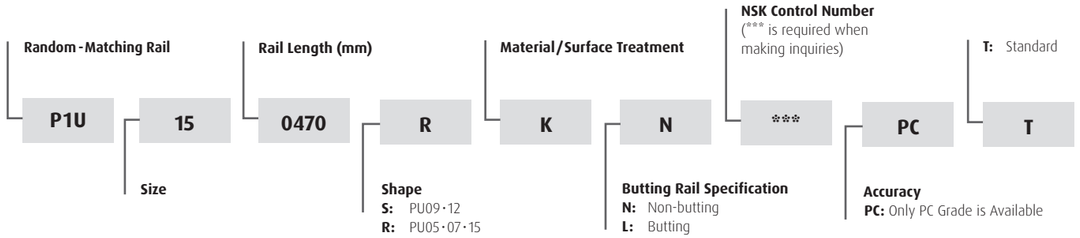
Note 3: Basic dynamic load rating C is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface.
To convert C to C_{100} for a 100-km fatigue life, divide C by 1.26.
*Standard mounting hole of LS15 rail is for M3 bolts (Hole size: 3.5×6×4.5). If you require mounting hole for M4 bolts (Hole size: 4.5×7.5×5.3), please specify when ordering.

Linear Guides: PU Series

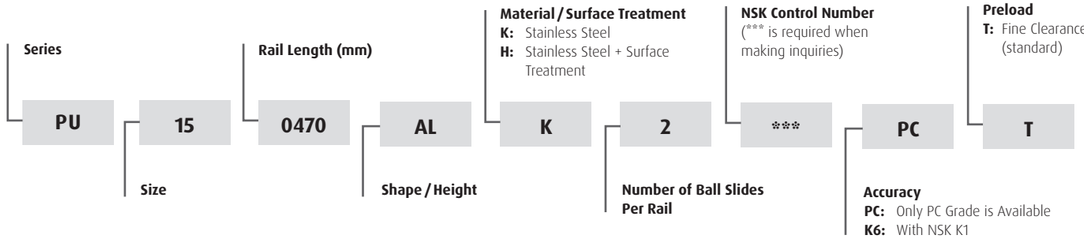
Part Number Example for Ball Slide Only



Reference Part Number for Rail Only



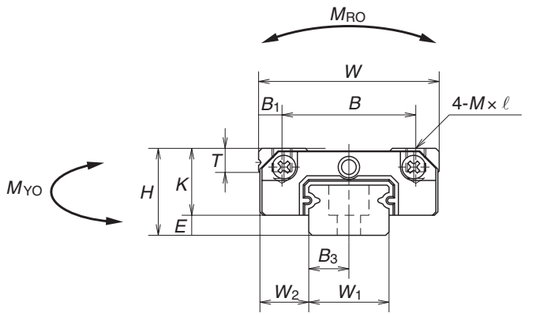
Reference Part Number for Assembly (Ball Slide + Rail)



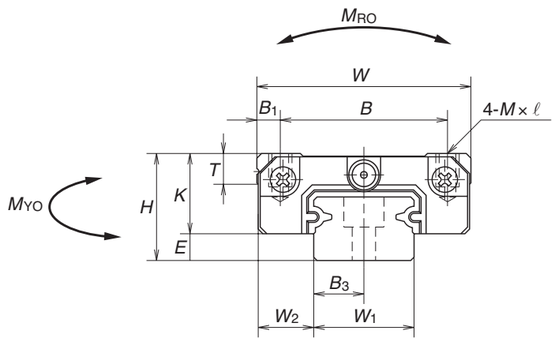
Linear Guides: PU Series

Ball Slide Models: TR, AR, AL, UR, BL

Front View

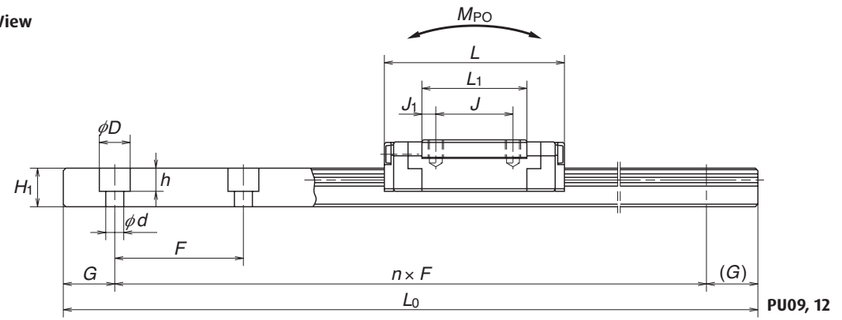


PU09, 12

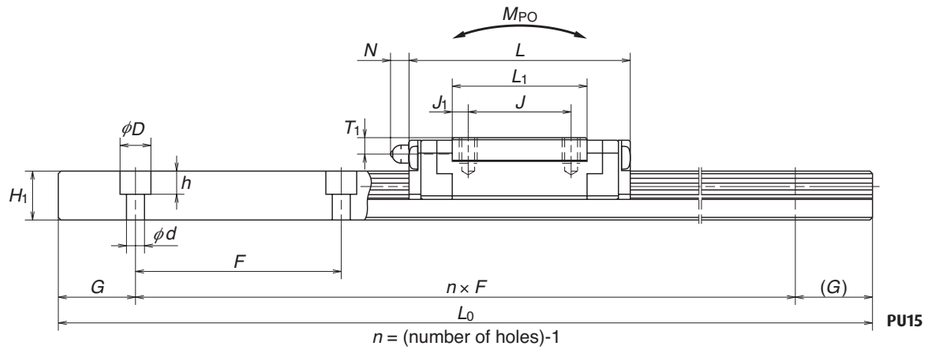


PU15

Side View



PU09, 12



PU15

n = (number of holes)-1

Unit: mm

Model No.	Assembly			Ball Slide													Rail							Basic Load Rating					Ball Diameter	Weight	
	Height			Width	Length	Mounting Hole								Grease Fitting			Width	Height	Pitch	Mounting Bolt Hole			Max Length (Single Rail)	Dynamic	Static	Static Moment					
	H	E	W_2	W	L	B	J	M x pitch x ℓ	B_1	L_1	J_1	K	T	Mounting Hole Size	T_1	N	W_1	H_1	F	d x D x h	B_3	G	L_{0max}	C (N)	C_0 (N)	M_{R0} (N•m)	M_{P0} (N•m)	M_{Y0} (N•m)	D_w	Ball Slide (g)	Rail (g/100 mm)
PU09TR PU09UR	10	2.2	5.5	20	30.0 41.0	15	10 16	M3×0.5×3	2.5	19.6 30.6	4.8 7.3	7.8	2.6	—	—	—	9	5.5	20	3.5×6×4.5	4.5	7.5	600	1490 2100	2150 3500	10.0 16.4	6.1 15.6	6.1 15.6	1.5875	16 25	35
PU12TR PU12UR	13	3.0	7.5	27	35.0 48.7	20	15 20	M3×0.5×3.5	3.5	20.4 34.1	2.7 7.1	10.0	3.4	—	—	—	12	7.5	25	3.5×6×4.5	6.0	10.0	800	2830 4000	3500 5700	21.7 35.0	11.4 28.3	11.4 28.3	2.3812	32 53	65
PU15AL PU15BL	16	4.0	8.5	32	43.0 61.0	25	20 25	M3×0.5×5	3.5	26.2 44.2	3.1 9.6	12.0	4.4	ϕ3	3.2	(3.6)	15	9.5	40	3.5×6×4.5	7.5	15.0	1000	5550 8100	6600 11300	49.5 54.5	25.6 69.5	25.6 69.5	3.1750	59 100	105

Note: Basic dynamic load rating C is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface.
To convert C to C_{100} for a 100-km fatigue life, divide C by 1.26.

Linear Guides: PE Series

Part Number Example for Ball Slide Only

Random-Matching Ball Slide	Size	Shape / Height		Accessories
PAE	15	AL	S	-K
			S: Stainless Steel	**K:** With NSK K1

Reference Part Number for Rail Only

Random-Matching Rail	Size	Rail Length (mm)	Shape	Material / Surface Treatment	Butting Rail Specification	NSK Control Number (*** is required when making inquiries)	Accuracy	
P1E	15	0470	R	K	N	***	PC	T
			S: PE05・07・09・12 **R:** PE15		**N:** Non-butting **L:** Butting		**PC:** Only PC Grade is Available	**Z:** Standard

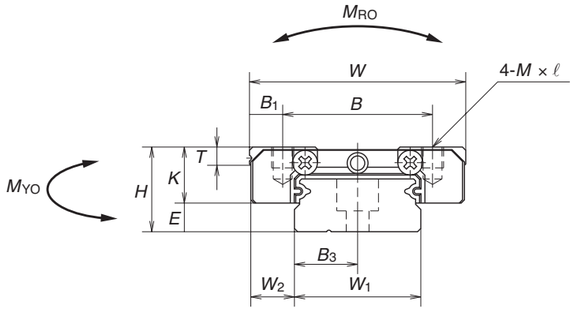
Reference Part Number for Assembly (Ball Slide + Rail)

Series	Size	Rail Length (mm)	Shape / Height	Material / Surface Treatment	Number of Ball Slides Per Rail	NSK Control Number (*** is required when making inquiries)	Accuracy	Preload
PE	15	0470	AL	K	2	***	PC	T
				K: Stainless Steel **H:** Stainless Steel + Surface Treatment			**PC:** Only PC Grade is Available **KC:** With NSK K1	**T:** Fine Clearance (standard)

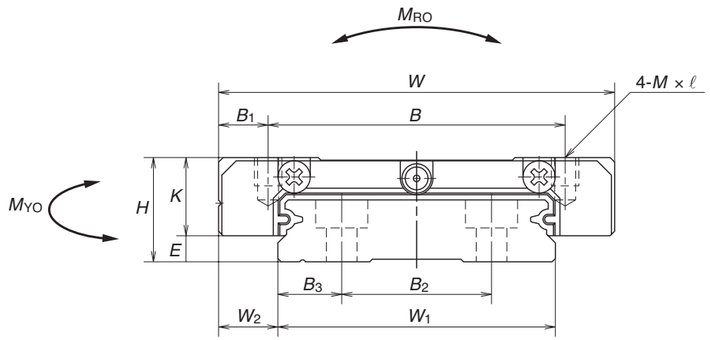
Linear Guides: PE Series

Ball Slide Models: AR, TR, UR, BR

Front View

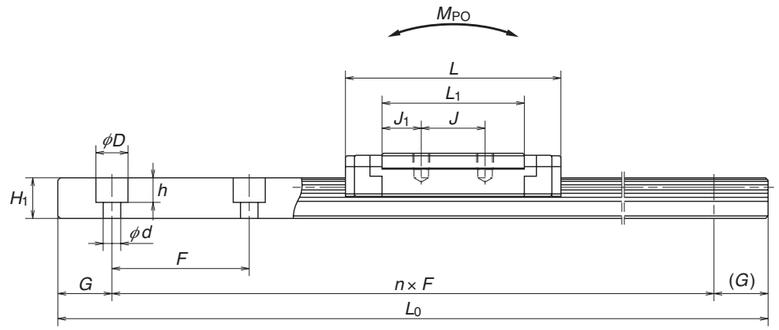


PE09, 12

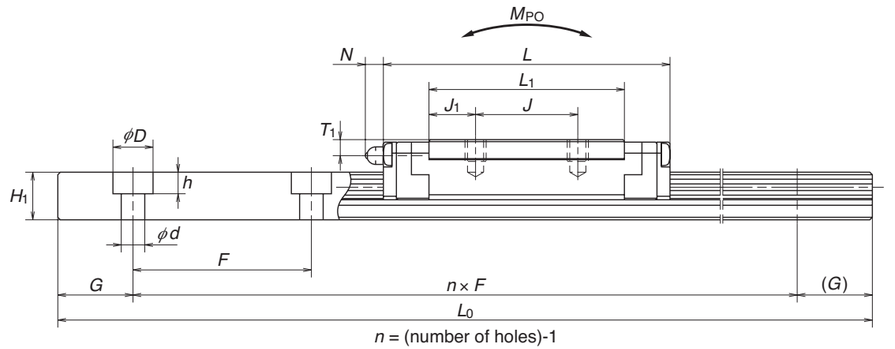


PE15

Side View



PE09, 12



PE15

n = (number of holes)-1

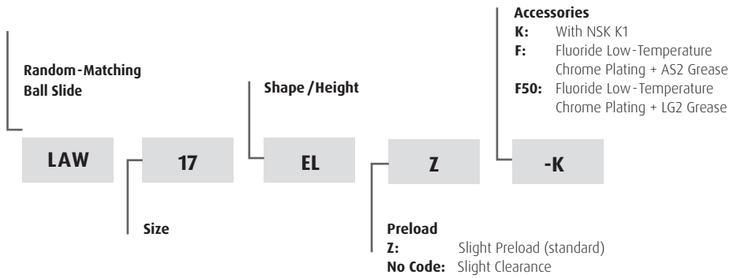
Unit: mm

Model No.	Assembly			Ball Slide												
	Height			Width	Length	Mounting Hole								Grease Fitting		
	H	E	W_2	W	L	B	J	M x pitch x ℓ	B_1	L_1	J_1	K	T	Mounting Hole Size	T_1	N
PE09TR PE09UR	12	4	6	30	39.8 51.2	21 23	12 24	M3×0.5×3	4.5 3.5	26.6 38.0	7.3 7.0	8.0	2.8	—	—	—
PE12AR PE12BR	14	4	8	40	45.0 60.0	28	15 28	M3×0.5×4	6.0	31.0 46.0	8.0 9.0	10.0	3.2	—	—	—
PE15AR PE15BR	16	4	9	60	56.6 76.0	45	20 35	M4×0.7×4.5	7.5	38.4 57.8	9.2 11.4	12.0	4.1	ϕ3	3.2	(3.3)

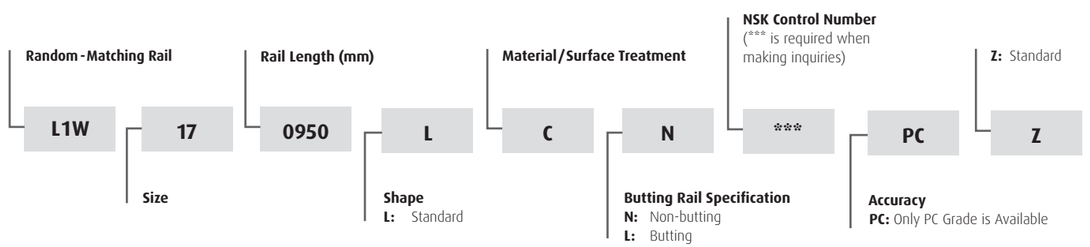
Rail								Basic Load Rating					Ball Diameter	Weight	
Width	Height		Pitch	Mounting Bolt Hole d x D x h			Max Length (Single Rail)	Dynamic	Static	Static Moment					
W_1	H_1	B_2	F		B_3	G	L_{0max}	C (N)	C_0 (N)	M_{RO} (N•m)	M_{PO} (N•m)	M_{YO} (N•m)	D_w	Ball Slide (g)	Rail (g/100m)
18	7.5	—	30	3.5×6×4.5	9.0	10	800	3000 4000	4500 6700	36.5 54.5	17.3 37.5	17.3 37.5	2.000	35 50	95
24	8.5	—	40	4.5×8×4.5	12.0	15	1000	4350 5800	6350 9550	70.5 106.0	29.3 63.5	29.3 63.5	2.381	66 98	140
42	9.5	23	40	4.5×8×4.5	9.5	15	1200	7600 10300	10400 16000	207.0 320.0	59.0 135.0	59.0 135.0	3.175	140 211	275

Note: Basic dynamic load rating C is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface.
To convert C to C_{100} for a 100-km fatigue life, divide C by 1.26.

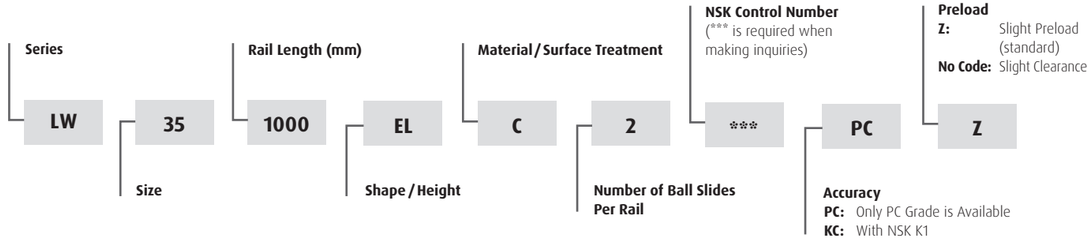
Part Number Example for Ball Slide Only



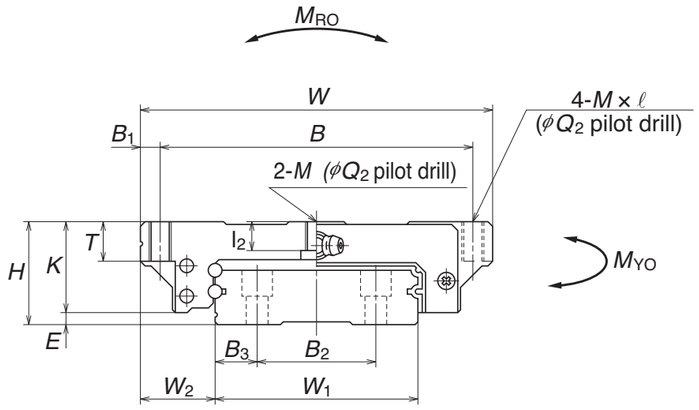
Reference Part Number for Rail Only



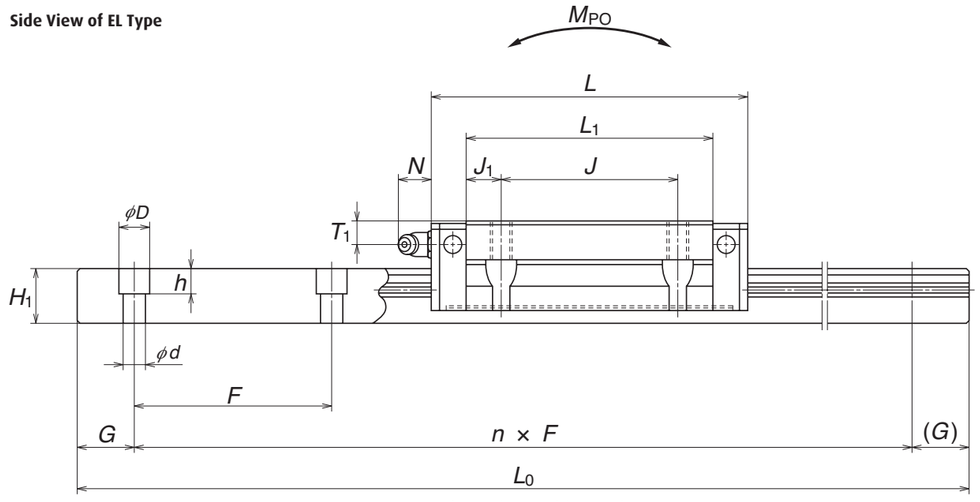
Reference Part Number for Assembly (Ball Slide + Rail)



Front View of EL Type



Side View of EL Type



n = (number of holes)-1

Unit: mm

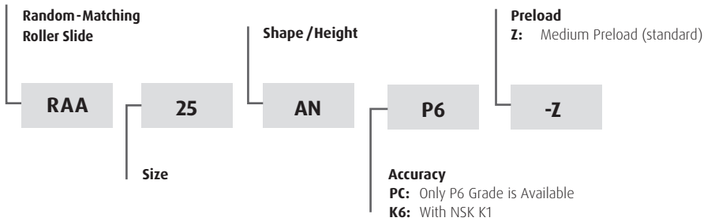
Model No.	Assembly			Ball Slide													
	Height			Width	Length	Mounting Hole										Grease Fitting	
	H	E	W_2	W	L	B	J	M x pitch x ℓ	ℓ_2	Q_2	B_1	L_1	J_1	K	T	Hole Size	T_1	N
LW17EL	17	2.5	13.5	60	51.4	53	26	M4×0.7×6	3.2	3.3	3.5	35	4.5	14.5	6	φ3	4.0	3
LW21EL	21	3.0	15.5	68	58.8	60	29	M5×0.8×8	3.7	4.4	4.0	41	6.0	18.0	8	M6×0.75	4.5	11
LW27EL	27	4.0	19.0	80	74.0	70	40	M6×1×10	6.0	5.3	5.0	56	8.0	23.0	10	M6×0.75	6.0	11
LW35EL	35	4.0	25.5	120	108.0	107	60	M8×1.25×14	9.0	6.8	6.5	84	12.0	31.0	14	M6×0.75	8.0	11
LW50EL	50	4.5	36.0	162	140.6	144	80	M10×1.5×18	14.0	8.6	9.0	108	14.0	45.5	18	Rc1/8	14.0	14

Rail								Basic Load Rating					Ball Diameter	Weight	
Width	Height		Pitch	Mounting Bolt Hole d x D x h		G (recommended)	Max length (Single Rail)	Dynamic	Static	Static Moment				Ball Slide (kg)	Rail (kg/m)
W_1	H_1	B_2	F		B_3		L_{0max}	C (N)	C_0 (N)	M_{R0} (N•m)	M_{P0} (N•m)	M_{Y0} (N•m)	D_w		
33	8.7	18	40	4.5×7.5×5.3	7.5	15	1000	5600	11300	135	44.0	37	2.381	0.2	2.1
37	10.5	22	50	4.5×7.5×5.3	7.5	15	1600	6450	13900	185	65.5	55	2.381	0.3	2.9
42	15.0	24	60	4.5×7.5×5.3	9.0	20	2000	12800	26900	400	171.0	143	3.175	0.5	4.7
69	19.0	40	80	7×11×9	14.5	20	2400	33000	66500	1690	645.0	545	4.762	1.5	9.6
90	24.0	60	80	9×14×12	15.0	20	3000	61500	117000	1530	1530.0	1280	6.350	4.0	15.8

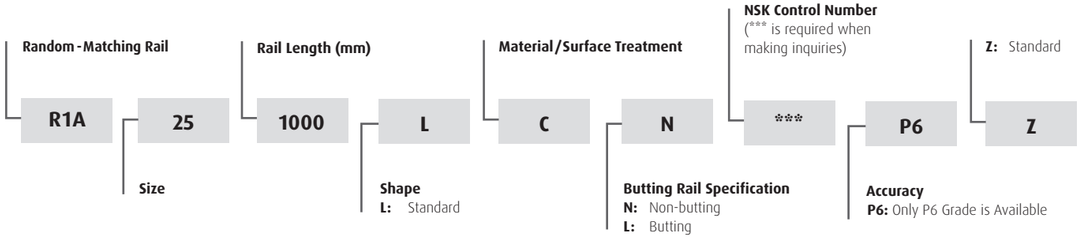
Note: Basic dynamic load rating C is a load that allows for a 50-km rating fatigue life and is a vertical and constant load on the ball slide mounting surface.

To convert C to C_{100} for a 100-km fatigue life, divide C by 1.26.

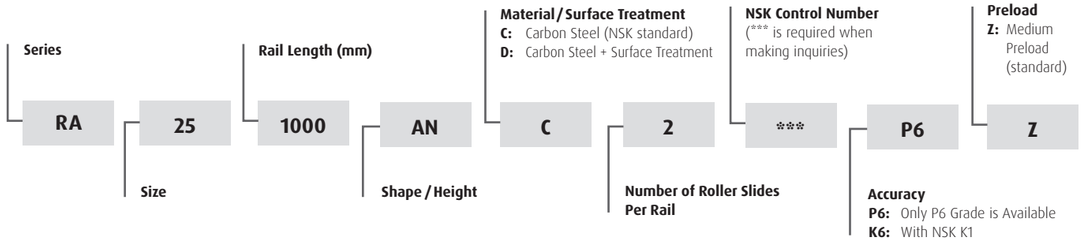
Part Number Example for Roller Slide Only



Reference Part Number for Rail Only



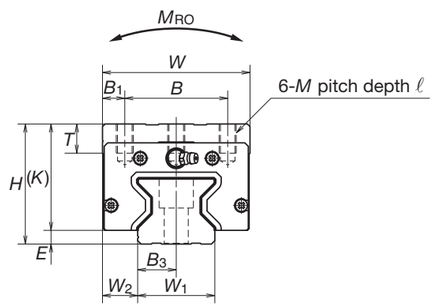
Reference Part Number for Assembly (Roller Slide + Rail)



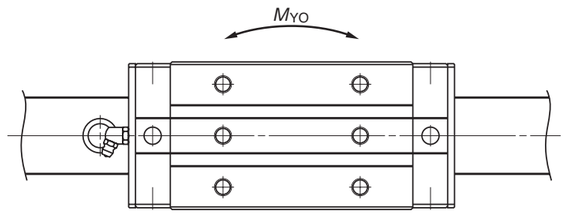
Linear Guides: RA Series

Roller Slide Models: AN, BN

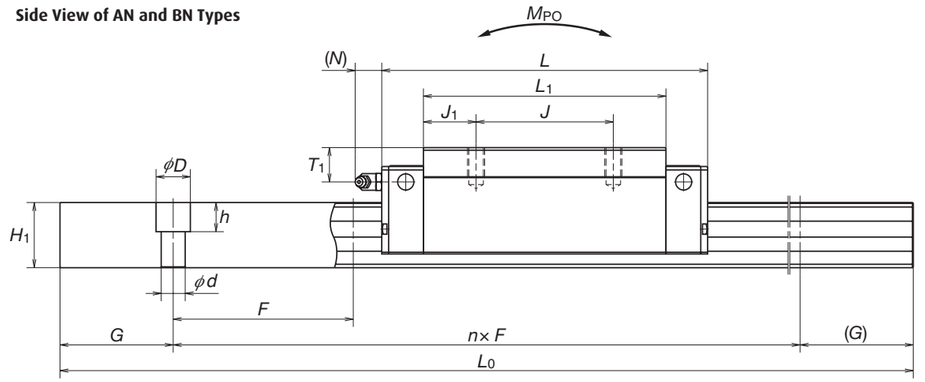
Front View of AN and BN Types



Upper View of AN and BN Types



Side View of AN and BN Types



n = (number of holes)-1

Unit: mm

Model No.	Assembly			Roller Slide													Rail							Basic Load Rating					Weight	
	Height			Width	Length	Mounting Hole							Grease Fitting			Width	Height	Pitch	Mounting Bolt Hole			Max Length (Single Rail)	Dynamic	Static	Static Moment			Roller	Rail
	H	E	W_2	W	L	B	J	M x pitch x ℓ	B_1	L_1	J_1	K	T	Mounting Hole Size	T_1	N	W_1	H_1	F	d x D x h	B_3	G	L_{0max}	C (N)	C_0 (N)	M_{RO} (N•m)	M_{PO} (N•m)	M_{YO} (N•m)	Slide (kg)	(kg/m)
RA25AN RA25BN	40	5.0	12.5	48	97.5 115.5	35	35 50	M6×1×9	6.5	65.5 83.5	15.25 16.75	35	12	M6×0.75	10	11	23	24.0	30.0	7×11×9	11.5	20.0	3000	29200 35400	72700 92900	970 1240	760 1240	760 1240	0.60 0.91	3.4
RA30AN RA30BN	45	6.5	16.0	60	110.8 135.4	40	40 60	M8×1.25×11	10.0	74.0 98.6	17.00 19.30	39	14	M6×0.75	10	11	28	28.0	40.0	9×14×12	14.0	20.0	3500	38900 47600	93500 12000	1670 2170	1140 1950	1140 1950	1.00 1.30	4.9
RA35AN RA35BN	55	6.5	18.0	70	123.8 152.0	50	50 72	M8×1.25×12	10.0	83.2 111.4	16.60 19.70	49	15	M6×0.75	15	11	34	31.0	40.0	9×14×12	17.0	20.0	3500	53300 67400	129000 175000	2810 3810	1800 3250	1800 3250	1.60 2.10	6.8
RA45AN RA45BN	70	8.0	20.5	86	154.0 190.0	60	60 80	M10×1.5×17	13.0	105.4 141.4	22.70 30.70	62	17	Rc1/8	14	14	45	38.0	52.5	14×20×17	22.5	22.5	3500	92800 116000	229000 305000	6180 8240	4080 7150	4080 7150	3.00 4.10	10.9
RA55AN RA55BN	80	9.0	23.5	100	184.0 234.0	75	75 95	M12×1.75×18	12.5	128.0 178.0	26.50 41.50	71	18	Rc1/8	21	14	53	43.5	60.0	16×23×20	26.5	30.0	3500	129000 168000	330000 462000	10200 14300	7060 13600	7060 13600	4.90 6.70	14.6
RA65AN RA65BN	90	13.0	31.5	126	228.4 302.5	76	70 120	M16×2×20	25.0	155.4 229.5	42.70 54.75	77	22	Rc1/8	19	14	63	55.0	75.0	18×26×22	31.5	35.0	3500	210000 288000	50000 756000	19200 28700	12700 28600	12700 28600	9.30 12.20	22.0

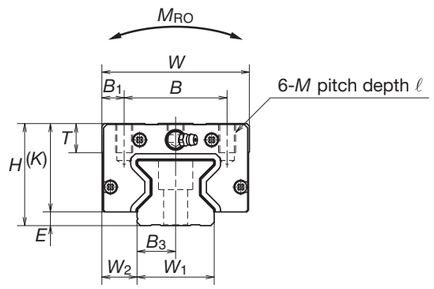
Note: Basic load rating complies with ISO standards (ISO14728-1, ISO14728-2).

If above basic dynamic load rating (100-km rating) is converted into 50-km rating, use the following formula: $C_{50\ km} = 1.23 \times C_{100\ km}$.

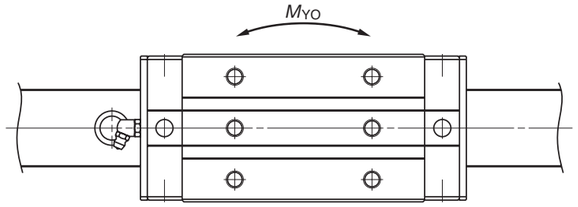
Linear Guides: RA Series

Roller Slide Models: AL, BL

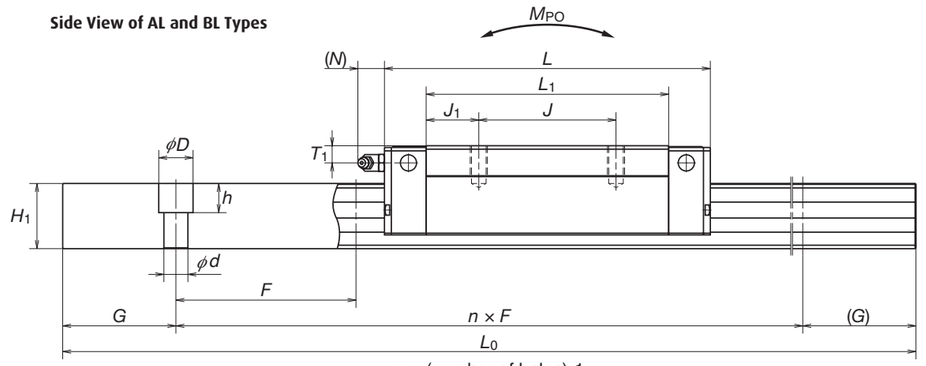
Front View of AL and BL Types



Upper View of AL and BL Types



Side View of AL and BL Types



n = (number of holes)-1

Unit: mm

Model No.	Assembly			Roller Slide													Rail							Basic Load Rating					Weight	
	Height			Width	Length	Mounting Hole							Grease Fitting			Width	Height	Pitch	Mounting Bolt Hole			Max Length (Single Rail)	Dynamic	Static	Static Moment			Roller slide (kg)	Rail (kg/m)
	H	E	W_2	W	L	B	J	M x pitch x ℓ	B_1	L_1	J_1	K	T	Mounting Hole Size	T_1	N	W_1	H_1	F	d x D x h	B_3	G	L_{0max}	C (N)	C_0 (N)	M_{RO} (N•m)	M_{PO} (N•m)	M_{YO} (N•m)		
RA25AL RA25BL	36	5.0	12.5	48	97.5 115.5	35	35 50	M6×1×8	6.5	65.5 83.5	15.25 16.75	31	12	M6×0.75	6	11	23	24	30.0	7×11×9	11.5	20.0	3000	29200 35400	72700 92900	970 1240	760 1240	760 1240	0.45 0.80	3.4
RA30AL RA30BL	42	6.5	16.0	60	110.8 135.4	40	40 60	M8×1.25×11	10.0	74.0 98.6	17.00 19.30	36	14	M6×0.75	7	11	28	28	40.0	9×14×12	14.0	20.0	3500	38900 47600	93500 121000	1670 2170	1140 1950	1140 1950	0.85 1.10	4.9
RA35AL RA35BL	48	6.5	18.0	70	123.8 152.0	50	50 72	M8×1.25×12	10.0	83.2 111.4	16.60 19.70	42	15	M6×0.75	8	11	34	31	40.0	9×14×12	17.0	20.0	3500	53300 67400	129000 175000	2810 3810	1800 3250	1800 3250	1.20 1.70	6.8
RA45AL RA45BL	60	8.0	20.5	86	154.0 190.0	60	60 80	M10×1.5×16	13.0	105.4 141.4	22.70 30.70	52	17	Rc1/8	10	14	45	38	52.5	14×20×17	22.5	22.5	3500	92800 116000	229000 305000	6180 8240	4080 7150	4080 7150	2.50 3.40	10.9
RA55AL RA55BL	70	9.0	23.5	100	184.0 234.0	75	75 95	M12×1.75×18	12.5	128.0 178.0	26.50 41.50	61	18	Rc1/8	11	14	53	43.5	60.0	16×23×20	26.5	30.0	3500	129000 168000	330000 462000	10200 14300	7060 13600	7060 13600	4.10 5.70	14.6

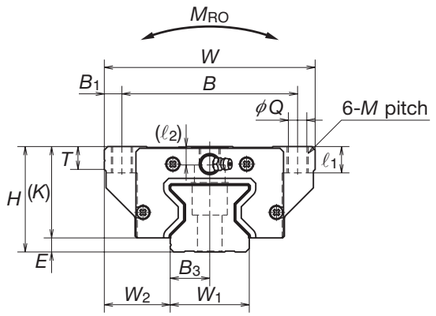
Note: Basic load rating complies with ISO standards (ISO14728-1, ISO14728-2).

If above basic dynamic load rating (100-km rating) is converted into 50-km rating, use the following formula: $C_{50\ km} = 1.23 \times C_{100\ km}$.

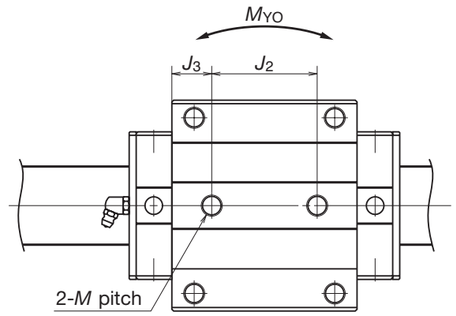
Linear Guides: RA Series

Roller Slide Models: EM, GM

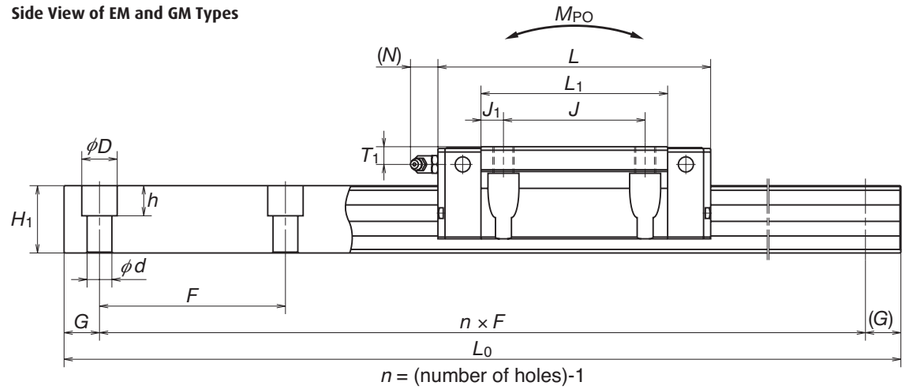
Front View of EM and GM Types



Upper View of EM and GM Types



Side View of EM and GM Types



n = (number of holes)-1

Unit: mm

Model No.	Assembly			Roller Slide																Rail							Basic Load Rating					Weight	
	Height			Width	Length	Mounting Hole											Grease Fitting			Width	Height	Pitch	Mounting Bolt Hole			Max Length (Single Rail)	Dynamic	Static	Static Moment			Roller slide (kg)	Rail (kg/m)
	H	E	W_2	W	L	B	J	J_2	M x pitch x ℓ_1 (ℓ_2)	Q x ℓ_1 (ℓ_2)	B_1	L_1	J_1	J_3	K	T	Mounting Hole Size	T_1	N	W_1	H_1	F	d x D x h	B_3	G	L_{0max}	C (N)	C_0 (N)	M_{RO} (N•m)	M_{PO} (N•m)	M_{YO} (N•m)		
RA25EM	36	5.0	23.5	70	97.5	57	45	40	M8×1.25×10 (11)	6.8×10 (11)	6.5	65.5	10.25	12.75	31	11	M6×0.75	6	11	23	24.0	30.0	7×11×9	11.5	20.0	3000	29200	72700	970	760	760	0.80	3.4
RA25GM					115.5							83.5	19.25	21.75													35400	92900	1240	1240	1240	1.10	
RA30EM	42	6.5	31.0	90	110.8	72	52	44	M10×1.5×12 (12.5)	8.6×12 (12.5)	9.0	74.0	11.00	15.00	36	11	M6×0.75	7	11	28	28.0	40.0	9×14×12	14.0	20.0	3500	38900	93500	1670	1140	1140	1.30	4.9
RA30GM					135.4							98.6	23.30	27.30													47600	121000	2170	1950	1950	1.70	
RA35EM	48	6.5	33.0	100	123.8	82	62	52	M10×1.5×13 (7)	8.6×13 (7)	9.0	83.2	10.60	15.60	42	12	M6×0.75	8	11	34	31.0	40.0	9×14×12	17.0	20.0	3500	53300	129000	2810	1800	1800	1.70	6.8
RA35GM					152.0							111.4	24.70	29.70													67400	175000	3810	3250	3250	2.30	
RA45EM	60	8.0	37.5	120	154.0	100	80	60	M12×1.75×15 (10.5)	10.5×15 (10.5)	10.0	105.4	12.70	22.70	52	13	Rc1/8	10	14	45	38.0	52.5	14×20×17	22.5	22.5	3500	92800	229000	6180	4080	4080	3.20	10.9
RA45GM					190.0							141.4	30.70	40.70													116000	305000	8240	7150	7150	4.30	
RA55EM	70	9.0	43.5	140	184.0	116	95	70	M14×2×18 (13)	12.5×18 (13)	12.0	128.0	16.50	29.00	61	15	Rc1/8	11	14	53	43.5	60.0	16×23×20	26.5	30.0	3500	129000	330000	10200	7060	7060	5.40	14.6
RA55GM					234.0							178.0	41.50	54.00													168000	462000	14300	13600	13600	7.50	
RA65EM	90	13.0	53.5	170	228.4	142	110	82	M16×2×24 (13)	14.6×24 (13)	14.0	155.4	22.70	36.70	77	22	Rc1/8	19	14	63	55.0	75.0	18×26×22	31.5	35.0	3500	210000	504000	19200	12700	12700	12.20	22.0
RA65GM					302.5							229.5	59.75	73.75													288000	756000	28700	28600	28600	16.50	

Note: Basic load rating complies with ISO standards (ISO14728-1, ISO14728-2).

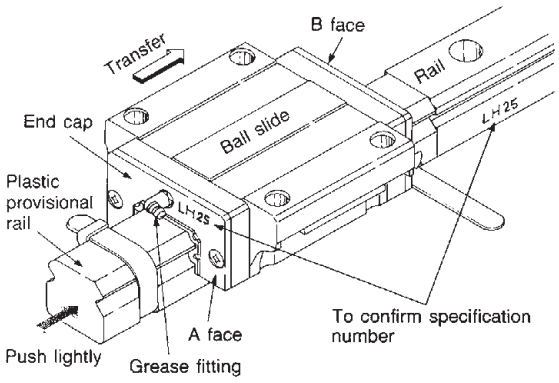
If above basic dynamic load rating (100-km rating) is converted into 50-km rating, use the following formula: $C_{50\ km} = 1.23 \times C_{100\ km}$.

Assembly

Interchangeable ball slides are shipped on (disposable) plastic provisional rails as shown in Fig I.1.

1. Wipe off anticorrosive oil from the rail.
2. All NSK slides come prepacked with Alvania 2 (AS2) grease for quick installation.
3. Align the rail with the bottom and side faces of the provisional rail while pushing the provisional rail lightly against the rail, slide the ball slide on the rail (Fig I.1).

Fig I.1 Assembly of Ball Slide with Rail



Mounting Method

Shoulder Height and Corner Shape at Mounting Face

When utilizing the reference surface to secure rail or ball slides to machine components the components must have the mounting face height (H', H") and corner chamfer (r) dimensions as listed in table below and illustrated in Figs. I.2 and I.3, to avoid interference.

Shoulder Height and Corner Shape at Mounting Face

Product No.	Radius of corner r (max)	Shoulder Height of Rail H′	Shoulder Height of Ball Slide H″
15	0.5	4.0	4.5
20	0.5	4.5	5.0
25	0.5	5.0	5.0
30	0.5	6.0	6.0
35	0.5	6.0	6.0
45	0.7	8.0	8.0
55	0.7	10.0	10.0
65	1.0	11.0	11.0

Fig I.2 Rail Datum Face Mounting Part

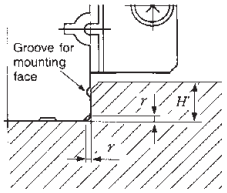
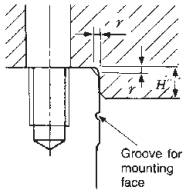


Fig I.3 Ball Slide Datum Face Mounting Part

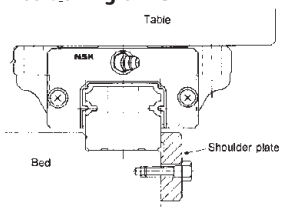


Mounting Procedure

For Cases where Datum Surface Exists on the Bed

1. Lightly tighten the rail mounting bolts and then use the shoulder plate to secure rail datum surface against bed mounting surface (See Fig. I.4).
2. Tighten rail mounting bolts to their recommended torque value (see table below). Tighten the bolts in an order which enables the wrench to help push the rail against the mounting surface (see Fig. I.5 for example).

Fig I.4 Positioning of Rail



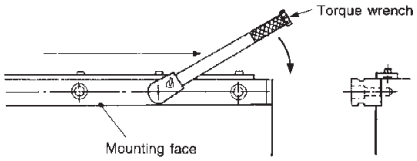
Recommended Torque for Rail Mounting Bolt (Case of Thermally Refined Bolt)

unit: kgf • cm

Bolt Nominal No.	Torque	Bolt Nominal No.	Torque
M3	10.8	M10	440
M4	25.0	M12	770
M5	52.0	M14	1240
M6	88.0	M16	2000
M8	220.0	--	--

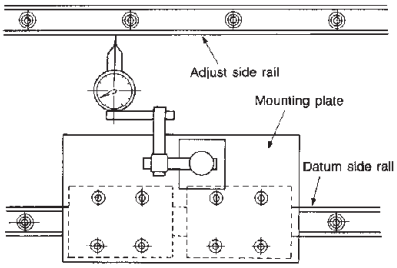
[1 kg • cm=0.8681 lb in]

Fig I.5 Tightening Direction



3. Mount the adjust side rail, as shown in Fig. I.6, while checking rail parallelism. For the jig shown in Fig. I.6, stability will be improved by mounting it to a ball slide.

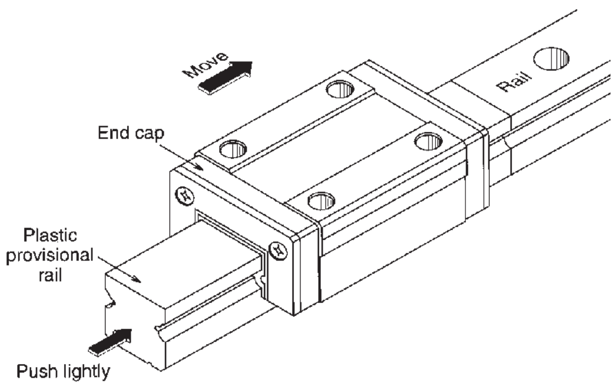
Fig I.6 Parallelism Measurement with Jigs



4. If dowel pins are being used they should be installed at this step.
5. Position the ball slides at specified intervals and mount the table gently.
6. Tighten ball slide mounting bolts of datum side while pushing the table so that the table and ball slide mounting reference surfaces are in contact.

Indication of Installed Standard Side

The datum face of each rail is indicated by a groove in the datum face or by an arrow mark on the end or top surface of the rail.



Lubrication

Grease Lubrication

NSK linear guides are packed with Alvania 2 (AS2) grease and can be used as delivered. The replenishment frequency is recommended to be once a year, but adjust the interval depending on the operational conditions.

To Change Direction of Grease Fitting

1. Remove the grease fitting with a wrench.
2. Wind some sealing tape on the thread of the fitting, then insert it and tighten. Be careful not to over torque when tightening into the side of the plastic bearing end cap.

Change of Fitting Position in Front/Back Direction

1. Remove the plug from the grease fitting mounting hole face B shown in Fig. I.1 with a hexagonal wrench.
2. Remove the grease fitting from face A and screw into hole face B.
3. In place of the removed fitting, insert the plug into the hole in the face A.

Change Grease Fitting Position to Side Surface

To mount the grease fitting on the end cap side face, or on the ball slide face, please consult NSK.

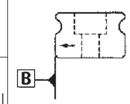
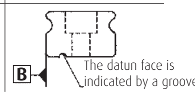
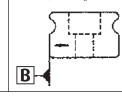
Oil Lubrication

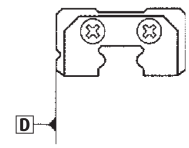
Oil piping can be connected to the tapped hole from where the grease fitting was removed. The recommended lubrication oil supply quantity per ball slide per hour Q is given by the following formula, where N is the rail width number.

$$Q = \frac{N}{150} \text{ (ml/hr)} \quad \ldots\ldots (5)$$

Using LH45 as an example, N=45, and

$$Q = \frac{45}{150} = 0.3\text{(ml/hr)}$$

Material \ Model	LU09 LE Series (all models)	LU12, 15
High-Carbon Steel		
Stainless Steel		



Notes on Usage

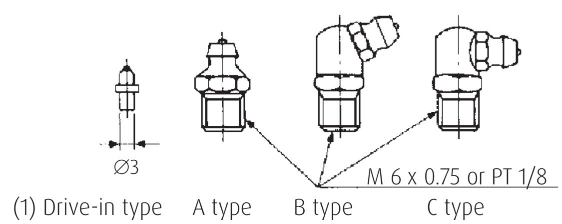
Separately packaged ball slide is mounted on a plastic temporary axis (disposable) as shown at left.

1. Wipe rust preventative oil from the rail.
2. Product is ready for immediate use. Comes prepacked with Alvania 2 (AS2) grease.
3. Note the groove mark which identifies the datum faces of ball slide and rail above.
4. Align the rail with the bottom and side faces of the provisional rail while pushing the provisional rail lightly against the rail, slide the ball slide on the rail (Fig I.1).

Grease Fittings for NSK Ball Slides

Type	Linear Guide Model #	Grease Fitting Part #	Thread Spec.
Drive	LH15, LS15, LW17	L50010000-301	Dia. 3mm
A	LS, LS 20, 25, 30, 25	L50000000-001	M6X0.75MM
B	LS, LS 20, 25, 30, 25	L50100000-001	M6X0.75MM
C	LS, LS 20, 25, 30, 25 LW 21, 27, 35	L50200000-001	M6X0.75MM
A	LH 45, 55, 65	L50003000-001	PT 1/8
B	LH 45, 55, 65	L50103000-001	PT 1/8
C	LH 45, 55, 65, LW 50	L50203000-001	PT 1/8

Shape of Grease Fitting



(1) Applies only to model No. LH15, LS15 and LW17.

NSK Grease Unit

Replenish grease to NSK linear guides and ball screws by a manual type hand grease pump. Install the grease in bellows tube to the pump. Several types of grease (80 g) are available.

Grease in a bellows tube

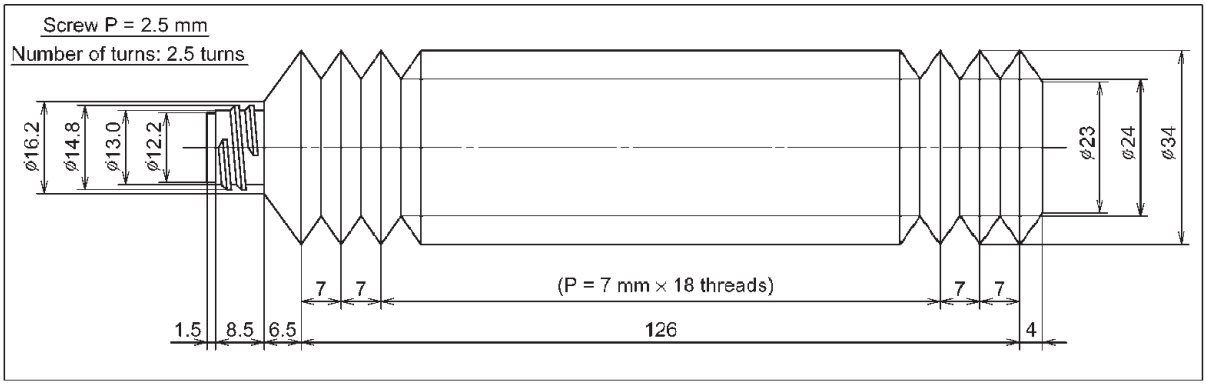
Composition of NSK Grease Unit

Components and grease types are shown below.

	Name	(tube type)	Reference Number
NSK Grease (80 g in a bellows tube)	NSK Grease AS2	(Brown)	NSK GRS AS2
	NSK Grease PS2	(Orange)	NSK GRS PS2
	NSK Grease LR3	(Green)	NSK GRS LR3
	NSK Grease LG2	(Blue)	NSK GRS LG2
NSK Hand Grease Pump Unit			
NSK Hand Grease Pump Straight nozzle NSK HGP NZ1 -- One nozzle is provided with the hand pump.)			NSK HGP
Grease nozzle (used with the hand grease pump)			
	NSK straight nozzle		NSK HGP NZ1
	NSK chuck nozzle		NSK HGP NZ2
	NSK drive fitting nozzle		NSK HGP NZ3
	NSK point nozzle		NSK HGP NZ4
	NSK flexible nozzle		NSK HGP NZ5
	NSK flexible extension pipe		NSK HGP NZ6
	NSK straight extension pipe		NSK HGP NZ7

NSK Greases (80 g in a bellows tube)

Bellows tube



NSK manual Grease Pump Unit

NSK Hand Grease Pump Unit
(Reference number: NSK HGP)

Features

- Light-weight ..... Can be operated by one hand yet there is no worry of making a mistake.
- Inserting by high pressure ..... Insert at 15 Mpa.
- No leaking ..... Does not leak when held upside down.
- Easy to change grease ..... Simply attach the grease in bellows tube.
- Remaining grease .... Can be confirmed through slit on the tube.
- Several nozzles ..... Five types of nozzles to choose from.

Specifications

- Spout volume..... 0.35 g/stroke
- Mass of main body..... 393 g
- Overall length ..... About 200 mm
- Overall width ..... About 200 mm
- Grease tube outer diameter ø38.1
- Accessory..... Several nozzles for a unique application can be attached

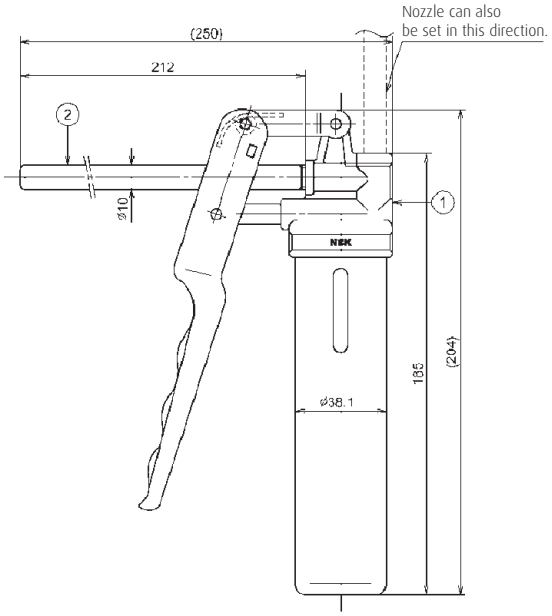
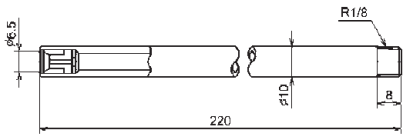
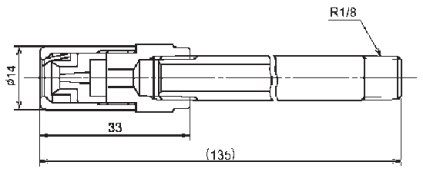
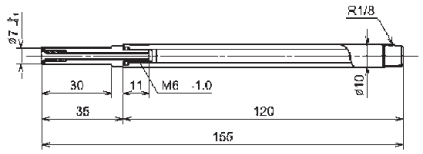
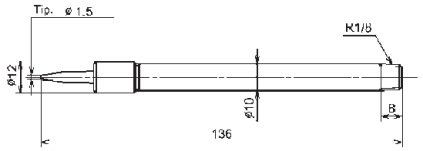
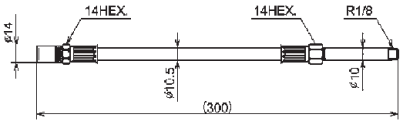
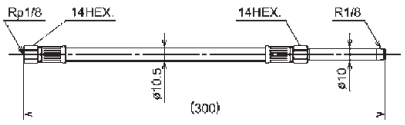
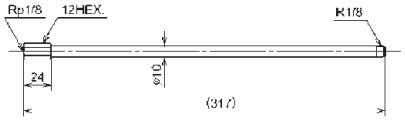


Fig I.7 NSK Hand Grease Pump with NSK straight nozzle

Nozzles

Nozzles that can be attached to NSK Hand Grease Pump

Name	Designation Code	Use	Dimensions
NSK straight nozzle	NSK HGP NZ1	Can be used with grease fitting A, B, and C under JIS B1575 standard.	
NSK chuck nozzle	NSK HGP NZ2	Can be used with grease fitting A, B, and C under JIS B1575 standard.	
NSK fitting nozzle	NSK HGP NZ3	Dedicated for the -f3 drive-in grease fitting.	
NSK point nozzle	NSK HGP NZ4	Used for linear guides and ball screws which do not have grease fitting. Used to supply grease directly to the ball grooves, or through the opening of ball slide or ball slide to inside.	
NSK flexible nozzle	NSK HGP NZ5	Tip of nozzle is flexible to supply grease in the areas where hand cannot reach.	
NSK flexible extension pipe	NSK HGP NZ6	Flexible extension pipe connects the grease pump and the nozzle.	
NSK straight extension pipe	NSK HGP NZ7	Straight extension pipe connects the grease pump and the nozzle.	

Grease Lubricant for Linear Guides and Ball Screws

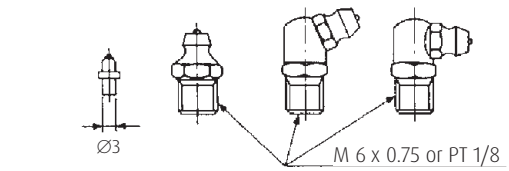
Type	Thickener	Base Oil	Base Oil Kinematic Viscosity cSt (40°C)	Range of use Temperature (°C)	Purpose
AS2	Lithium type	Mineral oil	130	-10 ~110	For general use at high load.
PS2	Lithium type	Synthetic oil + mineral oil	15	-50 ~110	For low temperature and high frequency operation.
LR3	Lithium type	Synthetic oil	30	-30 ~130	For ball screws at high speed, medium load.
LG2	Lithium type	Mineral oil + synthetic hydrocarbon oil	30	-20~70	For clean environment.
NF2	Urea composite type	Synthetic oil + mineral oil	27	-40~100	For fretting resistance.

Grease Nozzle used for NSK Linear Guide

Linear Guide Model	Tap Hole for Grease Fitting	Standard Grease Fitting	Straight Nozzle NZ1	Chuck Nozzles (two) NZ	Drive-in Nipple Nozzles NZ3	Point Nozzle NZ4	Flexible Nozzle NZ5
LS15	ø 3	Drive-in type			o		
LS20~35	M6 x 0.75	B type	o	o			o
LH15	ø 3	Drive-in type			o		
LH20~35	M6 x 0.75	B type	o	o			o
LH45~85	PT1 / 8	B type	o	o			o
LW17	ø 3	Drive-in type			o		
LW21~35	M6 x 0.75	B type	o	o			
LW50	PT/18	B type	o	o			o
LU09~15	-	None (1)				o (2)	o
LE09~15	-	None (1)				o (2)	

1) LU and LE Series: Apply grease directly to ball groove, etc. using a point nozzle.
2) LS20, LS25, LH20: Use straight nozzle. (Point nozzle tip cannot be used because it interferes wth the rail top surface).

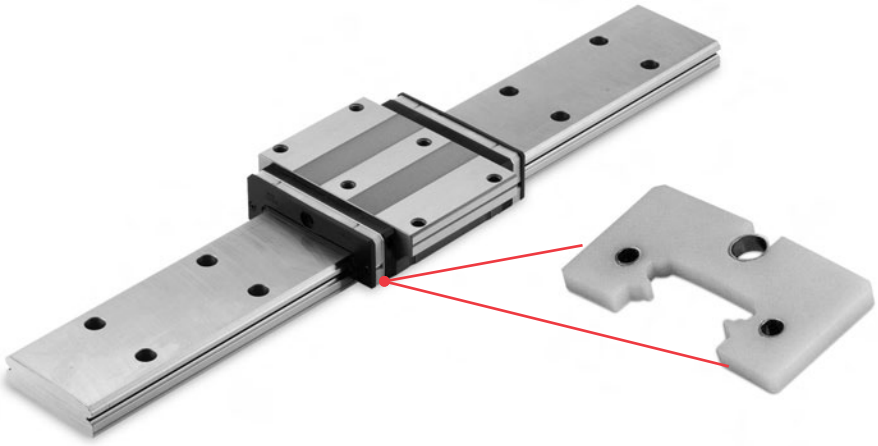
Figures of Grease Fittings



(1) Drive-in type A type B type C type

K1 Maintenance-Free Lubrication System

K1 Maintenance-Free Lubrication System



K1 Identification Number

Refer to the following numbering system when ordering.

Example:

Interchangeable Ball Slide		Size Number		Preload Code	
LA	H	30	AN	Z	-K
	Series Code		Z: In case of a light preload Ball slide shape code		NSK K1 Equipped

The NSK K1's distinctive capabilities as a compact and efficient oil-impregnated lubrication unit greatly increases the performance of the Linear Guide. The K1 Lubrication Unit is available in two types, one for industrial applications and one for food and medical devices where cleanliness and safety are paramount.

Features:

Long-term, Maintenance-Free Usage.
In mechanical environments where lubrication is difficult to apply, long-term running efficiency is maintained by using the NSK K1 in combination with grease.

Prevention of Oil-Related Environmental Pollution.
In locations where oil greatly affects the environment, or in mechanisms with severe hygiene restrictions, sufficient lubrication is provided using the NSK K1 in combination with grease.

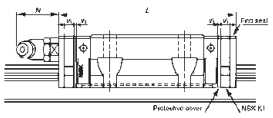
Effective in Environments where the Lubricant is Washed Away.
In facilities where mechanisms are washed down with water, or subject to severe weather conditions, long service life is ensured by using the NSK K1 in combination with grease. Especially effective under hygienic conditions where oil must not be dispersed.

Maintains Efficiency in Dusty Environments.
In environments where oil and grease-absorbing dust is produced, long-term efficiency is maintained by using the NSK K1 in combination with grease.

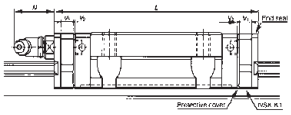
Interchangeable Linear Guide Dimensions - LH, LS, LW Series

Unit: mm

LH, LS Series



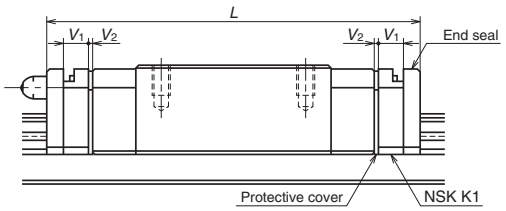
LW Series



Interchangeable Ball Slide Size Code	Ball Slide Form			Standard Ball Slide Length	Ball Slide Length with two NSK K1 L	Thickness of NSK K1 V_1	Thickness of Protective Cover V_2	Grease Fitting Projection N (mm)
LAH15	AN	EM		55.0	65.6	4.5	0.8	(5)
		GM		74.0	84.6			
LAH20	AN	EM		69.8	80.4	4.5	0.8	(14)
	BN	GM		91.8	102.4			
LAH25	AN	EM		79.0	90.6	5.0	0.8	(14)
	BN	GM		107.0	118.6			
LAH30	AN			85.6	97.6	5.0	1.0	(14)
		EM		98.6	110.6			
	BN	GM		124.6	136.6			
LAH35	AN	EM		109.0	122.0	5.5	1.0	(14)
	BN	GM		143.0	156.0			
LAH45	AN	EM		139.0	154.0	6.5	1.0	(15)
	BN	GM		171.0	186.0			
LAH55	AN	EM		163.0	178.0	6.5	1.0	(15)
	BN	GM		201.0	216.0			
LAH65*	AN	EM		193.0	211.0	8.0	1.0	(16)
	BN	GM		253.0	271.0			
LAS15	AL	EL	FL	56.8	66.4	4.0	0.8	(5)
	CL		KL	40.4	50.0			
LAS20	AL	EL	FL	65.2	75.8	4.5	0.8	(14)
	CL		KL	47.2	57.8			
LAS25	AL	EL	FL	81.4	92.0	4.5	0.8	(14)
	CL		KL	59.4	70.0			
LAS30	AL	EL	FL	96.4	108.4	5.0	1.0	(14)
	CL		KL	67.4	79.4			
LAS35	AL	EL	FL	108.0	121.0	5.5	1.0	(14)
	CL		KL	77.0	90.0			
LAW17	EL			51.4	61.6	4.5	0.6	(5)
LAW21	EL			58.8	71.4	5.5	0.8	(13)
LAW27	EL			74.0	86.6	5.5	0.8	(13)
LAW35	EL			108.0	123.0	6.5	1.0	(13)
LAW50	EL			140.6	155.6	6.5	1.0	(14)

*Contact NSK for information on assembly instructions.
Note: Can be used on PU/PE and RA. Contact NSK for availability.

K1 Maintenance-Free Lubrication System (cont.)



Dimension of PU Series Linear Guides Equipped with the NSK K1 Lubrication Unit

Unit: mm

Model No.	Ball Slide Length	Ball Slide Model	Standard Ball Slide Length	Ball Slide Length Equipped with Two NSK K1 L	Thickness of NSK K1, V_1	Thickness of Protective Cover, V_2	Grease Fitting Projection
PU05	Standard	TR	19.4	24.4	2.0	0.5	--
PU07	Standard	AR	23.4	29.4	2.5	0.5	--
PU09	Standard	TR	30.0	36.4	2.7	0.5	--
	Long	UR	41.0	47.4			
PU12	Standard	TR	35.0	42.0	3.0	0.5	--
	Long	UR	48.7	55.7			
PU15	Standard	AL	43.0	51.2	3.5	0.6	3.6
	Long	BL	61.0	69.2			

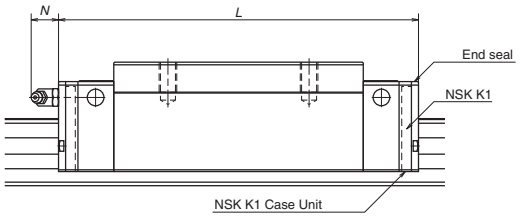
Note: Ball slide length equipped with NSK K1 = (Standard ball slide length) + (Thickness of NSK K1, V_1 × Number of NSK K1) (Thickness of the protective cover V_2 × 2)

Dimension of PE Series Linear Guides Equipped with the NSK K1 Lubrication Unit

Unit: mm

Model No.	Ball Slide Length	Ball Slide Model	Standard Ball Slide Length	Ball Slide Length Equipped with Two NSK K1 L	Thickness of NSK K1, V_1	Thickness of Protective Cover, V_2	Grease Fitting Projection
PE05	Standard	AR	24.1	28.9	2.0	0.4	--
PE07	Standard	TR	31.1	37.1	2.5	0.5	--
PE09	Standard	TR	39.8	46.8	3.0	0.5	--
	Long	UR	51.2	58.2			
PE12	Standard	AR	45.0	53.0	3.5	0.5	--
	Long	BR	60.0	68.0			
PE15	Standard	AR	56.6	66.2	4.0	0.8	3.3
	Long	BR	76.0	85.6			

Note: Ball slide length equipped with NSK K1 = (Standard ball slide length) + (Thickness of NSK K1, V_1 × Number of NSK K1) + (Thickness of the protective cover V_2 × 2)



Dimension of RA Series Linear Guides Equipped with the NSK K1 Lubrication Unit

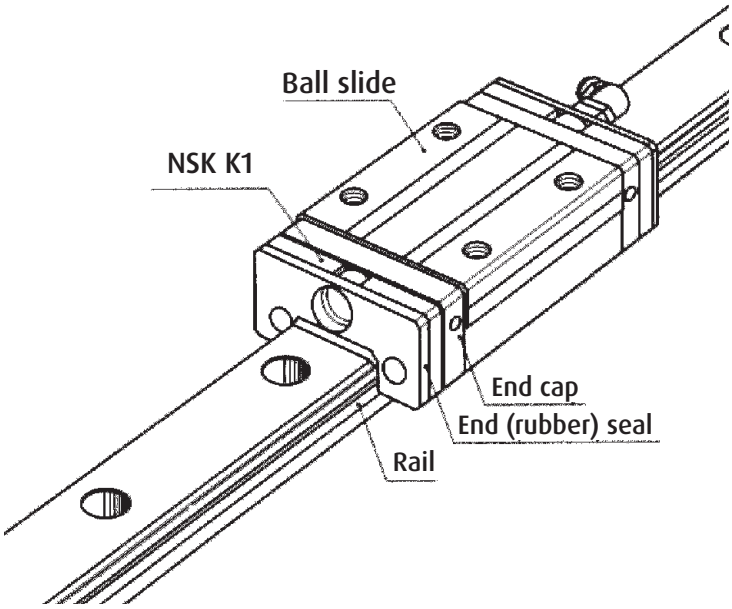
Unit: mm

Model No.	Roller Slide Length	Roller Slide Model	Roller Slide Length L				Protruding Area of the Grease Fitting N
			Standard	With NSK K1	Double Seal	Protector	
RA15	Standard	AN, AL, EM	70.0	79.0	76.0	75.4	(3)
	Long	BN, BL, GM	85.4	94.4	91.4	90.8	
RA20	Standard	AN, EM	86.5	95.5	92.5	93.1	(3)
	Long	BN, GM	106.3	115.3	112.3	112.9	
RA25	Standard	AN, AL, EM	97.5	107.5	103.9	104.1	(11)
	Long	BN, BL, GM	115.5	125.5	121.9	122.1	
RA30	Standard	AN, AL, EM	110.8	122.8	117.6	118.0	(11)
	Long	BN, BL, GM	135.4	147.4	142.2	142.6	
RA35	Standard	AN, AL, EM	123.8	136.8	130.6	131.0	(11)
	Long	BN, BL, GM	152.0	165.0	158.8	159.2	
RA45	Standard	AN, AL, EM	154.0	168.0	162.0	162.4	(14)
	Long	BN, BL, GM	190.0	204.0	198.0	198.4	
RA55	Standard	AN, AL, EM	184.0	198.0	192.0	192.4	(14)
	Long	BN, BL, GM	234.0	248.0	242.0	242.4	
RA65	Standard	AN, EM	228.4	243.4	238.4	239.4	(14)
	Long	BN, GM	302.5	317.5	312.5	313.5	

Note: Roller slide length equipped with NSK K1 = (Standard roller slide length) + (Thickness of NSK K1 Case Unit × Number of NSK K1 Case Unit)

K1 Maintenance-Free Lubrication System (cont.)

K1 Lubrication Unit Handling and Assembly Instructions



Handling Instructions

To maintain the NSK K1 unit's high efficiency over a long period of time, please follow these instructions:

1. Permissible temperature range Max. operating temperature: 50°C (122°F) Max. peak temperature: 80°C (176°F). If not installed immediately, they should be kept refrigerated. Avoid storage in direct sunlight.

2. Never leave the linear guide in close proximity to grease-removing organic solvents such as hexane, thinners, etc.

   Never immerse the linear guide in kerosene or rust preventative oils which contain kerosene.

Note

Other oils such as: water-based cutting oil, oil-based cutting oil, grease (mineral oil-AS2, ester-PS2) present no problems to the K1 lubricating unit's performance.

Assembly Instructions for the K1 Lubricating Unit for Linear Guides

1. Slide linear bearing on to the linear rail, using the plastic provisional rail supplied.
2. Remove the grease fitting from the end of the bearing.
3. Remove the Phillips screws (2 pieces).
4. Remove the end seal from end of bearing.
5. Install threaded plug from K1 kit (or see option 9 and 10 depending on application).
6. Install the cover plate from the K1 kit, to the end of bearing, against the end cap.
7. Install K1 lubricating unit without fixing rings, so it can be expanded over the rail.
8 Put the three (3) fixing rings in position on the K1 lubricating unit.
9. Replace the end seal, in front of the K1 lubricating unit.
10. Install connector screw for grease fitting.
11. Replace the grease fitting in connector screw.
12. Install the **extension** Phillips screws (2 pieces, supplied with the K1 unit kit).

Note: The K1 lubricating unit has a shelf life. They should be installed immediately upon receipt. It is important to avoid direct sun light and extreme heat conditions.

Unit Conversions

To convert

From	To	Multiply By
daN	N	10.000
kgf	N	9.810
kgf	lbf	2.205
kgf.cm	lbf.in	0.868
kgf.cm	ozf.in	13.890
kgf.m	lbf.ft	7.234
kgf.m	lbf.in	86.811
N.m	lbf.ft	0.738
mm	inch	0.03900
inch	mm	25.400

Precision Ground Ball Screw

Precision Ground Ball Screws are designed to ensure smooth, precise travel, reduced wear and longer life. NSK is the leading producer of these precision products. Custom designs can be ordered for demanding applications.

Ball Screw Code — W

Shaft Diameter (mm) — 16

Approx. Effective Threaded Length (Unit: X100mm) — 03

A-Series: MA, FA, SA
S-Series: MS, FS, SS — FA-

Serial No. of Design — 7

Preload Type
P: Oversized Ball
D: Double Nut
Z: Offset Lead — P

Recirculation Code
No Code: Tube
Y: Deflector
G: End Cap — G

Special Style — X

Accuracy Grade Code
C0: Highest Accuracy
C1:
C2:
C3:
C5:
C7:
C10: Lowest Accuracy — C5-

Axial Clearance Code
Z: No Axial Clearance (preload)
T: Fine Clearance, <5µm Clearance — Z

Lead (mm) — 32

- In addition to standard ground Ball Screws, NSK offers a complete line of custom Precision Ground Ball Screws.
- NSK also offers a wide variety of either Flange or Square style Ball Screw Support Unit kits.

Custom Part:

Ball Screw Code — W

Shaft Diameter (mm) — 16

Approx. Effective Threaded Length (Unit: X100mm) — 02

Franklin Indiana Plant — WF-

Serial No. of Design — 90

Preload Code
P: Oversized Ball
Z: Offset Lead
No Code: Clearance
D: Double Nut — P

Recirculation Code
No Code: Tube
Y: Deflector
G: End Cap
SS: Internal Recirculating (tangential pick-up) — G

Material Code — S1

Accuracy Grade Code
C0: Highest Accuracy
C1:
C2:
C3:
C5:
C7:
C10: Lowest Accuracy — C3-

Axial Clearance
Z: No Axial Clearance (preload)
T: Fine Clearance, <5µm Clearance
S: <20µm Clearance
N: <50µm Clearance
L: Largest Clearance, based on Ball Size — Z

Lead (mm) — 5.08

Plant Code — E

- NSK offers a wide variety of standard "off the shelf" ball screw support unit kits.
- NSK's standard line of both metric and inch series precision ground ball screws are manufactured to either a C3 or C5 accuracy grade.

Ball Screw Specification Sheet For New Applications

Detailed data is required in order for NSK to properly provide a ball screw specification. Please utilize the below sheet for gathering ball screw data. Page can be photocopied and faxed to NSK with details.

Customer Name: _____ Date: _____

Customer POC: _____ PO Number: _____

Customer Phone: _____ Customer E-mail: _____

Application: _____ ex: machine tool, transport, etc.

Speed and Travel:

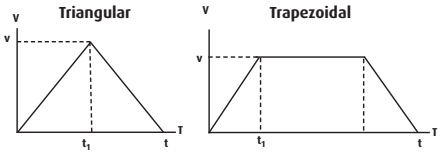
Stroke: _____ mm

Stroke Time (t): _____ sec

Ramp Time (t1): _____ sec

Acceleration: _____ m/s^2

Deceleration: _____ m/s^2

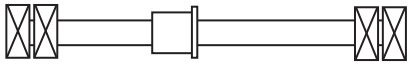


Orientation:

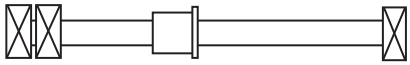
Mounting Orientation: (Horizontal/Vertical) _____

Support Method

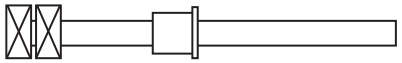
○ Fixed-Fixed



○ Fixed -Simple



○ Fixed-Free



Accuracy/Repeatability Requirements:

_____ _____

_____

_____

_____

Application Details (Please enter any other special considerations not covered)**:**

_____

_____

_____

_____

Environment:

Temperature Range:

deg C

_____ deg F

- ❑ General Industry
- ❑ Wash Down
- ❑ Clean Room
- ❑ Vacuum
- ❑ Outside Use
- ❑ Splash
- ❑ Corrosive
- ❑ High Humidity
- ❑ Contaminated
- ❑ Food/Medical

Additional Comments:

_____

_____

_____

Load Conditions:

Moving Mass: _____ kg

External Axial Force: _____ N

Maximum Load: _____ N

Maximum RPM: _____ rpm

Mass Supported by Linear Guides?

_____ Yes _____ No

Position of Ball Screw Relative to COG

X-coord: _____ (mm) (Horizontal Distance)

Y-coord: _____ (mm) (Vertical Distance)

Duty Cycle:

Life Expectation: _____ (Years)

Cycles Per Hour: _____

Operating Hours: _____ (Per Day)

Operating Days: _____ (Per Years)

NSK Precision America, Inc.

Phone: 1-800-255-4773

Fax: (317) 738-5050

Compact FA Quickship Ball Screws

Compact FA Series ball screws incorporate NSK's internal ball recirculation system and offer quiet, high-speed performance. In order to respond quickly to a wide range of needs, NSK offers four-week delivery on common sizes. These high-performing ball screws are ready for use in a variety of industries including: semiconductor manufacturing, food, medical equipment, factory automation and general industrial use.

Features

Quick Delivery
Manufacturing in the USA and comprehensive stocking program ensure four-week delivery and reduced shipping costs.

Compact Ball Screw
The outside diameter of the ball nut is as much as 30% smaller than those of existing NSK products. Compact size enables equipment and devices, such as linear stages, to be smaller. NSK has also designed low profile support units, specific for the Compact FA series, enabling a unique space-saving design.

Example of Standard Part Reference Number

Compact FA series Accuracy Grade: C5	Screw Shaft Diameter (mm)	Lead (mm)	NSK Control Number	Ball Screw Overall Shaft Length (mm)
PSS	15	10	N1D	1179

Quiet Operation
The noise level of ball screws has been reduced by 6 dB, about half of what is sensed by the ear. Ball screws subsequently produce a quieter and gentler sound.

High-Speed Operation
They handle speeds up to 5000 RPM. This capability dramatically expands the range of service conditions.

Grease Fitting provided as Standard Equipment
The new ball screws are equipped with a grease fitting (M5 × 0.8). Lubrication ports are provided in two locations to facilitate maintenance. The ball screws can be easily connected to an integrated lubrication system.

Contact Seal
Compact, thin plastic seal is available and helps to reduce entry of contamination, and minimize grease dispersion, maintaining a clean work environment.

Application: Combination of Shaft Diameter and Lead

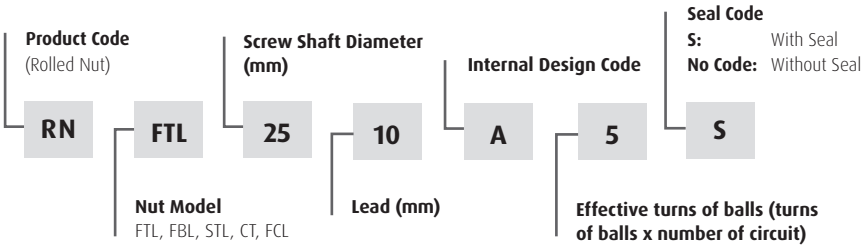
Shaft Diameter	Lead	Stroke														Recommended Support Unit	
		50	100	150	200	300	400	500	600	700	800	1000	1200	1600	2000	Fixed Side Support Unit	Simple Side Support Unit
10	5	•	•		•	•	•									WBK08-01B	WBK08S-01B
	10		•		•	•	•										
12	5	•	•		•	•	•	•								WBK08-01B	WBK08S-01B
	10		•		•	•	•	•									
	20		▲		▲	▲	▲	▲									
	30		▲		▲	▲	▲	▲									
15	5	•	•		•	•	•	•	•							WBK12-01B	WBK12S-01B
	10		•		•	•	•	•	•	•	•	•					
	20		▲		▲	▲	▲	▲	▲	▲	▲	▲					
	30		▲		▲	▲	▲	▲	▲	▲	▲	▲					
20	5			•	•	•	•	•	•	•	•					WBK15-01B	WBK15S-01B
	10				•	•	•	•	•	•	•	•	•				
	20					▲	▲	▲	▲	▲	▲	▲	▲	▲			
	30				▲	▲	▲	▲	▲	▲	▲	▲	▲				
	40						▲	▲	▲	▲	▲	▲	▲	▲	▲		
	60						▲	▲	▲	▲	▲	▲	▲	▲	▲		
25	5			•	•	•	•	•		•	•	•				WBK20-01	WBK20S-01
	10					•	•	•	•	•	•	•		•			
	20							•	•	•	•	•	•	•	•		
	25							•	•	•	•	•	•	•	•		
	30							▲	▲	▲	▲	▲	▲	▲	▲		
	50							▲	▲	▲	▲	▲	▲	▲	▲		

• Four week delivery ▲ Made to order

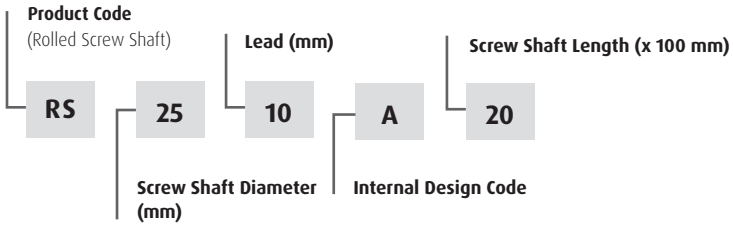
Reference Number

Reference number of rolled ball screw is described below. Please use reference number to order, or for a price inquiry

Nut Assembly (example)



Screw Shaft (example)



Product classification

NSK rolled ball screws are classified by nut model as shown in table below.

Classification of Rolled Ball Screws

Nut Model	Nut Shape		Recirculation System	Lead Classification
RNFTL		Flanged, Tube projecting type	Return tube type	Fine, medium lead High helix lead
RNFBL		Flanged Circular	Return tube type	Fine, medium lead
RNCT		V-thread (no flange) Projecting tube type	Return tube type	Fine lead
RNSTL		Square type	Return tube type	Small, medium lead
RNFCL		Flanged Circular	End cap type	High helix lead Ultra high helix lead

Features

- Short delivery time: R Series is standardized, and available in stock.
- Interchangeable screw shaft and ball nut: Screw shaft and nut assembly components are sold separately, and randomly matched. The maximum axial play after assembly is shown in the dimension tables.
- Low prices: Screw shaft is processed by rolling. This is why prices are lower than those of precision types.
- Abundant series: There are 128 types of nut assembly combinations in the series. Each combination has two to three different lengths in screw shaft.

Accuracy

- Lead accuracy: Ct10 grade (u_{300}=0.210). Refer to "Technical Description: Lead Accuracy" for details.
- Axial play: Varies with internal specification. Refer to the dimension tables.
- Run out of screw shaft center: Ct10 grade

Nut installation

Refer to "Technical Description: Installation".

Shaft End Machining

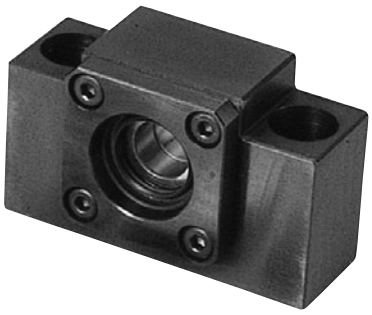
It is necessary to machine screw shaft end of the rolled ball screw.

Refer to "Configuration of rolled ball screw shaft end" if you use standard support unit. Refer to "Technical Description: Shaft end machining" for procedures and precautions.

Rust Prevention

Rust prevention agent is applied at time of delivery. But special surface treatment is not given to these ball screws. NSK furnishes treatment such as phosphate coating or electrolysis low temperature chrome plating on request.

Ball Screw Support Units



Reference number and applicable ball screw

For Light Load

Support Side Code
No code: Fixed Support Side
S: Simple Support Side
SF: Simple Support Side (for FSS and VFA)
R: Fixed Support Side (support kit)

Support Unit Product Code

WBK	08	S	01

Nominal Size

01: Square Type
11: Round Type

For Heavy Load

Bearing Combination
DF: Duplex (face to face)
DFD: Triplex (face to face)
DFF: Quadruple (face to face)

Support Unit Product Code

WBK	25	DF	31

Nominal Size

Design Serial Number

Support units

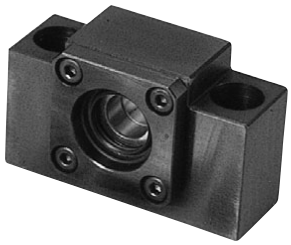
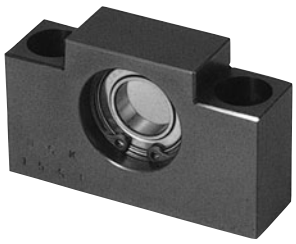
Classification

Ball Screw support units are categorized by their shape. Select the type that is appropriate for you to use.

Features

- NSK Bearings Inside:
  - General Use: Fixed support side units use Angular Contact Ball Bearings for rigidity and low friction torque.
  - Heavy Load/Machine Tool: Fixed support side units use Thrust Angular Contact bearings for greater rigidity and load capacity.
- Low Friction Torque: To minimize friction torque a deep groove ball bearing with a shield on both sides is used on the simple support side.
- High Dust Prevention: Oil seal is installed in small clearance on the fixed support side.
- Lock Nut: A fine grade lock nut is provided to fix bearing with high precision.
- Short Delivery Time: Standard items in stock.

Support Unit Categories

Application		Shape	Support Side	Bearing in Use	Bearing Bore Bearing Seat Diameter
Small equipment, light load	Square	WBK**-01* 	Fixed support side	Angular contact ball bearing	ϕ6 - ϕ25
		WBK**S-01* 	Simple support side	Deep groove ball bearing	ϕ6 - ϕ25
		WBK**SF-01* 		Deep groove ball bearing	ϕ12, ϕ15 (FSS type or VFA type)
Small equipment, light load	Round	WBK**R-11 (support kit) 	Fixed support side	Deep groove ball bearing (arranged to have angular contact)	ϕ4, ϕ6 (exclusive for RMA and RMS types)
		WBK**-11* 		Angular contact ball bearing	ϕ6 - ϕ25
Machine tools, heavy load	Round	WBK**DF*-31 	Fixed support side	Thrust angular contact ball bearing	ϕ17 - ϕ40

Ball Screw Support Units (cont.)

Tables below show "shaft diameter/lead combinations" of standard ball screws that are applicable to support units.

Support Units for Light Load and Applicable "Screw Shaft Diameter/Lead Combinations"

Light Load/Small Equipment

Support unit/reference number			"Screw Shaft Diameter/Lead Combinations" of Standard Ball Screws that are Applicable to Support Unit (mm)
Square		Round	
Fixed Support Side (Driving Motor Side)	Simple Support Side (Opposite to Driving Motor)	Fixed Support Side	
WBK06-01A	—	WBK06-11	φ4x1, φ6x1
WBK08-01A	WBK08S-01	WBK08-11	φ8x1, φ8x1.5, φ8x2, φ10x2, φ10x2.5
WBK10-01A	WBK10S-01	WBK10-11	φ10x4, φ12x2, φ12x2.5, φ12x5, φ12x10
WBK12-01A	WBK12S-01	WBK12-11	φ14x5, φ14x8, φ15x10, φ15x20, φ16x2 φ16x2.5, φ16x5, φ16x16, φ16x32
WBK15-01A	WBK15S-01	WBK15-11	φ20x4, φ20x5, φ20x10, φ20x20, φ20x40
WBK20-01	WBK20S-01	WBK20-11	φ25x4, φ25x5, φ25x6, φ25x10, φ25x20 φ25x25, φ25x50, φ28x5, φ28x6
WBK25-01	WBK25S-01	WBK25-11	φ32x5, φ32x6, φ32x8, φ32x10 φ32x25, φ32x32

Notes: 1. Reference number is based on the bearing bore on the fixed support side.
2. Please note that the reference numbers 12 or below on the simple-side support do not match the bore of the deep-groove ball bearing in use.

Support Units for Heavy Load and Applicable "Screw Shaft Diameter/Lead Combinations"

Heavy Load/Machine Tools

Support Unit/Reference Number		"Screw Shaft Diameter/Lead Combinations" of Standard Ball Screws that are Applicable to the Support Unit (mm)
Fixed Support Side (Drive Motor Side)	Fixed Support Side (Opposite to Drive Motor)	
WBK30DF-31	WBK25DF-31	φ36x10
WBK30DFD-31	WBK25DFD-31	φ36x10, φ40x10
WBK30DF-31	WBK30DF-31	φ40x5, φ40x8, φ40x10, φ40x12
WBK30DFD-31	WBK30DFD-31	φ40x12
WBK35DF-31	WBK35DF-31	φ45x10
WBK40DF-31	WBK40DF-31	φ50x10
WBK40DFD-31	WBK40DFD-31	φ50x10

Support Units for Light Load and Small Equipment

Fixed Support Side Support Unit						Simple Support Side Support Unit		
Reference No.	Use	Axial Direction			Maximum Starting Torque [N•cm]	Reference No.	Bearing Reference No.	Radial Direction Basic Dynamic Load Rating C [N]
		Basic Dynamic Load Rating Ca [N]	Load Limit [N]	Rigidity [N/μm]				
WBK06-01A	General	2670	1040	28.0	0.49	—	—	—
WBK06-11	General	2670	1040	28.0	0.49	—	—	—
WBK08-01A	General	4400	1450	49.0	0.88	WBK08S-01	606ZZ	2260
WBK08-01B	Low type	6600	2730	94.0	1.90	WBK08S-01B	606ZZ	2260
						WBK12SF-01B*1	6801ZZ	1920
WBK08-01C	Clean environment	3100	1100	36.0	0.52	WBK08S-01C	606VV	2260
WBK08-11	General	4400	1450	49.0	0.88	WBK08S-01	606ZZ	2260
WBK08-11B	Low type	6600	2730	94.0	1.90	—	606ZZ	2260
WBK08-11C	Clean environment	3100	1100	36.0	0.52	WBK08S-01C	606VV	2260
WBK10-01A	General	6600	2730	94.0	1.90	WBK10S-01	608ZZ	3300
						WBK12SF-01*2	6001ZZ	5100
WBK10-01B	Low type	6600	2730	94.0	1.90	—	608ZZ	3300
WBK10-01C	Clean environment	4250	1364	50.0	1.10	WBK10S-01C	608VV	3300
WBK10-11	General	6600	2730	94.0	1.90	WBK10S-01	608ZZ	3300
WBK10-11C	Clean environment	4250	1364	50.0	1.10	WBK10S-01C	608VV	3300
WBK12-01A	General	7100	3040	104.0	2.10	WBK12S-01	6000ZZ	4550
						WBK15SF-01*2	6902ZZ	4350
WBK12-01B	Low type	7100	3040	104.0	2.10	WBK12S-01B	6000ZZ	4550
						WBK15SF-01B*1	6902ZZ	4350
WBK12-01C	Clean environment	4700	2443	57.0	1.20	WBK12S-01C	6000VV	4550
WBK12-11	General	7100	3040	104.0	2.10	WBK12S-01	6000ZZ	4550
WBK12-11C	Clean environment	4700	2443	57.0	1.20	WBK12S-01C	6000VV	4550
WBK15-01A	General	7600	3380	113.0	2.40	WBK15S-01	6002ZZ	5600
WBK15-01B	Low type	7600	3380	113.0	2.40	WBK15S-01B	6002ZZ	5600
						WBK20SF-01B*1	6804ZZ	4000
WBK15-01C	Clean environment	5100	2757	63.0	1.30	WBK15S-01C	6002VV	5600
WBK15-11	General	7600	3380	113.0	2.40	WBK15S-01	6002ZZ	5600
WBK15-11C	Clean environment	5100	2757	63.0	1.30	WBK15S-01C	6002VV	5600
WBK17-01A	General	13400	5800	120.0	3.50	WBK17S-01	6203ZZ	9550
WBK20-01	General	17900	8240	155.0	6.20	WBK20S-01	6204ZZ	12800
						WBK25SF-01*1	6005ZZ	10100
WBK20-11	General	17900	8240	155.0	6.20	WBK20S-01	6204ZZ	12800
WBK25-01	General	20200	10000	192.0	7.20	WBK25S-01	6205ZZ	14000
WBK25-11	General	20200	10000	192.0	7.20	WBK25S-01	6205ZZ	14000
WBK04R-11	General	615	490	6.5	0.59	—	—	—
WBK06R-11	General	1280	930	9.0	0.59	—	—	—

*1: Exclusive for FSS type.
*2: Exclusive for VFA type.

Monocarrier®

Features

NSK's Monocarrier is the culmination of technology and innovation in linear motion. This lightweight, compact single axis linear actuator integrates quality NSK ball screw, linear guide and support bearings into one unit.

1 Light Weight, Compact Design

- Available in two different shapes of cross-section, depending on application.
  Light weight type: MCM Series
  Rigid type: MCH Series

2 All -In-One Structure

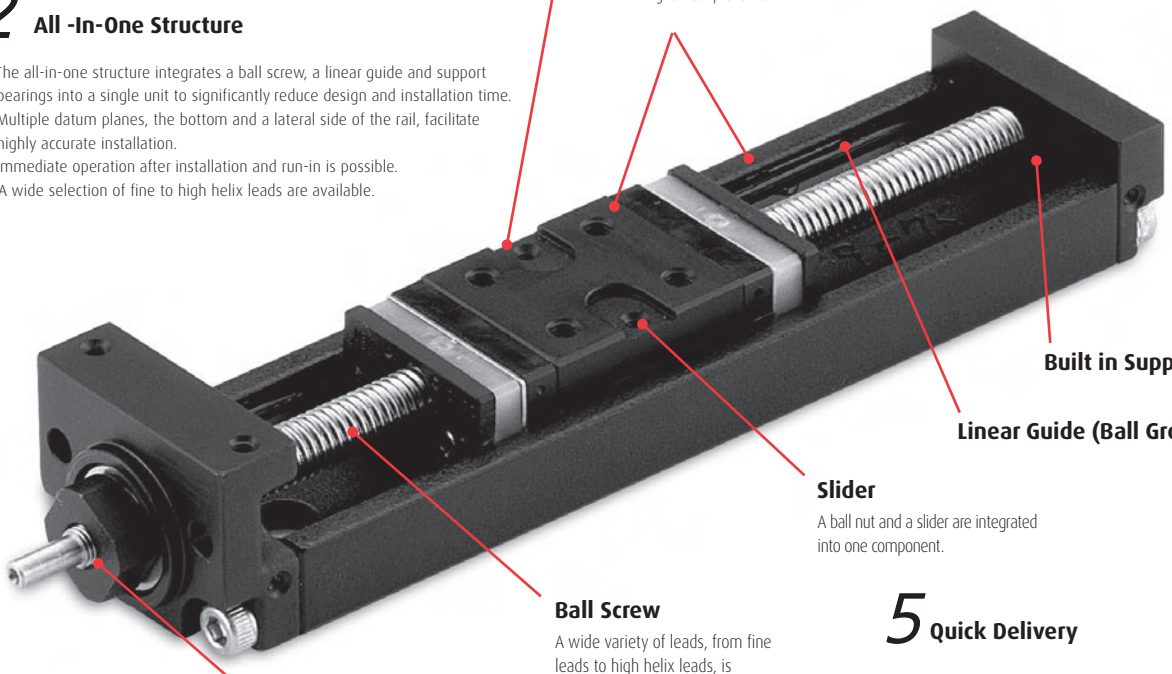
- The all-in-one structure integrates a ball screw, a linear guide and support bearings into a single unit to significantly reduce design and installation time.
- Multiple datum planes, the bottom and a lateral side of the rail, facilitate highly accurate installation.
- Immediate operation after installation and run-in is possible.
- A wide selection of fine to high helix leads are available.

3 Superb Antirust Capability

- Low temperature chrome plating is a standard feature for the bodies and sliders to control rusting in normal operating and storing environments. Fluoride low temperature chrome plating is optionally available for much higher rust prevention.

4 Long Term Maintenance Free

- Use of NSK K1 Lubrication Units and grease maintains a smooth lubricating performance for long periods in mechanical environments where lubrication is difficult to apply, where use of oil is not permitted because of hygienic issues, or where the mechanical equipment is subjected to frequent wash downs.
- NSK K1 lubrication unit is available for food processing machines and medical equipment.
- Grease for clean environments and for general machinery is available.



Built in Support Bearings

Linear Guide (Ball Groove)

Slider
A ball nut and a slider are integrated into one component.

Ball Screw
A wide variety of leads, from fine leads to high helix leads, is available.

Built in Support Bearings

5 Quick Delivery

Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

A monocarrier is a single axis unit that combines a ball screw, a linear guide, and a support bearing unit, for ease of design and assembly on a machine. Both MCM and MCH type Monocarriers, equiped with NSK K1 lubrication unit, (which enables long term maintenance free operation) are a standard feature.

Applications

› **Automotive Manufacturing Equipment** › **Manufacturing Machine for Semiconductors and Liquid Crystal Displays**
› **Food Processing / Medical Equipment** › **Optical / Glass Working Equipment** › **Telecommunication Manufacturing Equipment**

Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

MCM Series Monocarrier®

MCM Series Reference Number Coding

Monocarrier		Nominal Size Rail width, Unit: 10mm		Accuracy Grade H: High Grade P: Precision Grade		Slider Specification K: Single Slider D: Double Slider		NSK Management Number
MC	M	08	040	H	10	K	0	0
	M Type: MCM Series		Stroke Unit: 10mm		Ball Screw lead (mm)		Grease Specification 0: Standard AS2 Clean Grease Specification B: LG2	

With Optional Accessories

	E: With Optional Accessories									Sensor Unit		Motor Bracket
MC	E	08	040	H	10	K	0	0	K	0	0	0
									NSK Management Number		Cover Unit	

Monocarrier is suitable for a vertical axis of a material handling robot.

Applications

› Equipment that Needs to Reduce the Weight › Substitution for Pneumatic Actuator › Robots › Transporting Equipment › Measuring Machine › Equipment for Factory Automation

Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

Accuracy Grade and Limitations of MCM Series

The accuracy grade of Monocarrier standard inventories is high grade (H), except for lead 1 and 2 of MCM02 and MCM03. When you require strokes longer than 1,200mm, please consult NSK about the accuracy grade.

Accuracy Grade

Unit: μm

Grade	High Grade			Precision			
Stroke (mm)	Repeatability	Running Parallelism (vertical)	Backlash	Repeatability	Positioning Accuracy	Running Parallelism (vertical)	Backlash
~200	±10	14	20 or less	±3	20	8	3 or less
~400		16			25	10	
~600		20			30	12	
~700		23			30	15	
~1,000		23			35	15	
~1,200		30			40	20	

Limitations

Model No.		Lead (mm)	Slider	Stroke (mm)
MCM Series	MCM02	1,2	Single	150
	MCM03	1,2	Single	150
		10,12	Single	350
	MCM05	5,10,20,30*	Single	900
			Double	810
	MCM06	5,10,20	Single	1000
			Double	910
	MCM08	5,10,20,30*	Single	1000
			Double	880
	MCM10	10,20,30*	Single	1800
			Double	1670

* Applicable only to single slider.

Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

MCM Series Standard Combinations of Stroke and Ball Screw Lead

Single Slider

Unit: mm

Model No.	MCM02		MCM03				MCM05				MCM06			MCM08				MCM10		
Stroke \ Lead	1	2	1	2	10	12	5	10	20	30	5	10	20	5	10	20	30	10	20	30
50	•	•	•	•	•	•	•	•	•		•	•	•	•	•					
100	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•		•	•	
150	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•		•	•	
200					•	•	•	•	•		•	•	•	•	•	•		•	•	
250					•	•	•	•	•		•	•	•	•	•	•		•	•	
300							•	•	•	•	•	•	•	•	•	•		•	•	
400							•	•	•	•	•	•	•	•	•	•	•	•	•	
500							•	•	•	•	•	•	•	•	•	•	•	•	•	•
600							•	•	•	•	•	•	•	•	•	•	•	•	•	•
700											•	•	•	•	•	•	•	•	•	•
800											•	•	•	•	•	•		•	•	•
900																		•	•	
1000																		•	•	

Double Slider

• Mark: Standard Product

Unit: mm

Nominal Size	MCM05		MCM06			MCM08		MCM10	
Stroke \ Lead	10	20	5	10	20	10	20	10	20
60	•								
70								•	
80						•			
110	•		•	•					
160	•								
170								•	•
180						•	•		
210	•	•	•	•	•				
270								•	•
280						•	•		
310	•	•	•	•	•				
370								•	•
380						•	•		
410	•	•	•	•	•				
470								•	•
480						•	•		
510	•	•		•	•				
570								•	•
580						•	•		
610				•	•				
670								•	•
680						•	•		
710				•	•				
870								•	•

Please consult NSK about double slider of MCM02 and MCM03.

Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

MCM Series Basic Load Rating

Basic Load Rating

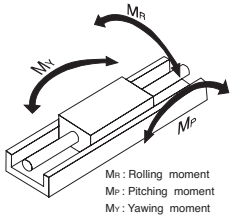
Nominal Size	Lead ℓ (mm)	Shaft Dia d (mm)	Basic Dynamic Load Rating (N)				Basic Static Load Rating (N)		Support Unit Limit Load (N)
			Ball Screw C_a	Linear Guide C	Support Unit C_a	Rated Running Distance L_a (km)	Ball Screw C_{oa}	Linear Guide C_o	
MCM02	1	ø6	340 (High grade)	4,910	615	1	555 (High grade)	2,120	490
			405 (Precision)				615 (Precision)		
	2		340 (High grade)	3,900		2	555 (High grade)		
			405 (Precision)				615 (Precision)		
MCM03	1	ø6	735	10,900	2,670	1	1,230	4,900	1,040
	2		735	8,650		2			
	10	ø8	1,230	6,250		10	1,690	6,620	
	12		1,230	5,880		12			
MCM05	5	ø12	3,760	15,600	4400	5	6,310	10,900	1,450
	10		2,260	12,400		10	3,780		
	20		2,260	9,850		20	3,780		
	30		3,260	8,600	6550	30	5,400		2,730
MCM06	5	ø16	7,310	25,200	6,550	5	13,500	17,000	2,730
	10	ø15	7,060	20,000		10	12,700		
	20		4,560	15,900		20	7,750		
MCM08	5	ø16	7,310	30,800	7,100	5	13,500	22,800	3,040
	10	ø15	7,060	24,400		10	12,700		
	20		4,560	19,400		20	7,750		
	30		5,070	16,930		30	8,730		
MCM10	10	ø20	10,900	33,500	7,600	10	21,700	29,400	3,380
	20		7,060	26,600		20	12,700		
	30		11,700	23,200		30	22,700		

Notes: • Basic dynamic and static load ratings indicate values for one slider. • Basic dynamic load rating of linear guide is load of perpendicular direction to the axis that allows 90% of a group of the same Monocarriers to operate "Rated running distance" in table, that is equivalent to 1 million revolutions of ball screw and support unit under the same conditions without causing flaking by rolling contact fatigue. • Basic dynamic load rating of ball screw is load in the axial direction that allows 90% of ball screws of a group of the same Monocarriers to rotate 1 million revolutions under the same conditions without causing flaking by rolling contact fatigue. • Basic dynamic load rating of support unit is constant load in the axial direction that allows 90% of support units of the same group of Monocarriers to rotate 1 million revolutions under the same conditions without causing flaking by rolling contact fatigue. • Basic static load rating is load that results in combined permanent deformations at contact points of balls and ball grooves of respective parts at a diameter of 0.01%.

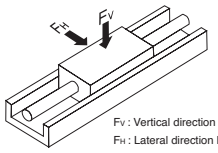
Basic Static Moment Load of Linear Guide

Model No.	Lead (mm)	Slider	Basic Static Moment (N•m)		
			Rolling M_{RO}	Pitching M_{PO}	Yawing M_{YO}
MCM02	1,2	Single	24	8	8
MCM03	1,2		68	28	28
	10,12		92	51	51
MCM05	5,10,20,30*	Single	229	89	89
		Double	455	765	765
MCM06	5,10,20	Single	415	174	174
		Double	825	1,220	1,220
MCM08	5,10,20,30*	Single	770	300	300
		Double	1,540	2,050	2,050
MCM10	10,20,30*	Single	1,170	425	425
		Double	2,340	2,940	2,940

• Basic static moment of double slider is a value when two sliders equipped with NSK K1™ are butted against each other.
• Basic static moment is the value when a rolling contact pressure of balls exceeds 4,000N/mm2.
• If extremely heavy load is required, please consult NSK for estimation of fatigue life.
*Applicable only to single slider.



M_R : Rolling moment
M_P : Pitching moment
M_V : Yawing moment



F_V : Vertical direction load
F_H : Lateral direction load

Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

MCH Series Monocarrier®

MCH Series Reference Number Coding

* These two code fields shall be added when non-standard grease is used. The coding of a MCH Monocarrier with standard grease shall have 12 characters as shown above.

Monocarrier		Nominal Size Rail width, Unit: 10mm		Accuracy Grade H: High Grade P: Precision Grade		Slider Specification K: Single Slider D: Double Slider		Special Specification
MC	H	06	040	H	10	K	B*	0*

- **H Type:** MCH Series
- **L Type:** MCH Series Low Profile Rail (only for 06 size)

Stroke Unit: 10mm

Grease Specification
B: LG2

With Optional Accessories

S: With MCH Optional Components
R: With MCL Optional Components

MC	S	06	040	H	10	K	0	0	K	0	0	0

- **K:** NSK Management Number
- **Sensor Unit**
- **Cover Unit**
- **Intermediate plate for motor bracket**

Note: Optional components are available separately.

Monocarrier is stiff rail, which can be a beam on its own.

Applications

› Equipment that Needs to Reduce the Weight › Substitution for Pneumatic Actuator › Robots › Transporting Equipment › Measuring Machine › Equipment for Factory Automation

Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

Accuracy Grade and Limitations of MCH Series

The accuracy grade of Monocarrier standard inventories is high grade (H), except for lead 1 and 2 of MCM02 and MCM03. When you require strokes longer than 1,200mm, please consult NSK about the accuracy grade.

Accuracy Grade

Unit: μm

Grade	High Grade			Precision			
Stroke (mm)	Repeatability	Running Parallelism (vertical)	Backlash	Repeatability	Positioning Accuracy	Running Parallelism (vertical)	Backlash
~200	±10	14	20 or less	±3	20	8	3 or less
~400		16			25	10	
~600		20			30	12	
~700		23			30	15	
~1,000		23			35	15	
~1,200		30			40	20	

Limitations

Nominal Size		Lead (mm)	Slider	Stroke (mm)
MCH Series	MCH06	5,10,20	Single	600
			Double	500
	MCH09	5,10,20	Single	1,000
			Double	850
	MCH10	10,20	Single	1,800
			Double	1,650
	MCL06	5,10,20	Single	500

Note: Optional components are available separately.

Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

MCH Series Standard Combinations of Stroke and Ball Screw Lead

Single Slider

• Mark: Standard Product **Unit: mm**

Nominal Size	MCH06			MCH09			MCH10	
Stroke \ Lead	5	10	20	5	10	20	10	20
50	•	•	•					
100	•	•	•	•	•	•	•	•
200	•	•	•	•	•	•	•	•
300	•	•	•	•	•	•	•	•
400	•	•	•	•	•	•	•	•
500	•	•	•	•	•	•	•	•
600				•	•	•	•	•
700				•	•	•	•	•
800				•	•	•	•	•
900							•	•
1000							•	•
1100							•	•
1200							•	•

Double Slider

• Mark: Standard Product **Unit: mm**

Nominal Size	MCH06			MCH09			MCH10	
Stroke \ Lead	5	10	20	5	10	20	10	20
100	•	•						
150				•	•			
200	•	•						
250				•	•		•	•
300	•	•						
350				•	•		•	•
400		•	•					
450					•	•	•	•
550							•	•
650					•	•	•	•
750								•
850								•
950								•
1050								•

Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

MCH Series Basic Load Rating

Basic Load Rating

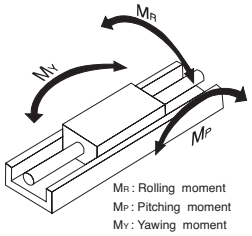
Nominal Size	Lead ℓ (mm)	Shaft Dia d (mm)	Basic Dynamic Load Rating (N)				Basic Static Load Rating (N)		Support Unit Limit Load (N)
			Ball Screw C_a	Linear Guide C	Support Unit C_a	Rated Running Distance L_a (km)	Ball Screw C_{oa}	Linear Guide C_o	
MCH06 (MCL06)	5	ø12	3,000 (High Grade)	22,800	4,400	5	5,410 (High Grade)	16,300	1,450
			3,760 (Precision)				6,310 (Precision)		
	10		1,930 (High Grade)	18,100		10	3,160 (High Grade)		
			2,260 (Precision)				3,780 (Precision)		
	20		1,930 (High Grade)	14,400		20	3,160 (High Grade)		
			2,260 (Precision)				3,780 (Precision)		
MCH09	5	ø15	6,820 (High Grade)	40,600	7,100	5	13,200 (High Grade)	30,500	3,040
			7,100 (Precision)				13,000 (Precision)		
	10		5,110 (High Grade)	32,200		10	9,290 (High Grade)		
			7,060 (Precision)				12,700 (Precision)		
	20		3,290 (High Grade)	25,500		20	5,620 (High Grade)		
			4,560 (Precision)				7,750 (Precision)		
MCH10	10	ø20	8,230 (High Grade)	44,600	7,600	10	17,100 (High Grade)	42,000	3,380
			10,900 (Precision)				21,700 (Precision)		
	20		5,300 (High Grade)	35,400		20	10,300 (High Grade)		
			7,060 (Precision)				12,700 (Precision)		

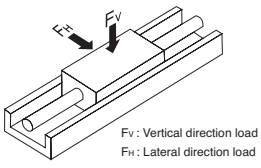
Notes
- Basic dynamic and static load ratings indicate the values for one slider.
- Basic dynamic load rating of the linear guide is the load of perpendicular direction to the axis that allows 90% of a group of the same Monocarriers to operate, "Rated running distance" in the table, that is equivalent to 1 million revolutions of the ball screw and the support unit under the same condition without causing flaking by rolling contact fatigue.
- Basic dynamic load rating of the ball screw is a load-to-axial direction that allows 90% of ball screws of a group of the same Monocarriers to rotate 1 million revolutions under the same condition without causing flaking by rolling contact fatigue.
- Basic dynamic load rating of the support unit is a constant load-to-axial direction that allows 90% of support units of the same group of Monocarriers to rotate 1 million revolutions under the same condition without causing flaking by rolling contact fatigue.
- Basic static load rating is a load that results in combined permanent deformations at the contact points of balls and ball grooves of respective part, which is 0.01% of the diameter.

Basic Static Moment Load of Linear Guide

Nominal size	Slider	Basic Static Moment (N•m)		
		Rolling M_{RO}	Pitching M_{PO}	Yawing M_{YO}
MCH06 (MCL06)	Single	335	133	133
	Double	770	730	730
MCH09	Single	890	385	385
	Double	1,780	2,070	2,070
MCH10	Single	1,460	610	610
	Double	2,920	3,430	3,430

- Basic static moment of double slider is a value when two sliders equipped with NSK K1™ Lubrication Units are butted against each other.
- The basic static moment is the value when a rolling contact pressure of balls exceeds 4,000N/mm².
- If operating under extreme load conditions, please consult NSK for estimation of fatigue life.





Please see NSK's Monocarrier™ catalog for more detailed information on monocarriers.

Notes

Table of Contents

Bearing Selection

The original equipment manufacturer (OEM) will select a bearing for their equipment based on the loading requirements of, and the space available for, the bearing. The bearing style and size provide the foundation for the bearing selection based on the load carrying capacity in relation to the loads to be carried.

Selection Based on Basic Load Rating

The most common way to determine bearing life is by using the load ratings of the bearing and the loads required by the application. The common measurement is "L_{10}" life, defined as the number of revolutions before metal fatigue first appears on 10% of a large group of like bearings. This is referred to as basic rating life or fatigue life. The equations for calculating L_{10} life are:

For ball bearings: $L_{10} = \left(\frac{C}{P}\right)^3$ **For roller bearings:** $L_{10} = \left(\frac{C}{P}\right)^{10/3}$

Where **L_{10}:** Rating fatigue life (1 million Revs)
P: Bearing Equivalent Load (lbf, N, kgf), see below for calculation of **P**
C: Basic Load Rating (from catalog tables)
For radial bearings, **C=Cr** For thrust bearings, **C=Ca**

If the bearings run at a constant speed, it is convenient to determine L_{10} life in terms of hours. This equation is expressed as:

For ball bearings: $L_{10h} = \frac{1{,}000{,}000}{60n}\left(\frac{C}{P}\right)^3$ **For roller bearings:** $L_{10h} = \frac{1{,}000{,}000}{60n}\left(\frac{C}{P}\right)^{10/3}$

Where **L_{10h}:** Rating fatigue life in hours **n:** Rotational speed, RPM

Equivalent Bearing Loads (P)

To determine the value of **P**, you must first determine the effects of the radial and axial loads applied. Once this hypothetical load is determined, it is assumed to be constant in magnitude and direction. The general formula for the calculation of **P** is: **P = X Fr + Y Fa**

Where **P:** Bearing equivalent load (lbf, N, kgf)
X: the Radial factor
Fr: the Actual constant radial load
Y: the Axial factor
Fa: the Actual constant axial load

The values for **X** and **Y** can be determined using the tables J.1 - J.3. First, determine the type of bearing being considered. Then, calculate the ratio of the axial load to the radial load and compare this to the bearings "**e**" value in the table. The "**e**" value is determined by multiplying the axial load applied to the bearing by the bearing coefficient factor, f_0, which is obtained from the bearing tables. Divide the result by the static radial load rating. Locate the result in the first column and read across to find the "**e**" value. (In the case of angular contact bearings, the "i" value must be used. If a duplex pair in a DB or DF configuration is used, the "i" value is 2.) In effect, if the axial load is small compared to the radial load, then only the radial load is considered. If not, then a combination of the two is used. After determining the equivalent bearing load, **P,** the L_{10} formula given above can be used to determine the L_{10} life with 90% reliability for a given bearing's basic load rating.
Also, for a required L_{10} life, a basic load rating requirement can be found for bearing selection.

Table J.1 - Equivalent Load Factors for Ball Bearings

Dynamic Equivalent Load $P = XF_r + YF_a$					
$\frac{f_o F_a}{C_{or}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8$, $P_o = 0.6\,F_r + 0.5\,F_a$ $\qquad$ $\frac{F_a}{F_r} \le 0.8$, $P_o = F_r$

Table J.2 - Equivalent Load Factors for Angular Contact Ball Bearings

Dynamic Equivalent Load $P = XF_r + YF_a$											
Contact Angle	$\frac{i f_o F_a^*}{C_{or}}$	e	Single, DT				DB or DF			
			$F_a / F_r \le e$		$F_a / F_r > e$		$F_a / F_r \le e$		$F_a / F_r > e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	--	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
30°	--	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24
40°	--	1.14	1	0	0.35	0.57	1	0.55	0.57	0.93

*For i, use 2 for DBl, DF and 1 for DT.

Static Equivalent Load $P_o = X_o F_r + Y_o F_a$				
Contact Angle	Single, DT		DB or DF	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

Single or DT mounting when $F_r > 0.5\,F_r + Y_0\,F_a$ use $P_0 = F_r$

Table J.3 - Load Conversion Factors for Other Bearings

Cylindrical Roller **Spherical Roller** **Tapered Roller** **Self-Aligning Ball**	Please Consult NSK Engineering for Values

Correction of Basic Load Rating Due to Temperature

The operating temperature will significantly affect the fatigue life by altering the hardness of the bearing. Consequently, the basic load rating, which depends on the physical properties of the bearing material, will decrease with higher temperatures. Thus, the basic load rating must be corrected for higher temperatures using the equation: $C_t = f_t * C$

Where C_t: Basic load rating after temperature correction
f_t: Temperature factor (see following table)
C: Basic load rating from tables, before application of temperature correction.

Table J.4 - Temperature Factor (f_t)

	Bearing Temperature (°C)			
	≤150°	175°	200°	250°
Temperature Factor f_t	1.00	0.95	0.90	0.75

Adjustments to Fatigue Life Rating

Each style of bearing has many characteristics that make that bearing better suited for an application than another bearing. For example, some common applications require a bearing that can handle misalignment, loads in both directions, high speeds, etc..., or a combination of two or more. These operating conditions will alter the bearing life and are accounted for by using correction factors for temperature, reliability, bearing material, and other operating conditions. For the complete list of adjustment factors and their values, please contact NSK engineering or refer to NSK catalog E1101 - (Rolling Bearings)

The formula for adjusting life based on reliability, material, and operating conditions is:

$$L_{na} = a_1 * a_2 * a_3 * L_{10}$$

Where L_{na}: Adjusted life rating.

L_{10}: Life rating, adjusted for fatigue life of 90% reliability. This may not satisfy all applications. For higher reliability requirements, L_{10} must be adjusted.

a_1: Life correction factor for reliability. This is determined from the reliability required of the bearing for its application (see table below).

a_2: Life correction factor for bearing material.

a_3: Life correction factor for operating conditions.

Values of a_2 and a_3 are difficult to determine, however, for most applications, $a_2 * a_3 = 1$ can be assumed. If you have concerns about lubrication viscosity, temperature, contamination, misalignment, or other operating abnormalities, please consult NSK Engineering.

Table J.5 - Reliability Factor (a_1)

	Reliability					
	90%	**95%**	**96%**	**97%**	**98%**	**99%**
a_1	1.00	0.62	0.53	0.44	0.33	0.21

Static Load Rating

Some applications are stationary with loads for long periods, rotate at very low speeds, are subjected to slow oscillations, or are exposed to shock loads. In these events, the static load rating (C_{or} or C_{oa}) must be used in the life calculations. Please contact NSK Engineering for more details.

Selection Based on Dimensions

For single row bearings having the same width series, diameter series, and bore size, all styles have the same bore, O.D., and width. For example, 6203, NJ203, and 7203 all have a 17mm bore, a 42mm O.D., and 12mm width. Therefore, selection can be made based on the requirements of the application such as, speeds, misalignment capabilities, bearing value, etc..., provided that the life requirement is met by the bearing style.

Bearing Tolerances

Bearing Tolerance Standards

The dimensional and running accuracies of rolling bearings are standardized by ISO with regard to the following items:

- Tolerances for bore diameter, outer diameter, individual ring width, and overall width.
- Tolerances for absolution dimensions of inscribed circle diameter and circumscribed circle diameter.
- Tolerances for chamfer dimension.
- Tolerances for width variations.
- Tolerances for taper angle and taper bore diameters.
- Tolerances for radial runout of inner ring and outer rings.
- Tolerances for axial runout of inner and outer rings.
- Tolerances for side or face runout of inner ring.
- Tolerances for side or face runout of outer ring.

In grading bearing tolerances, ISO "normal class" represents the standard. ISO classes 6, 5, 4, and 2 represent four higher grades. In general, DIN, JIS, and ABMA tolerance classes conform to these ISO standards. Tolerance classes applicable to each bearing type are shown in the subsequent tables.

Table J.6 - Bearing Types and Tolerance Classes

Bearing Types		Applicable Tolerance Classes					Applicable Tables	Applicable Pages
Angular Contact Ball Bearings		Class N	Class 6	Class 5	Class 4	Class 2	J.8 - J.12	J-7 - J-10
Self-Aligning Ball Bearings		Class N	Class 6 equivalent	Class 5 equivalent	--	--		
Cylindrical Roller Bearings		Class N	Class 6	Class 5	Class 4	Class 2		
Spherical Roller Bearings		Class N	Class 6 equivalent	Class 5 equivalent	--	--		
Tapered Roller Bearings	Metric Design	Class N, Class 6X	--	Class 5	Class 4	--	J.15 - J.19	J-11 - J-14
	Inch Design	ABMA, Class 4	ABMA, Class 2	AMBA, Class 3	ABMA, Class 0	ABMA, Class 00	J.20 - J.21	J-15 - J-16
Thrust Ball Bearings		Class N	Class 6	Class 5	Class 4	--	J.23 - J.25	J-17 - J-18
Spherical Roller Thrust Bearings		Class N	--	--	--	--	J.26 - J.27	J-18
Equivalent Standards (ref.)	JIS[1]	Class 0	Class 6	Class 5	Class 4	Class 2	--	--
	DIN[2]	0	P6	P5	Class P4	P2	--	--
	ABMA[3] Ball Bearings	ABEC1	ABEC3	ABEC5 (Class 5P)	ABEC7	ABEC9 (Class 9P)	J.8 - J.12	J-7 - J-10
	ABMA[3] Roller Bearings	RBEC1	RBEC3	RBEC5			--	--
	ABMA[3] Tapered Roller Bearings	Class 4	Class 2	Class 3	Class 0	Class 00	J.15 - J.21	J-11 - J-16

[1] JIS: Japanese Industrial Standards [2] DIN: Deutch Industrie Norm [3] ABMA: American Bearing Manufacturers Association

Bearing Tolerance Nomenclature

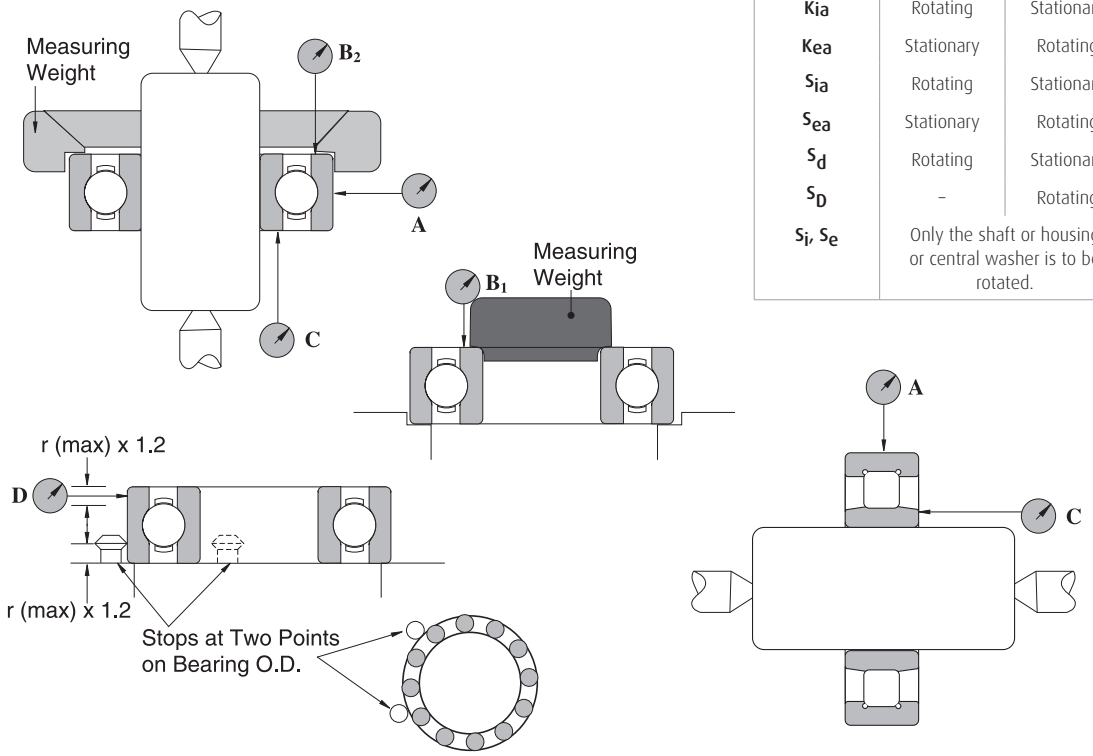
Definitions for running accuracy and their measuring methods are shown below. They are described in detail in ISO 5593 (Rolling Bearings-Vocabulary), JIS B 1515 (Measuring Methods for Rolling Bearings), and elsewhere.

Table J.7 - Symbols for Boundary Dimensions and Running Accuracy

d	Bearing bore diameter, nominal	$\triangle_{Ts}$	Deviation of the actual bearing width
$\triangle_{ds}$	Deviation of single bore diameter	D	Bearing outside diameter, nominal
$\triangle_{dmp}$	Single plane mean bore diameter deviation	$\triangle_{Ds}$	Deviation of a single outside diameter
V_{dp}	Bore diameter variation in a single radial plane	$\triangle_{Dmp}$	Single plane mean outside diameter deviation
V_{dmp}	Mean bore diameter variation	V_{Dp}	Outside diameter variation in a single radial plane
B	Inner ring width, nominal	V_{Dmp}	Mean outside diameter variation
$\triangle_{Bs}$	Deviation of a single inner ring width	C	Outer ring width, nominal
V_{Bs}	Inner ring width variation	$\triangle_{Cs}$	Deviation of a single outer ring width
K_{ia}	Radial runout of assembled bearing inner ring	V_{Cs}	Outer ring width variation
S_d	Inner ring reference face (backface, where applicable) runout with bore	K_{ea}	Radial runout of assembled bearing outer ring
S_{ia}	Assembled bearing inner ring (backface) runout with raceway	S_D	Variation of bearing outside surface generatrix inclination with outer ring reference face (backface)
S_i, S_e	Raceway to backface thickness variation of thrust bearing	S_{ea}	Assembled bearing outer ring (backface) runout with raceway
T	Bearing width, nominal		

Measuring Methods for Running Accuracy (summarized)

Illustrations



Running Accuracy	Inner Ring	Outer Ring	Dial Gage
K_{ia}	Rotating	Stationary	A
K_{ea}	Stationary	Rotating	A
S_{ia}	Rotating	Stationary	B1
S_{ea}	Stationary	Rotating	B2
S_d	Rotating	Stationary	C
S_D	–	Rotating	D
S_i, S_e	Only the shaft or housing or central washer is to be rotated.		E

Bearing Tolerances (cont.)

Table J.8 - Tolerances for Inner Ring Bore of Radial Bearings (excluding Tapered Roller Bearings)

Units: inch

Nominal Bore Diameter d (mm)		△dmp(1)										ds(1)			
		Class N		Class 6		Class 5		Class 4		Class 2		Class 4 Diameter Series 0, 1, 2, 3, 4		Class 2	
over	incl	high	low	high	low	high	low	high	low	high	low	high	low	high	low
0.6(2)	2.5	0	-.0003	0	-.0003	0	-.0002	0	-.0002	0	-.0001	0	-.0002	0	-.0001
2.5	10.0	0	-.0003	0	-.0003	0	-.0002	0	-.0002	0	-.0001	0	-.0002	0	-.0001
10	18.0	0	-.0003	0	-.0003	0	-.0002	0	-.0002	0	-.0001	0	-.0002	0	-.0001
18	30.0	0	-.0004	0	-.0003	0	-.0002	0	-.0002	0	-.0001	0	-.0002	0	-.0001
30	50.0	0	-.0005	0	-.0004	0	-.0003	0	-.0002	0	-.0001	0	-.0002	0	-.0001
50	80.0	0	-.0006	0	-.0005	0	-.0004	0	-.0003	0	-.0002	0	-.0003	0	-.0002
80	120.0	0	-.0008	0	-.0006	0	-.0004	0	-.0003	0	-.0002	0	-.0003	0	-.0002
120	150.0	0	-.0010	0	-.0007	0	-.0005	0	-.0004	0	-.0003	0	-.0004	0	-.0003
150	180.0	0	-.0010	0	-.0007	0	-.0005	0	-.0004	0	-.0003	0	-.0004	0	-.0003
180	250.0	0	-.0012	0	-.0009	0	-.0006	0	-.0005	0	-.0003	0	-.0005	0	-.0003
250	315.0	0	-.0014	0	-.0010	0	-.0007	–	–	–	–	–	–	–	–
315	400.0	0	-.0016	0	-.0012	0	-.0009	–	–	–	–	–	–	–	–
400	500.0	0	-.0018	0	-.0014	–	–	–	–	–	–	–	–	–	–
500	630.0	0	-.0020	0	-.0016	–	–	–	–	–	–	–	–	–	–
630	800.0	0	-.0030	–	–	–	–	–	–	–	–	–	–	–	–
800	1000.0	0	-.0039	–	–	–	–	–	–	–	–	–	–	–	–
1000	1250.0	0	-.0049	–	–	–	–	–	–	–	–	–	–	–	–
1250	1600.0	0	-.0063	–	–	–	–	–	–	–	–	–	–	–	–
1600	2000.0	0	-0.0079	–	–	–	–	–	–	–	–	–	–	–	–

Note: (1) Applicable to bearings with cylindrical bores. (2) 0.6mm is included in this group.

Table J.9 - Tolerances for Outer Ring O.D. of Radial Bearings (excluding Tapered Roller Bearings)

Units: inch

Nominal Outside Diameter D (mm)		△Dmp										△Ds			
		Class N		Class 6		Class 5		Class 4		Class 2		Class 4 Diameter Series 0, 1, 2, 3, 4		Class 2	
over	incl	high	low	high	low	high	low	high	low	high	low	high	low	high	low
2.5(1)	6	0	-.0003	0	-.0003	0	-.0002	0	-.0002	0	-.0001	0	-.0002	0	-.0001
6	18	0	-.0003	0	-.0003	0	-.0002	0	-.0002	0	-.0001	0	-.0002	0	-.0001
18	30	0	-.0004	0	-.0003	0	-.0002	0	-.0002	0	-.0002	0	-.0002	0	-.0002
30	50	0	-.0004	0	-.0004	0	-.0003	0	-.0002	0	-.0002	0	-.0002	0	-.0002
50	80	0	-.0005	0	-.0004	0	-.0004	0	-.0003	0	-.0002	0	-.0003	0	-.0002
80	120	0	-.0006	0	-.0005	0	-.0004	0	-.0003	0	-.0002	0	-.0003	0	-.0002
120	150	0	-.0007	0	-.0006	0	-.0004	0	-.0004	0	-.0002	0	-.0004	0	-.0002
150	180	0	-.0010	0	-.0007	0	-.0005	0	-.0004	0	-.0003	0	-.0004	0	-.0003
180	250	0	-.0012	0	-.0008	0	-.0006	0	-.0004	0	-.0003	0	-.0004	0	-.0003
250	315	0	-.0014	0	-.0010	0	-.0007	0	-.0005	0	-.0003	0	-.0005	0	-.0003
315	400	0	-.0016	0	-.0011	0	-.0008	0	-.0006	0	-.0004	0	-.0006	0	-.0004
400	500	0	-.0018	0	-.0013	0	-.0009	–	–	–	–	–	–	–	–
500	630	0	-.0020	0	-.0015	0	-.0011	–	–	–	–	–	–	–	–
630	800	0	-.0030	0	-.0018	0	-.0014	–	–	–	–	–	–	–	–
800	1000	0	-.0039	0	-.0024	–	–	–	–	–	–	–	–	–	–
1000	1250	0	-.0049	–	–	–	–	–	–	–	–	–	–	–	–
1250	1600	0	-.0063	–	–	–	–	–	–	–	–	–	–	–	–
1600	2000	0	-.0079	–	–	–	–	–	–	–	–	–	–	–	–
2000	2500	0	-.0098	–	–	–	–	–	–	–	–	–	–	–	–

Note: (1) 2.5mm is included within this group.

Remarks: (1) The outside diameter low tolerances specified in this table do not apply within a distance of 1.2 times the chamfer dimension r(max) from the ring face.
(2) The cylindrical bore diameter "no-go" side tolereance limit (high) specified in this table does not necessarily apply within a distance of 1.2 times the chamfer dimension r (max) from the ring face.
(3) ABMA Std 20-1987 was amended: ABEC1 ◊ RBEC1, ABEC3 ◊ RBEC3, ABEC5 ◊ RBEC5, ABEC7, AND ABEC9 are equivalent to Classes N, 6, 5, 4, and 2 respectively.

Table J.8 - Tolerances for Inner Ring Bore of Radial Bearings (excluding Tapered Roller Bearings) (continued)

Units: inch

V_{dp}(1)											V_{dmp}(1)				
Class N Diameter Series			Class 6 Diameter Series			Class 5 Dia. Series		Class 4 Dia. Series		Class	Class				
7, 8, 9	0, 1	2, 3, 4	7, 8, 9	0, 1	2, 3, 4	7, 8, 9	0, 1, 2, 3, 4	7, 8, 9	0, 1, 2, 3, 4	2	N	6	5	4	2
max	max	max	max	max	max	max	max	max	max	max	max	max	max	max	max
+.0004	+.0003	+.0002	+.0004	+.0003	+.0002	+.0002	+.0002	+.0002	+.0001	+.0001	+.0002	+.0002	+.0001	+.0001	+.0001
+.0004	+.0003	+.0002	+.0004	+.0003	+.0002	+.0002	+.0002	+.0002	+.0001	+.0001	+.0002	+.0002	+.0001	+.0001	+.0001
+.0004	+.0003	+.0002	+.0004	+.0003	+.0002	+.0002	+.0002	+.0002	+.0001	+.0001	+.0002	+.0002	+.0001	+.0001	+.0001
+.0005	+.0004	+.0003	+.0004	+.0003	+.0002	+.0002	+.0002	+.0002	+.0002	+.0001	+.0003	+.0002	+.0001	+.0001	+.0001
+.0006	+.0005	+.0004	+.0005	+.0004	+.0003	+.0003	+.0002	+.0002	+.0002	+.0001	+.0004	+.0003	+.0002	+.0001	+.0001
+.0007	+.0007	+.0004	+.0006	+.0006	+.0004	+.0004	+.0003	+.0003	+.0002	+.0002	+.0004	+.0004	+.0002	+.0001	+.0001
+.0010	+.0010	+.0006	+.0007	+.0007	+.0004	+.0004	+.0003	+.0003	+.0002	+.0002	+.0006	+.0004	+.0002	+.0002	+.0001
+.0012	+.0012	+.0007	+.0009	+.0009	+.0006	+.0005	+.0004	+.0004	+.0003	+.0003	+.0007	+.0006	+.0003	+.0002	+.0001
+.0012	+.0012	+.0007	+.0009	+.0009	+.0006	+.0005	+.0004	+.0004	+.0003	+.0003	+.0007	+.0006	+.0003	+.0002	+.0001
+.0015	+.0015	+.0009	+.0011	+.0011	+.0007	+.0006	+.0005	+.0005	+.0004	+.0003	+.0009	+.0007	+.0003	+.0002	+.0002
+.0017	+.0017	+.0010	+.0012	+.0012	+.0007	+.0007	+.0006	–	–	–	+.0010	+.0007	+.0004	–	–
+.0020	+.0020	+.0012	+.0015	+.0015	+.0009	+.0009	+.0007	–	–	–	+.0012	+.0009	+.0005	–	–
+.0022	+.0022	+.0013	+.0017	+.0017	+.0010	–	–	–	–	–	+.0013	+.0010	–	–	–
+.0025	+.0025	+.0015	+.0020	+.0020	+.0012	–	–	–	–	–	+.0015	+.0012	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Note: (1) Applicable to bearings with cylindrical bores.

Table J.9 - Tolerances for Outer Ring O.D. of Radial Bearings (excluding Tapered Roller Bearings) (continued)

Units: inch

V_{Dp}(1)													V_{dmp}(1)				
Class N				Class 6				Class 5		Class 4		Class 2	Class				
Open Type Diameter Series			Shielded Sealed	Open Type Diameter Series			Shielded Sealed	Open Type Dia. Series		Open Type Dia. Series		Open Type					
7, 8, 9	0, 1	2, 3, 4	2, 3, 4	7, 8, 9	0, 1	2, 3, 4	0, 1, 2, 3, 4	7, 8, 9	0, 1, 2, 3, 4	7, 8, 9	0, 1, 2, 3, 4		N	6	5	4	2
max	max	max	max	max	max	max	max	max	max	max	max	max	max	max	max	max	max
+.0004	+.0003	+.0002	+.0004	+.0004	+.0003	+.0002	+.0004	+.0002	+.0002	+.0002	+.0001	+.0001	+.0002	+.0002	+.0001	+.0001	+.0001
+.0005	+.0004	+.0003	+.0005	+.0004	+.0003	+.0002	+.0004	+.0002	+.0002	+.0002	+.0002	+.0002	+.0003	+.0002	+.0001	+.0001	+.0001
+.0006	+.0004	+.0003	+.0005	+.0004	+.0004	+.0003	+.0005	+.0003	+.0002	+.0002	+.0002	+.0002	+.0003	+.0003	+.0002	+.0001	+.0001
+.0006	+.0005	+.0004	+.0008	+.0006	+.0004	+.0003	+.0006	+.0003	+.0003	+.0003	+.0002	+.0002	+.0004	+.0003	+.0002	+.0001	+.0001
+.0007	+.0007	+.0004	+.0010	+.0006	+.0006	+.0004	+.0008	+.0004	+.0003	+.0003	+.0002	+.0002	+.0004	+.0004	+.0002	+.0002	+.0001
+.0009	+.0009	+.0006	+.0012	+.0007	+.0007	+.0004	+.0010	+.0004	+.0003	+.0004	+.0003	+.0002	+.0006	+.0004	+.0002	+.0002	+.0001
+.0012	+.0012	+.0007	+.0015	+.0009	+.0009	+.0006	+.0012	+.0005	+.0004	+.0004	+.0003	+.0003	+.0007	+.0006	+.0003	+.0002	+.0001
+.0015	+.0015	+.0009	–	+.0010	+.0010	+.0006	–	+.0006	+.0004	+.0004	+.0003	+.0003	+.0009	+.0006	+.0003	+.0002	+.0002
+.0017	+.0017	+.0010	–	+.0012	+.0012	+.0007	–	+.0007	+.0006	+.0005	+.0004	+.0003	+.0010	+.0007	+.0004	+.0003	+.0002
+.0020	+.0020	+.0012	–	+.0014	+.0014	+.0008	–	+.0008	+.0006	+.0006	+.0004	+.0004	+.0012	+.0008	+.0004	+.0003	+.0002
+.0022	+.0022	+.0013	–	+.0016	+.0016	+.0010	–	+.0009	+.0007	–	–	–	+.0013	+.0010	+.0005	–	–
+.0025	+.0025	+.0015	–	+.0019	+.0019	+.0011	–	+.0011	+.0008	–	–	–	+.0015	+.0011	+.0006	–	–
+.0037	+.0037	+.0022	+.0022	+.0022	+.0022	+.0013	–	+.0014	+.0010	–	–	–	+.0022	+.0013	+.0007	–	–
+.0049	+.0049	+.0030	–	+.0030	+.0030	+.0018	–	–	–	–	–	–	+.0030	+.0018	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Note: (1) Applicable only when a locating snap ring is not used.

Table J.10 - Tolerances for Inner and Outer Ring Widths of Radial Bearings (excluding Tapered Roller Bearings)

Units: inch

Nominal Bore Diameter d (mm)		$\triangle B_s$ (or C_s)[1]										V_{Bs} (or V_{Cs})[1]				
		Single Bearing						Combined Bearings [2]				Inner Ring (or Outer Ring)[2]		Inner Ring		
		Class N Class 6		Class 5 Class 4		Class 2		Class N Class 6		Class 5 Class 4		Class		Class		
												N	6	5	4	2
over	incl	high	low	high	low	high	low	high	low	high	low	max	max	max	max	max
0.6[3]	2.5	0	-.0016	0	-.0016	0	-.0016	–	–	0	-.0098	+.0005	+.0005	+.0002	+.0001	+.0001
2.5	10.0	0	-.0047	0	-.0016	0	-.0016	0	-.0098	0	-.0098	+.0006	+.0006	+.0002	+.0001	+.0001
10.0	18.0	0	-.0047	0	-.0031	0	-.0031	0	-.0098	0	-.0098	+.0008	+.0006	+.0002	+.0001	+.0001
18.0	30.0	0	-.0047	0	-.0047	0	-.0047	0	-.0098	0	-.0098	+.0008	+.0008	+.0002	+.0001	+.0001
30.0	50.0	0	-.0047	0	-.0047	0	-.0047	0	-.0098	0	-.0098	+.0008	+.0008	+.0002	+.0001	+.0001
50.0	80.0	0	-.0059	0	-.0059	0	-.0059	0	-.0150	0	-.0098	+.0010	+.0010	+.0002	+.0002	+.0001
80.0	120.0	0	-.0079	0	-.0079	0	-.0079	0	-.0150	0	-.0150	+.0010	+.0010	+.0003	+.0002	+.0001
120.0	150.0	0	-.0098	0	-.0098	0	-.0098	0	-.0197	0	-.0150	+.0012	+.0012	+.0003	+.0002	+.0001
150.0	180.0	0	-.0098	0	-.0098	0	-.0118	0	-.0197	0	-.0150	+.0012	+.0012	+.0003	+.0002	+.0002
180.0	250.0	0	-.0118	0	-.0118	0	-.0138	0	-.0197	0	-.0197	+.0012	+.0012	+.0004	+.0002	+.0002
250.0	315.0	0	-.0138	0	-.0138	–	–	0	-.0197	0	-.0197	+.0014	+.0012	+.0005	–	–
315.0	400.0	0	-.0157	0	-.0157	–	–	0	-.0248	0	-.0248	+.0016	+.0016	+.0006	–	–
400.0	500.0	0	-.0177	–	–	–	–	–	–	–	–	+.0020	+.0018	–	–	–
500.0	630.0	0	-.0197	–	–	–	–	–	–	–	–	+.0024	+.0020	–	–	–
630.0	800.0	0	-.0295	–	–	–	–	–	–	–	–	+.0028	–	–	–	–
800.0	1000.0	0	-.0394	–	–	–	–	–	–	–	–	+.0031	–	–	–	–
1000.0	1250.0	0	-.0492	–	–	–	–	–	–	–	–	+.0039	–	–	–	–
1250.0	1600.0	0	-.0630	–	–	–	–	–	–	–	–	+.0047	–	–	–	–
1600.0	2000.0	0	-.0787	–	–	–	–	–	–	–	–	+.0055	–	–	–	–

Note: [1] Tolerance for width deviation and tolerance limits for the width variation of the outer ring should be the same.
[2] Applicable to individual rings manufactured for combined bearings.
[3] 0.6mm is included in this group.

Table J.11 - Tolerances for Inner Ring Runout of Radial Bearings (excluding Tapered Roller Bearings)

Units: inch

Nominal Bore Diameter d (mm)		K_{ia}					S_d			S_{ia}[1]		
		Class N	Class 6	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2
over	incl	max	max	max	max	max	max	max	max	max	max	max
0.6[2]	2.5	+.0004	+.0002	+.0002	+.0001	+.0001	+.0003	+.0001	+.0001	+.0003	+.0001	+.0001
2.5	10.0	+.0004	+.0002	+.0002	+.0001	+.0001	+.0003	+.0001	+.0001	+.0003	+.0001	+.0001
10.0	18.0	+.0004	+.0003	+.0002	+.0001	+.0001	+.0003	+.0001	+.0001	+.0003	+.0001	+.0001
18.0	30.0	+.0005	+.0003	+.0002	+.0001	+.0001	+.0003	+.0002	+.0001	+.0003	+.0002	+.0001
30.0	50.0	+.0006	+.0004	+.0002	+.0002	+.0001	+.0003	+.0002	+.0001	+.0003	+.0002	+.0001
50.0	80.0	+.0008	+.0004	+.0002	+.0002	+.0001	+.0003	+.0002	+.0001	+.0003	+.0002	+.0001
80.0	120.0	+.0010	+.0005	+.0002	+.0002	+.0001	+.0004	+.0002	+.0001	+.0004	+.0002	+.0001
120.0	150.0	+.0012	+.0007	+.0003	+.0002	+.0001	+.0004	+.0002	+.0001	+.0004	+.0003	+.0001
150.0	180.0	+.0012	+.0007	+.0003	+.0002	+.0002	+.0004	+.0002	+.0002	+.0004	+.0003	+.0002
180.0	250.0	+.0016	+.0008	+.0004	+.0003	+.0002	+.0004	+.0003	+.0002	+.0005	+.0003	+.0002
250.0	315.0	+.0020	+.0010	+.0005	–	–	+.0005	–	–	+.0006	–	–
315.0	400.0	+.0024	+.0012	+.0006	–	–	+.0006	–	–	+.0008	–	–
400.0	500.0	+.0026	+.0014	–	–	–	–	–	–	–	–	–
500.0	630.0	+.0028	+.0016	–	–	–	–	–	–	–	–	–
630.0	800.0	+.0031	–	–	–	–	–	–	–	–	–	–
800.0	1000.0	+.0035	–	–	–	–	–	–	–	–	–	–
1000.0	1250.0	+.0039	–	–	–	–	–	–	–	–	–	–
1250.0	1600.0	+.0047	–	–	–	–	–	–	–	–	–	–
1600.0	2000.0	+.0055	–	–	–	–	–	–	–	–	–	–

Note: [1] Applicable to ball bearings only.
[2] 0.6mm is included in this group.

Table J.12 - Tolerances for Outer Ring Runout of Radial Bearings (excluding Tapered Roller Bearings)

Units: inch

Nominal Outside Diameter D (mm)		K_{ea}					S_D			S_{ea}[1]			V_{Cs}[2]		
		Class					Class			Class			Class		
		N	6	5	4	2	5	4	2	5	4	2	5	4	2
over	incl	max	max	max	max	max	max	max	max	max	max	max	max	max	max
2.5[3]	6.0	+.0006	+.0003	+.0002	+.0001	+.0001	+.0003	+.0002	+.0001	+.0003	+.0002	+.0001	+.0002	+.0001	+.0001
6	18.0	+.0006	+.0003	+.0002	+.0001	+.0001	+.0003	+.0002	+.0001	+.0003	+.0002	+.0001	+.0002	+.0001	+.0001
18.0	30.0	+.0006	+.0004	+.0002	+.0002	+.0001	+.0003	+.0002	+.0001	+.0003	+.0002	+.0001	+.0002	+.0001	+.0001
30.0	50.0	+.0008	+.0004	+.0003	+.0002	+.0001	+.0003	+.0002	+.0001	+.0003	+.0002	+.0001	+.0002	+.0001	+.0001
50.0	80.0	+.0010	+.0005	+.0003	+.0002	+.0002	+.0003	+.0002	+.0001	+.0003	+.0002	+.0002	+.0002	+.0001	+.0001
80.0	120.0	+.0014	+.0007	+.0004	+.0002	+.0002	+.0004	+.0002	+.0001	+.0004	+.0002	+.0002	+.0003	+.0002	+.0001
120.0	150.0	+.0016	+.0008	+.0004	+.0003	+.0002	+.0004	+.0002	+.0001	+.0005	+.0003	+.0002	+.0003	+.0002	+.0001
150.0	180.0	+.0018	+.0009	+.0005	+.0003	+.0002	+.0004	+.0002	+.0001	+.0006	+.0003	+.0002	+.0003	+.0002	+.0001
180.0	250.0	+.0020	+.0010	+.0006	+.0004	+.0003	+.0004	+.0003	+.0002	+.0006	+.0004	+.0003	+.0004	+.0003	+.0002
250.0	315.0	+.0024	+.0012	+.0007	+.0004	+.0003	+.0005	+.0003	+.0002	+.0007	+.0004	+.0003	+.0004	+.0003	+.0002
315.0	400.0	+.0028	+.0014	+.0008	+.0005	+.0003	+.0005	+.0004	+.0003	+.0008	+.0005	+.0003	+.0005	+.0003	+.0003
400.0	500.0	+.0031	+.0016	+.0009	–	–	+.0006	–	–	+.0009	–	–	+.0006	–	–
500.0	630.0	+.0039	+.0020	+.0010	–	–	+.0007	–	–	+.0010	–	–	+.0007	–	–
630.0	800.0	+.0047	+.0024	+.0012	–	–	+.0008	–	–	+.0012	–	–	+.0008	–	–
800.0	1000.0	+.0055	+.0030	–	–	–	–	–	–	–	–	–	–	–	–
1000.0	1250.0	+.0063	–	–	–	–	–	–	–	–	–	–	–	–	–
1250.0	1600.0	+.0075	–	–	–	–	–	–	–	–	–	–	–	–	–
1600.0	2000.0	+.0087	–	–	–	–	–	–	–	–	–	–	–	–	–
2000.0	2500.0	+.0098	–	–	–	–	–	–	–	–	–	–	–	–	–

Note: [1] Tolerance for width deviation and tolerance limits for the width variation of the outer ring should be the same bearing.

[2] Aplicable to individual rings manufactured for combined bearings.

[3] 2.5 mm is included within this group.

Table J.13 - Tolerance of Bore Diameter of Inner Ring

Unit: µm

Bore Over	Diameter Incl.	P4		P4Y (Controlled to median value)	
		High	Low	High	Low
30	50	0	-6		-3
50	80	0	-7	-2	-5
80	120	0	-8	-3	-6
120	150	0	-10	-3	-7

Tolerances for bearings under 30mm bore are the same as values quoted between 30 and 50 mm bore.

Class 4Y is NSK's proprietary accuracy standard, in which tolerance of a bearing bore diameter and an outer ring diameter are in a special class (controlled to medium value) and other tolerances are Class 4. Class 4Y has the same running accuracy as Class 4 but has a narrower tolerance range of bore and outer diameter than Class 4. It is suitable for universal combination bearings.

Table J.14 - Tolerance of Outer Diameter of Outer Ring

Unit: µm

Outer Over	Diameter Incl.	P4		P4Y (Controlled to median value)	
		High	Low	High	Low
50	80	0	-7	-2	-6
80	120	0	-8	-2	-6
120	150	0	-9	-3	-7
150	180	0	-10	-3	-7
180	200	0	-11	-4	-9
200	Under 215	0	-11	-2	-9

Tolerances for bearings under 50mm outer diameter are the same as values quoted for bearings with outer diameters between 50-80mm outer diameter.

Class 4Y is NSK's proprietary accuracy standard, in which tolerance of a bearing bore diameter and an outer ring diameter are in a special class (controlled to medium value) and other tolerances are Class 4. Class 4Y has the same running accuracy as Class 4 but has a narrower tolerance range of bore and outer diameter than Class 4. It is suitable for universal combination bearings.

Bearing Tolerances (cont.)

Table J.15 - Tolerances for Inner Ring Bore Diameter of Metric Tapered Roller Bearings

Units: inch

Nominal Bore Diameter d (mm)		△dmp						△ds		Vdp				Vdmp			
		Class N Class 6X		Class 6 Class 5		Class 4		Class 4		Class				Class			
										N, 6X	6	5	4	N, 6X	6	5	4
over	incl	high	low	high	low	high	low	high	low	max	max	max	max	max	max	max	max
10.0	18.0	0	-.0003	0	-.0003	0	-.0002	0	-.0002	+.0003	+.0003	+.0002	+.0002	+.0002	+.0002	+.0002	+.0002
18.0	30.0	0	-.0004	0	-.0003	0	-.0002	0	-.0002	+.0004	+.0003	+.0002	+.0002	+.0003	+.0002	+.0002	+.0002
30.0	50.0	0	-.0005	0	-.0004	0	-.0003	0	-.0003	+.0005	+.0004	+.0003	+.0002	+.0004	+.0003	+.0002	+.0002
50.0	80.0	0	-.0006	0	-.0005	0	-.0004	0	-.0004	+.0006	+.0005	+.0004	+.0003	+.0004	+.0004	+.0002	+.0002
80.0	120.0	0	-.0008	0	-.0006	0	-.0004	0	-.0004	+.0008	+.0006	+.0004	+.0003	+.0006	+.0004	+.0003	+.0002
120.0	180.0	0	-.0010	0	-.0007	0	-.0005	0	-.0005	+.0010	+.0007	+.0006	+.0004	+.0007	+.0006	+.0004	+.0003
180.0	250.0	0	-.0012	0	-.0009	0	-.0006	0	-.0006	+.0012	+.0009	+.0007	+.0004	+.0009	+.0006	+.0004	+.0003
250.0	315.0	0	-.0014	0	-.0010	0	-.0007	0	-.0007	+.0014	–	–	–	+.0010	+.0006	–	–
315.0	400.0	0	-.0016	0	-.0012	0	-.0009	0	-.0009	+.0016	–	–	–	+.0012	–	–	–
400.0	500.0	0	-.0018	0	-.0014	0	-.0011	0	-.0011	–	–	–	–	–	–	–	–
500.0	630.0	0	-.0020	0	-.0016	–	–	–	–	–	–	–	–	–	–	–	–
630.0	800.0	0	-.0030	0	-.0024	–	–	–	–	–	–	–	–	–	–	–	–

Remarks: (1) The outside diameter "no-go side" tolerances (high) specified in this table do not necessarily apply within a distance of 1.2 times the chamfer dimension r (max) from the ring face.

(2) Some of these tolerances conform to the NSK standard, and not ISO standards.

Table J.16 - Tolerances for Outer Ring Diameter of Metric Tapered Roller Bearings

Units: inch

Nominal Outside Diameter D (mm)		△dmp						△ds		Vdp				Vdmp			
		Class N Class 6X		Class 6 Class 5		Class 4		Class 4		Class				Class			
										N, 6X	6	5	4	N, 6X	6	5	4
over	incl	high	low	high	low	high	low	high	low	max	max	max	max	max	max	max	max
18.0	30.0	0	-.0004	0	-.0003	0	-.0002	0	-.0002	+.0004	+.0003	+.0002	+.0002	+.0003	+.0002	+.0002	+.0002
30.0	50.0	0	-.0004	0	-.0004	0	-.0003	0	-.0003	+.0004	+.0004	+.0003	+.0002	+.0003	+.0003	+.0002	+.0002
50.0	80.0	0	-.0005	0	-.0004	0	-.0004	0	-.0004	+.0005	+.0004	+.0003	+.0003	+.0004	+.0003	+.0002	+.0002
80.0	120.0	0	-.0006	0	-.0005	0	-.0004	0	-.0004	+.0006	+.0005	+.0004	+.0003	+.0004	+.0004	+.0003	+.0002
120.0	150.0	0	-.0007	0	-.0006	0	-.0004	0	-.0004	+.0007	+.0006	+.0004	+.0003	+.0006	+.0004	+.0003	+.0002
150.0	180.0	0	-.0010	0	-.0007	0	-.0005	0	-.0005	+.0010	+.0007	+.0006	+.0004	+.0007	+.0006	+.0004	+.0003
180.0	250.0	0	-.0012	0	-.0008	0	-.0006	0	-.0006	+.0012	+.0008	+.0006	+.0004	+.0009	+.0006	+.0004	+.0003
250.0	315.0	0	-.0014	0	-.0010	0	-.0007	0	-.0007	+.0014	+.0010	+.0007	+.0006	+.0010	+.0007	+.0005	+.0004
315.0	400.0	0	-.0016	0	-.0011	0	-.0008	0	-.0008	+.0016	+.0011	+.0009	+.0006	+.0012	+.0008	+.0006	+.0004
400.0	500.0	0	-.0018	0	-.0013	0	-.0009	0	-.0009	+.0018	–	–	–	+.0013	–	–	–
500.0	630.0	0	-.0020	0	-.0015	–	-.0011	–	-.0011	+.0020	–	–	–	+.0015	–	–	–
630.0	800.0	0	-.0030	0	-.0018	–	–	–	–	–	–	–	–	–	–	–	–
800.0	1000.0	0	-.0039	0	-.0024	–	–	–	–	–	–	–	–	–	–	–	–

Remarks: (1) The outside diameter "no-go side" tolerances (high) specified in this table do not necessarily apply within a distance of 1.2 times the chamfer dimension r (max) from the ring face.

(2) Some of these tolerances conform to the NSK standard, and not ISO standards.

Table J.17 - Tolerances for Inner Ring Accuracy of Metric Tapered Bearings

Units: inch

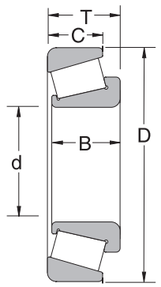
Nominal Bore Diameter d (mm)		K_{ia}				S_d		S_{ia}
		Class N Class 6X	Class 6	Class 5	Class 4	Class 5	Class 4	Class 4
over	incl	max	max	max	max	max	max	max
10	18	+.0006	+.0003	+.0001	+.0001	+.0003	+.0001	+.0001
18	30.0	+.0007	+.0003	+.0002	+.0001	+.0003	+.0002	+.0002
30.0	50.0	+.0008	+.0004	+.0002	+.0002	+.0003	+.0002	+.0002
50.0	80.0	+.0010	+.0004	+.0002	+.0002	+.0003	+.0002	+.0002
80.0	120.0	+.0012	+.0005	+.0002	+.0002	+.0004	+.0002	+.0002
120.0	180.0	+.0014	+.0007	+.0003	+.0002	+.0004	+.0002	+.0003
180.0	250.0	+.0020	+.0008	+.0004	+.0003	+.0004	+.0003	+.0003
250.0	315.0	+.0024	+.0010	+.0005	+.0004	+.0005	+.0003	+.0004
315.0	400.0	+.0028	+.0012	+.0006	+.0005	+.0006	+.0004	+.0006
400.0	500.0	+.0028	+.0014	+.0007	+.0006	+.0007	+.0005	+.0007
500.0	630.0	+.0033	+.0016	+.0008	--	+.0009	--	--
630.0	800.0	+.0039	+.0018	+.0009	--	+.0011	--	--

Table J.18 - Tolerances for Outer Ring Accuracy of Metric Tapered Bearings

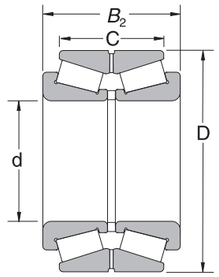
Units: inch

Nominal Outside Diameter D (mm)		K_{ea}				S_D		S_{ea}
		Class N Class 6X	Class 6	Class 5	Class 4	Class 5	Class 4	Class 4
over	incl	max	max	max	max	max	max	max
18.0	30.0	+.0007	+.0004	+.0002	+.0002	+.0003	+.0002	+.0002
30.0	50.0	+.0008	+.0004	+.0003	+.0002	+.0003	+.0002	+.0002
50.0	80.0	+.0010	+.0005	+.0003	+.0002	+.0003	+.0002	+.0002
80.0	120.0	+.0014	+.0007	+.0004	+.0002	+.0004	+.0002	+.0002
120.0	150.0	+.0016	+.0008	+.0004	+.0003	+.0004	+.0002	+.0003
150.0	180.0	+.0018	+.0009	+.0005	+.0003	+.0004	+.0002	+.0003
180.0	250.0	+.0020	+.0010	+.0006	+.0004	+.0004	+.0003	+.0004
250.0	315.0	+.0024	+.0012	+.0007	+.0004	+.0005	+.0003	+.0004
315.0	400.0	+.0028	+.0014	+.0008	+.0005	+.0005	+.0004	+.0005
400.0	500.0	+.0031	+.0016	+.0009	+.0006	+.0006	+.0004	+.0006
500.0	630.0	+.0039	+.0020	+.0010	+.0007	+.0007	+.0005	+.0007
630.0	800.0	+.0047	+.0024	+.0012	--	+.0008	--	--
800.0	1000.0	+.0047	+.0030	+.0014	--	+.0009	--	--

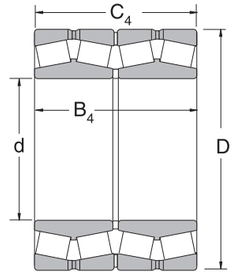
Bearing Tolerances (cont.)



Single Row



KBE Type



KV Type

Table J.19 - Tolerances for Cone Width, Cup Width, and Combined Cone/Cup Width of Metric Tapered Roller Bearings

Units: inch

Nominal Bore Diameter d (mm)		$\triangle B_S$						$\triangle C_S$						$\triangle T_S$					
		Class N Class 6		Class 6X		Class 5 Class 4		Class N Class 6		Class 6X		Class 5 Class 4		Class N Class 6		Class 6X		Class 5 Class 4	
over	incl	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low
10.0	18.0	0	-.0047	0	-.0020	0	-.0079	0	-.0047	0	-.0039	0	-.0079	-.0079	.0000	+.0039	0	+.0079	-.0079
18.0	30.0	0	-.0047	0	-.0020	0	-.0079	0	-.0047	0	-.0039	0	-.0079	-.0079	.0000	+.0039	0	+.0079	-.0079
30.0	50.0	0	-.0047	0	-.0020	0	-.0094	0	-.0047	0	-.0039	0	-.0094	-.0079	.0000	+.0039	0	+.0079	-.0079
50.0	80.0	0	-.0059	0	-.0020	0	-.0118	0	-.0059	0	-.0039	0	-.0118	-.0079	.0000	+.0039	0	+.0079	-.0079
80.0	120.0	0	-.0079	0	-.0020	0	-.0157	0	-.0079	0	-.0039	0	-.0157	.0079	-.0079	+.0039	0	+.0079	-.0079
120.0	180.0	0	-.0098	0	-.0020	0	-.0197	0	-.0098	0	-.0039	0	-.0197	.0138	-.0098	+.0059	0	+.0138	-.0098
180.0	250.0	0	-.0118	0	-.0020	0	-.0197	0	-.0118	0	-.0039	0	-.0197	.0138	-.0098	+.0059	0	+.0209	-.0098
250.0	315.0	0	-.0138	0	-.0020	0	-.0276	0	-.0138	0	-.0039	0	-.0276	.0138	-.0098	+.0079	0	+.0209	-.0098
315.0	400.0	0	-.0157	0	-.0020	0	-.0315	0	-.0157	0	-.0039	0	-.0315	.0157	-.0157	+.0079	0	+.0157	-.0157
400.0	500.0	0	-.0177	–	–	0	-.0315	0	-.0177	–	–	0	-.0315	.0157	-.0157	–	–	+.0157	-.0157
500.0	630.0	0	-.0197	–	–	0	-.0315	0	-.0197	–	–	0	-.0315	.0197	-.0197	–	–	+.0197	-.0197
630.0	800.0	0	-.0295	–	–	0	-.0315	0	-.0295	–	–	0	-.0315	.0236	-.0236	–	–	+.0236	-.0236

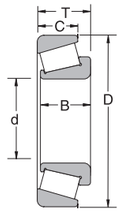
Remarks: (1) The effective width of a cone with rollers T1 is defined as the overall bearing width of a cone with rollers combined with a master cup.
(2) The effective width of a cup T2 is defined as the overall bearing width of a cup combined with a master cone with rollers.

Table J.19 - Tolerances for Cone Width, Cup Width, and Combined Cone/Cup Width of Metric Tapered Roller Bearings (continued)

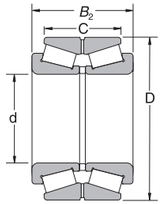
Units: inch

Nominal Bore Diameter d (mm)		Effective Cone Width (with Rollers) Deviation $\triangle T_{1s}$				Effective Cup Width Deviation $\triangle T_{2s}$				Overall Combined Bearing Width Deviation			
										$\triangle B_{2s}$		$\triangle B_{4s}$, $\triangle C_{4s}$	
		Class N		Class 6X		Class N		Class 6X		All classes of double-row bearings		All classes of four-row bearings	
over	incl	high	low	high	low	high	low	high	low	high	low	high	low
10.0	18.0	+.0039	0	+.0020	0	+.0039	0	+.0020	0	+.0079	-.0079	–	–
18.0	30.0	+.0039	0	+.0020	0	+.0039	0	+.0020	0	+.0079	-.0079	–	–
30.0	50.0	+.0039	0	+.0020	0	+.0039	0	+.0020	0	+.0079	-.0079	–	–
50.0	80.0	+.0039	0	+.0020	0	+.0039	0	+.0020	0	+.0118	-.0118	+.0118	-.0118
80.0	120.0	+.0039	-.0039	+.0020	0	+.0039	-.0039	+.0020	0	+.0118	-.0118	+.0157	-.0157
120.0	180.0	+.0059	-.0059	+.0020	0	+.0079	-.0039	+.0039	0	+.0157	-.0157	+.0197	-.0197
180.0	250.0	+.0059	-.0059	+.0020	0	+.0079	-.0039	+.0039	0	+.0177	-.0177	+.0236	-.0236
250.0	315.0	+.0059	-.0059	+.0039	0	+.0079	-.0039	+.0039	0	+.0217	-.0217	+.0276	-.0276
315.0	400.0	+.0079	-.0079	+.0039	0	+.0079	-.0079	+.0039	0	+.0236	-.0236	+.0315	-.0315
400.0	500.0	–	–	–	–	–	–	–	–	+.0276	-.0276	+.0354	-.0354
500.0	630.0	–	–	–	–	–	–	–	–	+.0315	-.0315	+.0394	-.0394
630.0	800.0	–	–	–	–	–	–	–	–	+.0472	-.0472	+.0591	-.0591

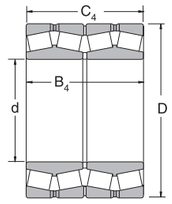
Bearing Tolerances (cont.)



Single Row



KBE Type



KV Type

Table J.20 - Tolerances for Outer Ring Outside Diameter and Radial Runout of Inch Tapered Roller Bearings

Units: inch

Nominal Outside Diameter D (in)		△Ds					
		Class 4, 2		Class 3, 0		Class 00	
over	incl.	high	low	high	low	high	low
	10.5000	+.0010	0	+.0005	0	+.0003	0
10.5000	12.0000	+.0010	0	+.0005	0	–	–
12.0000	24.0000	+.0020	0	+.0010	0	–	–
24.0000	36.0000	+.0030	0	+.0015	0	–	–
36.0000	48.0000	+.0040	0	+.0020	0	–	–
48.0000		+.0050	0	+.0030	0	–	–

Table J.21 - Tolerances for Overall Width and Combined Width of Inch Tapered Roller Bearings

Units: inch

Nominal Bore Diameter d (in)		△Ts									
		Class 4		Class 2		Class 3, 0				Class 0 Class 00	
						D ≤ 508.000mm		D>508.000mm			
over	incl.	high	low	high	low	high	low	high	low	high	low
	4.0000	+.0080	–	+.0080	–	+.0080	-.0080	+.0080	-.0080	+.0080	-.0080
4.0000	12.0000	+.0140	-.0100	+.0080	–	+.0080	-.0080	+.0080	-.0080	+.0080	-.0080
12.0000	24.0000	+.0150	-.0150	+.0150	-.0150	+.0080	-.0080	+.0150	-.0150	–	–
24.0000		+.0150	-.0150	–	–	+.0150	-.0150	+.0150	-.0150	–	–

Table J.22 - Tolerances for Inner Ring Bore of Inch Design Tapered Roller Bearings

Units: inch

Nominal Bore Diameter d (in)		$\triangle d_s$					
		Class 4, 2		Class 3, 0		Class 00	
over	incl	high	low	high	low	high	low
	3.0000	+.0005	0	+.0005	0	+.0003	0
3.0000	10.5000	+.0010	0	+.0005	0	+.0003	0
10.5000	12.0000	+.0010	0	+.0005	0	–	–
12.0000	24.0000	+.0020	0	+.0010	0	–	–
24.0000	36.0000	+.0030	0	+.0015	0	–	–
36.0000	48.0000	+.0040	0	+.0020	0	–	–
48.0000		+.0050	0	+.0030	0	–	–

Table J.20 - Tolerances for Outer Ring Outside Diameter and Radial Runout of Inch Tapered Roller Bearings (continued)

Units: inch

K_{ia}, K_{ea}				
Class 4	Class 2	Class 3	Class 0	Class 00
max	max	max	max	max
.0020	.0015	.0003	.0002	.0001
.0020	.0015	.0003	.0002	–
.0020	.0015	.0003	–	–
.0030	.0020	.0020	–	–
.0030	–	.0030	–	–
.0030	–	.0030	–	–

Table J.21 - Tolerances for Overall Width and Combined Width of Inch Tapered Roller Bearings (continued)

Units: inch

Double-Row Bearings (KBE Type) $\varnothing B_{2s}$										Four-Row Bearings (KV Type) $\varnothing B_{4s}$, $\varnothing C_{4s}$	
Class 4		Class 2		Class 3, 0				Class 0, 00		Class 4, 3, 0	
				D ≤ 508.000mm		D > 508.000mm					
high	low	high	low	high	low	high	low	high	low	high	low
+.0160	0	+.0160	0	+.0160	-.0160	+.0160	-.0160	+.0160	-.0160	+.0600	-.0600
+.0280	-.0200	+.0160	-0.008	+.0160	-.0160	+.0160	-.0160	+.0160	-.0160	+.0600	-.0600
+.0300	-.0300	+.0300	-0.030	+.0160	-.0160	+.0308	-.0308	–	–	+.0600	-.0600
+.0300	-.0300	–	–	+.0300	-.0300	+.0308	-.0308	–	–	+.0600	-.0600

Table J.23 - Tolerances for Shaft Washer Bore Diameter and Running Accuracy of Thrust Ball Bearings

Units: inch

Nominal Bore Diameter d or d_2 (mm)		$Ød_{mp}$ or $Ød_{2mp}$				V_{dp} or V_{d2p}		S_i or S_e (1)			
		Class N, 6, 5		Class 4		Class N, 6, 5	Class 4	Class N	Class 6	Class 5	Class 4
over	incl	high	low	high	low	max	max	max	max	max	max
	18	0	-.0003	0	-.0003	.0002	.0002	.0004	.0002	.0001	.0001
18	30	0	-.0004	0	-.0003	.0003	.0002	.0004	.0002	.0001	.0001
30	50	0	-.0005	0	-.0004	.0004	.0003	.0004	.0002	.0001	.0001
50	80	0	-.0006	0	-.0005	.0004	.0004	.0004	.0003	.0002	.0001
80	120	0	-.0008	0	-.0006	.0006	.0004	.0006	.0003	.0002	.0001
120	180	0	-.0010	0	-.0007	.0007	.0006	.0006	.0004	.0002	.0002
180	250	0	-.0012	0	-.0009	.0009	.0007	.0008	.0004	.0002	.0002
250	315	0	-.0014	0	-.0010	.0010	.0007	.0010	.0005	.0003	.0002
315	400	0	-.0016	0	-.0012	.0012	.0009	.0012	.0006	.0003	.0002
400	500	0	-.0018	0	-.0014	.0013	.0010	.0012	.0007	.0004	.0002
500	630	0	-.0020	0	-.0016	.0015	.0012	.0014	.0008	.0004	.0003
630	800	0	-.0030	0	-.0020	–	–	.0016	.0010	.0005	.0003
800	1000	0	-.0039	–	–	–	–	.0018	.0012	.0006	–
1000	1250	0	-.0049	–	–	–	–	.0020	.0014	.0007	–

Note: (1) For double-direction bearings, the thickness variation doesn't depend on the bore diameter d_2, but on d for single-direction bearings with the same D in the same diameter series.

Remarks: The thickness variation of housing washers, S_e, applies only to flat-seat thrust bearings.

Table J.24 - Tolerances for Outside Diameter of Housing Washers and Aligning Seat Washers of Thrust Ball Bearings

Units: inch

Nominal Outside Diameter of Bearing or Aligning Seat Washer D or D_3 (mm)		ØDmp						V_{Dp}		Aligning Seat Washer Outside Diameter Deviation $ØD_{3s}$	
		Flat Seat Type				Aligning Seat Washer Type		Class N, 6, 5	Class 4	Class N, 6	
		Class N, 6, 5		Class 4		Class N, 6					
over	incl	high	low	high	low	high	low	max	max	high	low
10	18	0	-.0004	.0000	-.0003	.0000	-.0007	+0.0003	+0.0002	.0000	-.0010
18	30	0	-.0005	.0000	-.0003	.0000	-.0008	+0.0004	+0.0002	.0000	-.0012
30	50	0	-.0006	.0000	-.0004	.0000	-.0009	+0.0005	+0.0003	.0000	-.0014
50	80	0	-.0007	.0000	-.0004	.0000	-.0011	+0.0006	+0.0003	.0000	-.0018
80	120	0	-.0009	.0000	-.0005	.0000	-.0013	+0.0007	+0.0004	.0000	-.0024
120	180	0	-.0010	.0000	-.0006	.0000	-.0015	+0.0007	+0.0004	.0000	-.0030
180	250	0	-.0012	.0000	-.0008	.0000	-.0018	+0.0009	+0.0006	.0000	-.0035
250	315	0	-.0014	.0000	-.0010	.0000	-.0021	+0.0010	+0.0007	.0000	-.0041
315	400	0	-.0016	.0000	-.0011	.0000	-.0024	+0.0012	+0.0008	.0000	-.0047
400	500	0	-.0018	.0000	-.0013	.0000	-.0027	+0.0013	+0.0010	.0000	-.0053
500	630	0	-.0020	.0000	-.0015	.0000	-.0030	+0.0015	+0.0011	.0000	-.0071
630	800	0	-.0030	.0000	-.0018	.0000	-.0044	+0.0022	+0.0013	.0000	-.0089
800	1000	0	-.0039	–	–	–	–	+0.0030	–	–	–
1000	1250	0	-.0049	–	–	–	–	–	–	–	–
1250	1600	0	-.0063	–	–	–	–	–	–	–	–

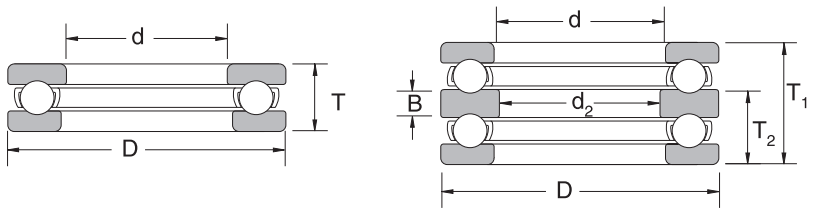


Table J.25 - Tolerances for Thrust Ball Bearing Height and Central Washer Height

Units: inch

Nominal Bore Diameter d (mm)		Flat Seat Type				Aligning Seat Washer Type				With Aligning Seat Washer				Height Deviation of Central Washer $ØB_{s}$(1)	
		$ØT_{s}$ or $ØT_{2s}$		$ØT_{1s}$		$ØT_{3s}$ or $ØT_{5s}$		$ØT_{5s}$		$ØT_{4s}$ or $ØT_{8s}$		$ØT_{1s}$			
		Class N, 6, 5, 4		Class N, 6, 5, 4		Class N, 6		Class N, 6		Class N, 6		Class N, 6		Class N, 6, 5, 4	
over	incl.	high	low	high	low	high	low	high	low	high	low	high	low	high	low
	30	+0	-.0030	+.0020	-.0059	+0	-.0030	+.0020	-.0059	+.0020	-.0030	+.0059	-.0059	+0	-.0020
30	50	+0	-.0039	+.0030	-.0079	+0	-.0039	+.0030	-.0079	+.0020	-.0039	+.0069	-.0079	+0	-.0030
50	80	+0	-.0049	+.0039	-.0098	+0	-.0049	+.0039	-.0098	+.0030	-.0049	+.0098	-.0098	+0	-.0039
80	120	+0	-.0059	+.0049	-.0118	+0	-.0059	+.0049	-.0118	+.0030	-.0059	+.0108	-.0118	+0	-.0049
120	180	+0	-.0069	+.0059	-.0138	+0	-.0069	+.0059	-.0138	+.0039	-.0069	+.0138	-.0138	+0	-.0059
180	250	+0	-.0079	+.0069	-.0157	+0	-.0079	+.0069	-.0157	+.0039	-.0079	+.0148	-.0157	+0	-.0069
250	315	+0	-.0089	+.0079	-.0177	+0	-.0089	+.0079	-.0177	+.0049	-.0089	+.0177	-.0177	+0	-.0079
315	400	+0	-.0118	+.0098	-.0236	+0	-.0118	+.0098	-.0236	+.0059	-.0108	+.0217	-.0217	+0	-.0098

Note: (1) For double-direction bearings, the thickness variation doesn't depend on the bore diameter d_2, but on d for singe-direction bearings with the same D in the same diameter series.

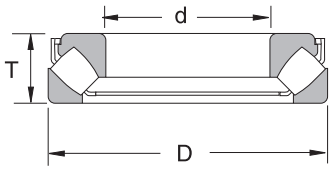


Table J.26 - Tolerances for Bore Diameters of Inner Rings and Height (Class N) of Spherical Thrust Roller Bearings

Units: inch

Nominal Bore Diameter d (mm)		$Ød_{mp}$		V_{dp}	Reference		
					S_d	$ØT_s$	
over	incl	high	low	max	max	high	low
50	80	0	-.0006	.0004	.0010	+.0059	-.0059
80	120	0	-.0008	.0006	.0010	+.0079	-.0079
120	180	0	-.0010	.0007	.0012	+.0098	-.0098
180	250	0	-.0012	.0009	.0012	+.0118	-.0118
250	315	0	-.0014	.0010	.0014	+.0138	-.0138
315	400	0	-.0016	.0012	.0016	+.0157	-.0157
400	500	0	-.0018	.0013	.0018	+.0177	-.0177

Table J.27 - Tolerances for Outer Ring Diameter (Class N) of Spherical Thrust Roller Bearings

Units: inch

Nominal Outside Diameter D (mm)		$ØD_{mp}$	
over	incl	high	low
120	180	0	-.0010
180	250	0	-.0012
250	315	0	-.0014
315	400	0	-.0016
400	500	0	-.0018
500	630	0	-.0020
630	800	0	-.0030
800	1000	0	-.0039

Tolerances for Shaft Diameters

Table J.28 - Tolerances for Shaft Diameters

Units: inch

Shaft Diameter (mm)		Bearing Bore Tolerance	Shaft Tolerance							
over	incl.	ABEC1	g6	h6	h9	h10	js5	js6	k5	k6
3	6	+0 -0.0003	-0.0002 -0.0005	+0 -0.0003	+0 -0.0012	+0 -0.0019	±0.0001	±0.0002	+0.0002 +0	+0.0004 +0
6	10	+0 -0.0003	-0.0002 -0.0006	+0 -0.0004	+0 -0.0014	+0 -0.0023	±0.0001	±0.0002	+0.0003 +0	+0.0004 +0
10	18	+0 -0.0003	-0.0002 -0.0007	+0 -0.0004	+0 -0.0017	+0 -0.0028	±0.0002	±0.0002	+0.0004 +0	+0.0005 +0
18	30	+0 -0.0004	-0.0003 -0.0008	+0 -0.0005	+0 -0.002	+0 -0.0033	±0.0002	±0.0003	+0.0004 +0.0001	+0.0006 +0.0001
30	50	+0 -0.0005	-0.0004 -0.0010	+0 -0.0006	+0 -0.0024	+0 -0.0039	±0.0002	±0.0003	+0.0005 +0.0001	+0.0007 +0.0001
50	80	+0 -0.0006	-0.0004 -0.0011	+0 -0.0007	+0 -0.0029	+0 -0.0047	±0.0003	±0.0004	+0.0006 +0.0001	+0.0008 +0.0001
80	120	+0 -0.0008	-0.0005 -0.0013	+0 -0.0009	+0 -0.0034	+0 -0.0055	±0.0003	±0.0004	+0.0007 +0.0001	+0.0010 +0.0001
120	180	+0 -0.001	-0.0006 -0.0015	+0 -0.001	+0 -0.0039	+0 -0.0063	±0.0004	±0.0005	+0.0008 +0.0001	+0.0011 +0.0001
180	250	+0 -0.0012	-0.0006 -0.0017	+0 -0.0011	+0 -0.0045	+0 -0.0073	±0.0004	±0.0006	+0.0009 +0.0002	+0.0013 +0.0002
250	315	+0 -0.0014	-0.0007 -0.0019	+0 -0.0013	+0 -0.0051	+0 -0.0083	±0.0005	±0.0006	+0.0011 +0.0002	+0.0014 +0.0002
315	400	+0 -0.0016	-0.0007 -0.0021	+0 -0.0014	+0 -0.0055	+0 -0.0091	±0.0005	±0.0007	+0.0011 +0.0002	+0.0016 +0.0002
400	500	+0 -0.0018	-0.0008 -0.0024	+0 -0.0016	+0 -0.0061	+0 -0.0098	±0.0005	±0.0008	+0.0013 +0.0002	+0.0018 +0.0002
500	630	+0 -0.002	-0.0009 -0.0026	+0 -0.0017	+0 -0.0069	+0 -0.011	–	±0.0009	– –	+0.0017 +0
630	800	+0 -0.003	-0.0009 -0.0029	+0 -0.002	+0 -0.0079	+0 -0.0126	–	±0.0010	– –	+0.0020 +0
800	1000	+0 -0.0039	-0.0010 -0.0032	+0 -0.0022	+0 -0.0091	+0 -0.0142	–	±0.0011	– –	+0.0022 +0
1000	1250	+0 -0.0049	-0.0011 -0.0037	+0 -0.0026	+0 -0.0102	+0 -0.0165	–	±0.0013	– –	+0.0026 +0
1250	1600	+0 -0.0063	-0.0012 -0.0043	+0 -0.0031	+0 -0.0122	+0 -0.0197	–	±0.0015	– –	+0.0031 +0
1600	2000	+0 -0.0079	-0.0013 -0.0049	+0 -0.0036	+0 -0.0146	+0 -0.0236	–	±0.0018	–	+0.0036 +0

Directions: The shaft tolerances are determined by adding the top number in the tolerance group to the shaft size and adding the bottom number to the shaft size. This provides the maximum shaft size and the minimum shaft size, respectively.

For example:

Shaft size = 0.4724"
Application = Electric Motor (Recommended shaft fit js6)
Shaft Tolerance (max) = 0.4724" + 0.0002" = 0.4726"
Shaft Tolerance (min) = 0.4724" - 0.0002" = 0.4722"

Table J.28 - Tolerances for Shaft Diameters (continued)

Units: inch

Shaft Diameter (mm)		Shaft Tolerance			
over	incl.	m5	m6	n6	p6
3	6	+0.0004 +0.0002	+0.0005 +0.0002	+0.0006 +0.0003	+0.0008 +0.0005
6	10	+0.0005 +0.0002	+0.0006 +0.0002	+0.0007 +0.0004	+0.0009 +0.0006
10	18	+0.0006 +0.0003	+0.0007 +0.0003	+0.0009 +0.0005	+0.0011 +0.0007
18	30	+0.0007 +0.0003	+0.0008 +0.0003	+0.0011 +0.0006	+0.0014 +0.0009
30	50	+0.0008 +0.0004	+0.0010 +0.0004	+0.0013 +0.0007	+0.0017 +0.0010
50	80	+0.0009 +0.0004	+0.0012 +0.0004	+0.0015 +0.0008	+0.0020 +0.0013
80	120	+0.0011 +0.0005	+0.0014 +0.0005	+0.0018 +0.0009	+0.0023 +0.0015
120	180	+0.0013 +0.0006	+0.0016 +0.0006	+0.0020 +0.0011	+0.0027 +0.0017
180	250	+0.0015 +0.0007	+0.0018 +0.0007	+0.0024 +0.0012	+0.0031 +0.0020
250	315	+0.0017 +0.0008	+0.0020 +0.0008	+0.0026 +0.0013	+0.0035 +0.0022
315	400	+0.0018 +0.0008	+0.0022 +0.0008	+0.0029 +0.0015	+0.0039 +0.0024
400	500	+0.0020 +0.0009	+0.0025 +0.0009	+0.0031 +0.0016	+0.0043 +0.0027
500	630	– –	+0.0028 +0.0010	+0.0035 +0.0017	+0.0048 +0.0031
630	800	– –	+0.0031 +0.0012	+0.0039 +0.0020	+0.0054 +0.0035
800	1000	– –	+0.0035 +0.0013	+0.0044 +0.0022	+0.0061 +0.0039
1000	1250	– –	+0.0042 +0.0016	+0.0052 +0.0026	+0.0073 +0.0047
1250	1600	– –	+0.0050 +0.0019	+0.0061 +0.0031	+0.0086 +0.0055
1600	2000	–	+0.0059 +0.0023	+0.0072 +0.0036	+0.0103 +0.0067

Units: inch

Shaft Diameter (inch)		Shaft Tolerance	
over	incl.	r6	r7
3	6	+0.0009 +0.0006	+0.0007 +0.0006
6	10	+0.0011 +0.0007	+0.0013 +0.0007
10	18	+0.0013 +0.0009	+0.0016 +0.0009
18	30	+0.0016 +0.0011	+0.0019 +0.0011
30	50	+0.0020 +0.0013	+0.0023 +0.0013
50	65	+0.0024 +0.0016	+0.0028 +0.0016
65	80	+0.0024 +0.0017	+0.0029 +0.0017
80	100	+0.0029 +0.0020	+0.0034 +0.0020
100	120	+0.0030 +0.0021	+0.0035 +0.0021
120	140	+0.0035 +0.0025	+0.0041 +0.0025
140	160	+0.0035 +0.0026	+0.0041 +0.0026
160	180	+0.0037 +0.0027	+0.0043 +0.0027
180	200	+0.0042 +0.0030	+0.0048 +0.0030
200	225	+0.0043 +0.0031	+0.0050 +0.0031
225	250	+0.0044 +0.0033	+0.0051 +0.0033
250	280	+0.0050 +0.0037	+0.0057 +0.0037
280	315	+0.0051 +0.0039	+0.0059 +0.0039
315	355	+0.0057 +0.0043	+0.0065 +0.0043
355	400	+0.0059 +0.0045	+0.0067 +0.0045
400	450	+0.0065 +0.0050	+0.0074 +0.0050
450	500	+0.0068 +0.0052	+0.0077 +0.0052
500	560	+0.0076 +0.0059	+0.0087 +0.0059
560	630	+0.0078 +0.0061	+0.0089 +0.0061
630	710	+0.0089 +0.0069	+0.0100 +0.0069
710	800	+0.0093 +0.0073	+0.0104 +0.0073
800	900	+0.0105 +0.0083	+0.0118 +0.0083
900	1000	+0.0109 +0.0087	+0.0122 +0.0087
1000	1120	+0.0124 +0.0098	+0.0140 +0.0098
1120	1250	+0.0128 +0.0102	+0.0144 +0.0102
1250	1400	+0.0149 +0.0118	+0.0167 +0.0118
1400	1600	+0.0161 +0.0130	+0.0179 +0.0130
1600	1800	+0.0182 +0.0146	+0.0205 +0.0146
1800	2000	+0.0194 +0.0157	+0.0217 +0.0157

Tolerances for Housing Bore Diameters

Table J.29 - Tolerances for Housing Bore Diameters

Units: inch

Housing Bore Diameter (mm)		Bearing O.D. Tolerance	Housing Bore Tolerance						
over	incl.	ABEC1	G7	H6	H7	H8	J6	J7	JS6
10	18	+0	+0.0009	+0.0004	+0.0007	+0.0011	+0.0002	+0.0004	±0.0002
		-0.0003	+0.0002	+0	+0	+0	-0.0002	-0.0003	
18	30	+0	+0.0011	+0.0005	+0.0008	+0.0013	+0.0003	+0.0005	±0.0003
		-0.0004	+0.0003	+0	+0	+0	-0.0002	-0.0004	
30	50	+0	+0.0013	+0.0006	+0.0010	+0.0015	+0.0004	+0.0006	±0.0003
		-0.0004	+0.0004	+0	+0	+0	-0.0002	-0.0004	
50	80	+0	+0.0016	+0.0007	+0.0012	+0.0018	+0.0005	+0.0007	±0.0004
		-0.0005	+0.0004	+0	+0	+0	-0.0002	-0.0005	
80	120	+0	+0.0019	+0.0009	+0.0014	+0.0021	+0.0006	+0.0009	±0.0004
		-0.0006	+0.0005	+0	+0	+0	-0.0002	-0.0005	
120	150	+0	+0.0021	+0.0010	+0.0016	+0.0025	+0.0007	+0.0010	±0.0005
		-0.0007	+0.0006	+0	+0	+0	-0.0003	-0.0006	
150	180	+0	+0.0021	+0.0010	+0.0016	+0.0025	+0.0007	+0.0010	±0.0005
		-0.0010	+0.0006	+0	+0	+0	-0.0003	-0.0006	
180	250	+0	+0.0024	+0.0011	+0.0018	+0.0028	+0.0009	+0.0012	±0.0006
		-0.0012	+0.0006	+0	+0	+0	-0.0003	-0.0006	
250	315	+0	+0.0027	+0.0013	+0.0020	+0.0032	+0.0010	+0.0014	±0.0006
		-0.0014	+0.0007	+0	+0	+0	-0.0003	-0.0006	
315	400	+0	+0.0030	+0.0014	+0.0022	+0.0035	+0.0011	+0.0015	±0.0007
		-0.0016	+0.0007	+0	+0	+0	-0.0003	-0.0007	
400	500	+0	+0.0033	+0.0016	+0.0025	+0.0038	+0.0013	+0.0017	±0.0008
		-0.0018	+0.0008	+0	+0	+0	-0.0003	-0.0008	
500	630	+0	+0.0036	+0.0017	+0.0028	+0.0043	–	–	±0.0009
		-0.0020	+0.0009	+0	+0	+0	–	–	
630	800	+0	+0.0041	+0.0020	+0.0031	+0.0049	–	–	±0.0010
		-0.0030	+0.0009	+0	+0	+0	–	–	
800	1000	+0	+0.0046	+0.0022	+0.0035	+0.0055	–	–	±0.0011
		-0.0039	+0.0010	+0	+0	+0	–	–	
1000	1250	+0	+0.0052	+0.0026	+0.0041	+0.0065	–	–	±0.0013
		-0.0049	+0.0011	+0	+0	+0	–	–	
1250	1600	+0	+0.0061	+0.0031	+0.0049	+0.0077	–	–	±0.0015
		-0.0063	+0.0012	+0	+0	+0	–	–	
1600	2000	+0	+0.0072	+0.0036	+0.0059	+0.0091	–	–	±0.0018
		-0.0079	+0.0013	+0	+0	+0	–	–	
2000	2500	+0	+0.0082	+0.0043	+0.0069	+0.0110	–	–	±0.0022
		-0.0098	+0.0013	+0	+0	+0	–	–	

Directions: The housing bore tolerances are determined by adding the top number in the tolerance group to the housing bore size and adding the bottom number to the housing bore size. This provides the maximum and minimum housing bore, respectively.

For example:

Housing bore = 1.2598″
Application = Electric Motor (Recommended Housing fit H7)
Housing Bore Tolerance (max) = 1.2598″ + 0.0007″ = 1.2605″
Housing Bore Tolerance (min) = 1.2598″ + 0″ = 1.2598″

Table J.29 - Tolerances for Housing Bore Diameters (continued)

Units: inch

Housing Bore Diameter (mm)		Housing Bore Tolerance							
over	incl.	JS7	K6	K7	M6	M7	N6	N7	P7
10	18	±0.0004	+0.0001	+0.0002	-0.0002	+0	-0.0004	-0.0002	-0.0004
			-0.0004	-0.0005	-0.0006	-0.0007	-0.0008	-0.0009	-0.0011
18	30	±0.0004	+0.0001	+0.0002	-0.0002	+0	-0.0004	-0.0003	-0.0006
			-0.0004	-0.0006	-0.0007	-0.0008	-0.0009	-0.0011	-0.0014
30	50	±0.0005	+0.0001	+0.0003	-0.0002	+0	-0.0005	-0.0003	-0.0007
			-0.0005	-0.0007	-0.0008	-0.001	-0.0011	-0.0013	-0.0017
50	80	±0.0006	+0.0002	+0.0004	-0.0002	+0	-0.0006	-0.0004	-0.0008
			-0.0006	-0.0008	-0.0009	-0.0012	-0.0013	-0.0015	-0.0020
80	120	±0.0007	+0.0002	+0.0004	-0.0002	+0	-0.0006	-0.0004	-0.0009
			-0.0007	-0.0010	-0.0011	-0.0014	-0.0015	-0.0018	-0.0023
120	150	±0.0008	+0.0002	+0.0005	-0.0003	+0	-0.0008	-0.0005	-0.0011
			-0.0008	-0.0011	-0.0013	-0.0016	-0.0018	-0.0020	-0.0027
150	180	±0.0008	+0.0002	+0.0005	-0.0003	+0	-0.0008	-0.0005	-0.0011
			-0.0008	-0.0011	-0.0013	-0.0016	-0.0018	-0.0020	-0.0027
180	250	±0.0009	+0.0002	+0.0005	-0.0003	+0	-0.0009	-0.0006	-0.0013
			-0.0009	-0.0013	-0.0015	-0.0018	-0.0020	-0.0024	-0.0031
250	315	±0.0010	+0.0002	+0.0006	-0.0004	+0	-0.0010	-0.0006	-0.0014
			-0.0011	-0.0014	-0.0016	-0.0020	-0.0022	-0.0026	-0.0035
315	400	±0.0011	+0.0003	+0.0007	-0.0004	+0	-0.0010	-0.0006	-0.0016
			-0.0011	-0.0016	-0.0018	-0.0022	-0.0024	-0.0029	-0.0039
400	500	±0.0012	+0.0003	+0.0007	-0.0004	+0	-0.0011	-0.0007	-0.0018
			-0.0013	-0.0018	-0.0020	-0.0025	-0.0026	-0.0031	-0.0043
500	630	±0.0014	+0	+0	-0.0010	-0.0010	-0.0017	-0.0017	-0.0031
			-0.0017	-0.0028	-0.0028	-0.0038	-0.0035	-0.0045	-0.0058
630	800	±0.0016	+0	+0	-0.0012	-0.0012	-0.0020	-0.0020	-0.0035
			-0.002	-0.0031	-0.0031	-0.0043	-0.0039	-0.0051	-0.0066
800	1000	±0.0018	+0	+0	-0.0013	-0.0013	-0.0022	-0.0022	-0.0039
			-0.0022	-0.0035	-0.0035	-0.0049	-0.0044	-0.0057	-0.0075
1000	1250	±0.0020	+0	+0	-0.0016	-0.0016	-0.0026	-0.0026	-0.0047
			-0.0026	-0.0041	-0.0042	-0.0057	-0.0052	-0.0067	-0.0089
1250	1600	±0.0024	+0	+0	-0.0019	-0.0019	-0.0031	-0.0031	-0.0055
			-0.0031	-0.0049	-0.0050	-0.0068	-0.0061	-0.0080	-0.0104
1600	2000	±0.0030	+0	+0	-0.0023	-0.0023	-0.0036	-0.0036	-0.0067
			-0.0036	-0.0059	-0.0059	-0.0082	-0.0072	-0.0095	-0.0126
2000	2500	±0.0034	+0	+0	-0.0027	-0.0027	-0.0043	-0.0043	-0.0077
			-0.0043	-0.0069	-0.0070	-0.0096	-0.0087	-0.0112	-0.0146

Fit - Why It's Important

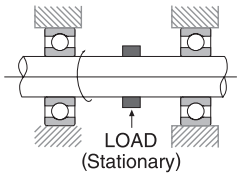
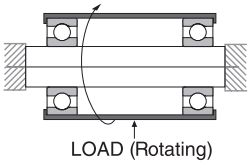
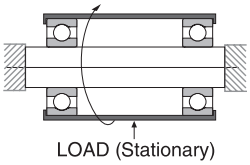
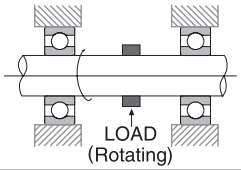
When a bearing's inner ring is fitted to the shaft with only slight interference, slipping or "creep" may occur. Creep may also occur between the outer ring and housing.

When creep occurs the fitted surfaces become abraded which causes excessive wear and may cause considerable damage to the shaft or housing. In addition, abrasive metal particles resulting from creep may enter the interior of the bearing and cause abnormal heating and vibration.

It is important to prevent creep by having sufficient interference to firmly secure the bearing ring to either the shaft or housing.

In specific applications, fits can be made without interference. For example, it is usually not necessary to provide fit interference for rings subjected only to stationary loads. In other applications, loose fits may be used to accommodate certain operating conditions or to facilitate bearing mounting and dismounting. In these cases, lubrication or other methods need to be considered to prevent damage to the fitting surfaces due to creep.

Table J.30 - Loading Conditions and Fit

Load Application	Bearing Operation		Loading Conditions	Fit	
	Inner Ring	Outer Ring		Inner Ring and Shaft	Outer Ring and Shaft
	Rotating	Stationary	Rotating Inner Ring Load	Tight Fit	Loose Fit
	Stationary	Rotating	Stationary Outer Ring Load		
	Stationary	Rotating	Rotating Outer Ring Load	Loose Fit	Tight Fit
	Rotating	Stationary	Stationary Inner Ring Load		
Direction of Load Interdeterminate	Rotating or Stationary	Rotating or Stationary	-	Tight Fit	Tight Fit

Load Conditions and Fit

Proper fit may be selected from Table J.30 on page J-23 based on the load and operating conditions.

Magnitude of Load and Interference

Under load, a slight amount of deflection or deformation of the bearing rings will occur. This reduces the interference fit. For this reason, heavier loaded bearings require a heavier initial interference fit. The required interference can be calculated using the following equations:

$$\varnothing \mathbf{d}_f = 0.08\sqrt{\frac{\mathbf{d}}{\mathbf{B}}\mathbf{F_r}}\ x10^{-3}$$

light and normal loads

$$\varnothing \mathbf{d_e} \geq 0.02\ \frac{\mathbf{F_r}}{\mathbf{B}}\ x10^{-3}$$

when $F_r > .20\ C_{or}$

Where $\varnothing \mathbf{d_f}$: Interference decrease of inner ring (mm)
$\varnothing \mathbf{d_e}$: Effective interference (mm)
$\mathbf{d}$: Bearing bore diameter (mm)
$\mathbf{B}$: Inner ing width (mm)
$\mathbf{F_r}$: Radial load applied to bearing (N)

Interference Variation Due to Temperature Difference Between Bearing and Shaft or Housing

Interference decreases when bearing temperature increases during operation. If the temperature difference between the interior of the bearing and the surrounding parts of the housing is Ø**T**(°C), then the temperature difference between the fitted surfaces of the shaft and the inner ring is estimated to be about (0.1~0.15)T. Decrease of inner ring interference due to this difference may be calculated from the following equation: $\varnothing d_T = (0.10 \sim 0.15)\ \varnothing \mathbf{T} \cdot \alpha \cdot d = 0.0015 \varnothing \mathbf{T} \cdot d x10^{-3}$

Where $\varnothing \mathbf{d_T}$ Decrease of interference of inner ring due to temperature increase (mm)
$\varnothing \mathbf{T}$ Temperature difference between bearing and surrounding parts
α Coefficient of linear expansion of bearing steel (12.5 x 10-6(1/°C))
$\mathbf{d}$ Bore diameter

Table J.31 - Fits of Radial Bearings with Solid Steel Shafts

Load Conditions		Examples	Shaft Diameter (mm)			Tolerance of Shaft
			Ball Bearings	Cylindrical or Tapered Roller Bearings	Spherical Roller Bearings	
Radial Bearings with Cylindrical Bores						
Rotating Outer Ring Load	Easy axial displacement of inner ring on shaft desirable	Wheels on Stationary Axles	All Shaft Diameters			**G6**
	Easy axial displacement of outer ring on shaft unnecessary	Tension Pulleys, Rope Sheaves				**H6**
Rotating Inner Ring Load or Direction of Load Indeterminate	Light Load (<0.06C_r[1])	Electrical Appliances, Pumps, Blowers, Transport Vehicles, Precision Machinery, Machine Tools	<18	–	–	**JS5**
			18 to 100	<40	–	**JS6 (J6)**
			100 to 200	40 to 140	–	**K6**
			–	140 to 200	–	**M6**
	Normal Loads (0.06 to 0.13 C_r[1])	General Bearing Applications, Medium and Large Motors, Turbines, Pumps, Engine Main Bearings, Gears, Woodworking Machines	<18	–	–	**JS5~6 (J5~6)**
			18 to 100	<40	<40	**K5 or 6**
			100 to 140	40 to 100	40 to 65	**M5 or 6**
			140 to 200	100 to 140	65 to 100	**M6**
			200 to 280	140 to 200	100 to 140	**N6**
			–	200 to 400	140 to 280	**P6**
			–	–	280 to 500	**R6**
			–	–	>500	**R7**
	Heavy Loads (> 0.13 C_r[1])	Railway Axle Boxes, Industrial Vehicles, Traction Motors, Construction Equipment, Crushers	–	50 to 140	50 to 100	**N6**
			–	140 to 200	100 to 140	**P6**
			–	over 200	140 to 200	**R6**
			–	–	200 to 500	**R7**
Axial Loads Only		-	All Shaft Diameters			**JS6 (J6)**
Radial Bearings with Tapered Bores and Sleeves (Contact NSK Engineering)						

Note: [1] C_r represents the basic load rating of the bearing.

Table J.32 - Fits of Thrust Bearings with Solid Steel Shafts

Load Conditions		Examples	Shaft Diameter (mm)	Tolerance of Shaft
Central Axial Load Only		Main Shafts of Lathes	All Shaft Diameters	**H6 OR JS6 (J6)**
Combined Radial and Axial Loads (Spherical Thrust Roller Bearings)	Stationary Inner Ring Load	Cone Crushers	All Shaft Diameters	**JS6 (J6)**
	Rotating Inner Ring Load or Direction of Load Indeterminate	Paper Pulp Refiners, Plastic Extruders	<200	**K6**
			200 to 400	**M6**
			Over 400	**N6**

Table J.33 - Fits of Radial Bearings with Housings

Load Conditions			Examples	Tolerances for Housing Bores
Solid Housings	Rotating Outer Ring Load	Heavy Loads on Bearing in Thin-Walled Housing or Heavy Shock Loads	Automotive Wheel Hubs (Roller Bearings), Crane Travelling Wheels	**P7**
		Normal or Heavy Loads	Automotive Wheel Hubs (Ball Bearings), Vibrating Screens	**N7**
		Light or Variable Loads	Conveyor Roller, Rope Sheaves, Tension Pulleys	**M7**
	Direction of Load Indeterminate	Heavy Shock Loads	Traction Motors	**M7**
		Normal or Heavy Loads	Pumps, Crankshaft Main Bearings, Medium and Large Motors	**K7**
Solid or Split Housings		Normal or Light Loads		**JS7 (J7)**
	Rotating Inner Ring Load	Loads of All Kinds	General Bearing Applications, Railway Axleboxes	**H7**
		Normal and Light Loads	Plummer Blocks	**H8**
		High Temperature Rise of Inner Ring Through Shaft	Paper Dryers	**G7**
Solid Housings		Accurate Running Desirable under Normal and Light Loads	Grinding Spindle Rear Ball Bearings, High Speed Centrifugal Compressor Free Bearings	**JS6 (J6)**
	Direction of Load Indeterminate		Grinding Spindle Front Ball Bearings, High Speed Centrifugal Compressor Fixed Bearings	**K6**
	Rotating Inner Ring Load	Accurate Running at High Rigidity Desirable under Variable Loads	Cylindrical Roller Bearings for Machine Tool Main Spindle	**M6 or N6**
		Minimum noise is required	Electrical Home Appliances	**H6**

Table J.34 - Fits of Thrust Bearings with Housings

Load Conditions			Remarks	Tolerances for Housing Bores
Axial Loads Only		Thrust Ball Bearings	General Purpose Application	**Clearance over 0.25mm**
			When Precision is Required	**H8**
		Spherical Thrust Roller Bearings	When Loads are Sustained by Other Bearings	**Outer ring has radial clearance**
Combined Radial and Axial Loads	Stationary Outer Ring Loads	Spherical Thrust Roller Bearings	-	**H7 or JS7 (J7)**
	Rotating Outer Ring Loads or Direction of Load Indeterminate		Normal Loads	**K7**
			Relatively Heavy Radial Loads	**M7**

Changes in Radial Internal Clearance

Decrease in Radial Internal Clearance Due to Fit

When the inner or outer ring is tight-fitted to the shaft or the housing, a decrease of radial internal clearance is caused by the expansion or contraction of the bearing rings. The decrease varies according to the bearing type, bearing size and shape, and design of the shaft or housing. The amount of decrease normally ranges from 70 to 90% of the interference.

The internal clearance after mounting, Ø*f*, is obtained by subtracting the interference decrease from the initial internal clearance.

Temperature Effects on Radial Internal Clearance

Under normal operation, the radial internal clearance of a bearing will decrease because of the temperature differences between the inner and outer rings. Typically, the temperatures of the inner ring and the rolling elements are higher than that of the outer ring by 8 to 15°F. When the shaft is heated or when the housing is cooled, the difference between the inner and outer rings is even larger.

The amount of decrease due to thermal expansion can be calculated from the following equations:

$$\delta_t = \alpha \triangle_t D_e$$

Where δ_t : Internal clearance decrease (inch) due to temperature
α: Coefficient of linear expansion of bearing steel (12.5×10^{-6}) (1/°C)
$\triangle_t$: Temperature difference between inner & outer rings (°C)
D_e : Outer ring raceway diameter (inch)

For Ball Bearings: $D_e = \frac{1}{5}(4D + d)$ **For Roller Bearings:** $D_e = \frac{1}{4}(3D + d)$

Where **D** : Bearing outside diameter (inch)
d : Bearing bore diameter (inch)

Effective Clearance

The effective, or operating, clearance Øis obtained by subtracting δ_t from the internal clearance after mounting Ø**f**. Theoretically, the longest life of a bearing can be expected when the effective clearance is slightly negative. However, it is difficult to achieve this condition and excessive negative clearance will shorten bearing life. Therefore, a clearance of zero or a slightly positive value is preferable.

Angular contact ball bearings or tapered roller bearings normally require the user to set the internal clearance at mounting. The user should check the proper orientation of these bearings by checking the original bearings or the service manual for the machine. A check should also be made for the recommended set clearance. This can be obtained from the service manual, the machine manufacturer, or the bearing manufacturer.

Preloaded Bearings

Types and Features

Rolling bearings usually retain some internal clearance while in operation. However, in some cases it is desirable to provide a negative clearance. This is called "preloading." Preloading can be used to decrease bearing deflection and provide greater bearing rigidity. However, it may also increase power consumption and reduce bearing life.

A preload is usually given to those types of bearings in which the axial clearance can be adjusted in mounting -- for example, angular contact ball bearings and tapered roller bearings. Usually preloaded bearings are mounted face to face or back to back to form a duplex bearing set.

Why Preload?

Typical reasons and applications for preloading bearings are:

- To maintain bearings in an exact position in both the radial and axial directions and to maintain the running accuracy of the shaft... for example, the main shaft of machine tools and instruments.
- To increase bearing rigidity. This is often needed on the main shaft of machine tools or the pinion shaft of automobile differentials.
- To minimize noise due to axial vibration and resonance...for example, in high speed or high acceleration applications of angular contact ball bearings and thrust ball bearings.
- To prevent sliding due to the gyratory movement of rolling elements...for example, in high speed or high acceleration applications of angular contact ball bearings and thrust ball bearings.
- To maintain the rolling elements in their proper position with the bearing rings...for example, on thrust ball bearings and spherical roller thrust bearings mounted on a horizontal shaft.

How to Preload Duplex Bearings

There are two basic methods for preloading duplex bearings -- preloading by position and preloading by constant pressure:

Position Preload

Position preload is achieved by positioning two axially opposed bearings while maintaining their relative positions in operation. This is usually done by one of the following methods:

- Installing a duplex bearing set with previously adjusted stand-out dimensions and axial clearance.
- Using a spacer or shim with proper dimensions to obtain the required spacing and preload. See Figure J.1.
- Using bolts or nuts to allow adjustment of the axial clearance. In this case the starting friction torque should be measured to verify the proper preload.

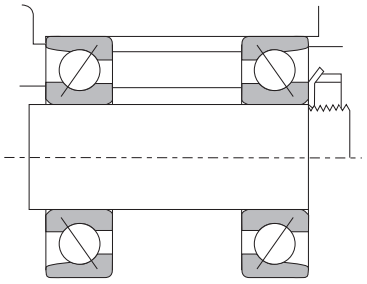


Figure J.1 - Example of Position Preload

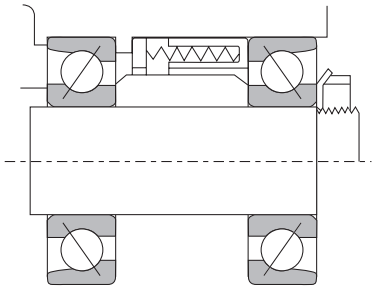


Figure J.2 - Example of Constant Pressure Preload

Constant Pressure Preload

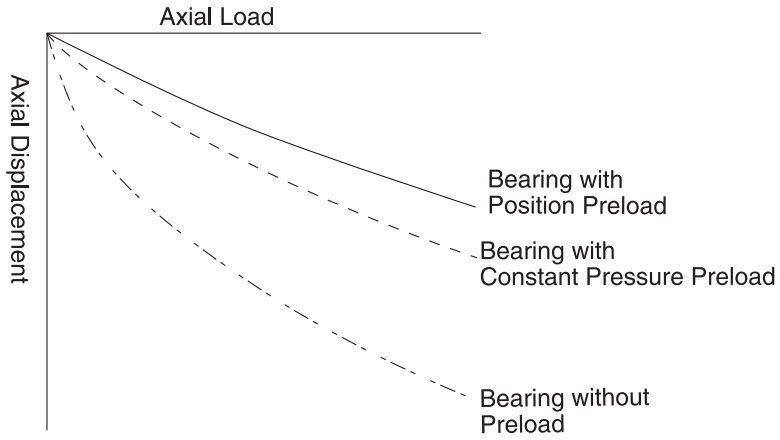
Constant pressure preload is achieved by using a coil or leaf spring to impose a constant preload. Even if the relative position of the bearings changes during operation, the magnitude of the preload remains relatively constant. See Figure J.2.

Selecting Preloading Method and The Amount of Preload Use

Comparison of Preloading Methods

A comparison of rigidity using different preloading methods is shown in the chart below.

Figure J.3 - Comparsion of Preloading Methods



Position preloading is generally preferred for increasing rigidity. Constant pressure preload is more suitable for high speed applications, prevention of axial vibration, and for use with thrust bearings on horizontal shafts. Position preload and constant pressure preload each offer specific advantages:

- When equal preloads are imposed, the position preload provides greater bearing rigidity. The deflection due to external loads is less for bearings with a position preload.
- In position preloading the level of preload varies depending on such factors as a difference in axial expansion due to a temperature difference between the inner and outer rings and deflection due to load.
- In constant pressure preloading it is possible to minimize any change in the preload because the variation of the spring load with shaft expansion and contraction is negligible.

How Much Preload to Use?

If the preload is larger than necessary, abnormal heat generation, increased frictional torque and reduced fatigue life may occur. The amount of the preload should be determined considering the operating conditions, the purpose of the preload, and the type of bearing to be preloaded.

Preload of Duplex Angular Contact Ball Bearings — The average preloads for duplex angular contact ball bearings (contact angle of 15°) with precision better than P5 class are listed in the tables on the following page. These bearings are used on the main shafts of machine tools.

The recommended fits between the shaft and inner ring, and between the housing and outer ring are listed in Table J.32 on page J-25 thru Table J.34 on page J-25.

For housing fits, the lower limit of the fit range should be selected for fixed-end bearings and the upper limit for free-end bearings.

As a general rule, an extra light or light preload should be selected for spindles of grinders and a medium preload should be selected for the main shafts of high speed lathes and milling machines.

Table J.35 - Preloads for Duplex Angular Contact Ball Bearings

Units: N

Bearing Number	Preload			
	Extra Light Preload EL	Light Preload L	Medium Preload M	Heavy Preload H
7000 C	12	25	49	100
7001 C	12	25	59	120
7002 C	14	29	69	150
7003 C	14	29	69	150
7004 C	24	49	120	250
7005 C	29	59	150	290
7006 C	39	78	200	390
7007 C	60	120	250	490
7008 C	60	120	290	590
7009 C	75	150	340	690
7010 C	75	150	390	780
7011 C	100	200	490	980
7012 C	100	200	540	1080
7013 C	125	250	540	1080
7014 C	145	290	740	1470
7015 C	145	290	780	1570
7016 C	195	390	980	1960
7017 C	195	390	980	1960
7018 C	245	490	1180	2350
7019 C	270	540	1180	2350
7020 C	270	540	1270	2550

Table J.36 - Duplex Bearing of Series 72

Units: N

Bearing Number	Preload			
	Extra Light Preload EL	Light Preload L	Medium Preload M	Heavy Preload H
7200 C	14	29	69	150
7201 C	19	39	100	200
7202 C	19	39	100	200
7203 C	24	49	150	290
7204 C	34	69	200	390
7205 C	39	78	200	390
7206 C	60	120	290	590
7207 C	75	150	390	780
7208 C	100	200	490	980
7209 C	125	250	540	1080
7210 C	125	250	590	1180
7211 C	145	290	780	1570
7212 C	195	390	930	1860
7213 C	220	440	1080	2160
7214 C	245	490	1180	2350
7215 C	270	540	1230	2450
7216 C	295	590	1370	2750
7217 C	345	690	1670	3330
7218 C	390	780	1860	3730
7219 C	440	880	2060	4120
7220 C	490	980	2350	4710

Table J.37 - Recommended Fits for Precision Class Duplex Angular Contact Ball Bearings with Preload

Nominal Bore Diameter d (mm)		Target Shaft Interference (inch)	Nominal Outside Diameter D (mm)		Target Housing Clearance (inch)	
over	incl.		over	incl.		
–	18	0 - 0.0001	–	18	–	–
18	30	0 - 0.0001	18	30	+.0001	+.0002
30	50	0 - 0.0001	30	50	+.0001	+.0002
50	80	0 - 0.0001	50	80	+.0001	+.0003
80	120	0 - 0.0002	80	120	+.0001	+.0004
120	150	–	120	150	+.0002	+.0005
150	180	–	150	180	+.0002	+.0005
180	250	–	180	250	+.0002	+.0006

Table J.38 - Duplex Bearings of Series 79

Units: N

Bearing Number	Preload			
	Extra Light Preload EL	Light Preload L	Medium Preload M	Heavy Preload H
7900 C	7	15	29	59
7901 C	8.6	15	39	78
7902 C	12	25	49	100
790 C3	12	25	59	120
7904 C	19	39	78	150
7905 C	19	39	100	200
7906 C	24	49	100	200
7907 C	34	69	150	290
7808 C	39	78	200	390
7909 C	50	100	200	390
7910 C	50	100	250	490
7911 C	100	200	490	980
7912 C	60	120	290	590
7913 C	75	150	340	690
7914 C	100	200	490	980
7915 C	100	200	490	980
7916 C	100	200	490	980
7917 C	145	290	640	1270
7918 C	145	290	740	1470
7919 C	145	290	780	1570
7920 C	195	390	880	1770

Preload of Thrust Ball Bearings

When the balls in thrust ball bearings rotate at relatively high speeds, sliding due to the gyratory movement of the balls may occur. The larger of the two values obtained from the equations below should be selected as the minimum axial load in order to prevent such sliding.

$$F_{a,min} = \frac{C_{oa}}{100} \left(\frac{n}{N_{max}} \right)^2$$

Where: $F_{a,min}$: Minimum axial load, N
C_{oa}: Basic static load rating, N
n: Rotational speed, RPM
N_{max}: Limiting speed (oil lubrication), RPM

Preload of Spherical Roller Thrust Bearings

When spherical roller thrust bearings are used a preload is necessary to keep the rollers in proper position against the outer ring raceway. The minimum axial load F_a,min necessary to do this is: $F_{a,min} = \left(\frac{C_{oa}}{1000} \right)$

Lubricating Grease

Grease is a semi-solid lubricant of a base oil and a thickener. Other ingredients are sometimes added to impart special properties to the base.

The main types and general properties of grease are shown in Table J.40 on page J-31. It should be noted that different brands of the same type of grease may have different properties.

Base Oil – Mineral oil or synthetic oils such as silicon or diester oil, are commonly used as the base oil for grease. The lubricating properties of grease are dependent on the characteristics of its base oil. The viscosity of the base oil is an important consideration when selecting grease. Usually grease made with a low viscosity base oil is more suitable for high speeds and low temperatures while grease made with high viscosity base oils is more suited for high temperatures and heavy loads. The thickener also influences the lubricating properties of grease, therefore selection criteria for grease are not the same as for lubricating oil.

Thickener – Several types of metallic soaps, inorganic compounds such as silica gel and bentonite, and heat resisting organic thickeners such as polyurea and flouric compounds are used as thickeners for grease. The water resistance properties of grease depend on the type of thickener. Sodium soap grease (or compound grease containing sodium soap) emulsifies when exposed to water or high humidity and therefore cannot be used where moisture is prevalent. Lithium soap grease, on the other hand, is recommended where moisture is present because of its resistance to wash off.

For applications where the operating temperature exceeds the limitation of common multi-purpose grease, greases having complex bases or non-soap bases are recommended. The grease used should also have a synthetic oil to withstand rapid deterioration at high temperatures. If the grease used in a high temperature application uses a mineral oil, it should be replenished frequently as deterioration of the oil will be accelerated at high temperatures.

Additives – Grease often contains a variety of additives such as antioxidants, corrosion inhibitors, and extreme pressure additives to give it special properties. Extreme pressure additives are recommended for use in heavy load applications. For long use without replenishment, an antioxidant should be added.

Consistency – Consistency indicates the "softness" of the grease. The following table shows the relationship between consistency and working conditions.

Table J.39 - Lubricant Consistency

	Consistency Number (Given by the National Lubricating Grease Institute (NLGI) Scale)				
	0	**1**	**2**	**3**	**4**
Consistency (1) (1/10mm)	385~355	340~310	295~265	250~220	205~175
Working Condition	For centralized oiling. When false brinelling is liable to occur.	For centralized oiling. When fretting is liable to occur. For low temperature.	For general use. For sealed bearings.	For high temperature. For general use. For sealed bearings.	For high temperature. For grease seals.

Note: (1) Consistency: Depth into grease attained by a cone when pressed with a specified weight, indicated in units of 1/10 mm. The larger the value, the softer the grease.

Mixing Different Types of Grease – In general, grease of different types must not be mixed. Mixing grease with different types of thickeners may destroy the composition and physical properties of the grease. Even if the thickeners are of the same type, possible differences in the additives may cause detrimental effects.

Table J.40 - Grease Properties

	Popular Name →	Lithium Grease			Sodium Grease (Fiber Grease)	Calcium Grease (Cup Grease)	Mixed Base Grease	Complex Grease	Non-Soap Base Grease	
	Thickener →	Li Soap			Na Soap	Ca Soap	Na + Ca Soap, Li + Ca Soap, etc.	Ca Complex, A1 Complex, etc.	Silica Gel, Bentonite, Carbon Black, Polyurea, Flouric Compounds, Heat Resistant Organic Compound, etc.	
	Base Oil →	Mineral Oil	Diester Oil	Silicone Oil	Mineral Oil	Mineral Oil	Mineral Oil	Mineral Oil	Mineral Oil	Synthetic Oil
Property (1)	Dropping Point, ᶜº	170~190	170~195	200~210	170~210	70~90	160~190	180~300	230	240~
	Working Temp., ᶜº	-20~110	-50~130	-50~160	-20~130	-20~60	-20~80	-20~130	-10~130	~250
	Working Speed, % (2)	70	100	60	70	40	70	70	70	40~100
	Mechanical Stability	Good	Good	Good	Good	Poor	Good	Good	Good	Good
	Pressure Resistance	Fair	Fair	Poor	Fair	Poor	Fair to Good	Fair to Good	Fair	Fair
	Water Resistance	Good	Good	Good	Poor	Good	Poor for Na Soap Grease	Good	Good	Good
	Rust Prevention	Good	Good	Poor	Poor to Good	Good	Fair to Good	Fair to Good	Fair to Good	Fair to Good
	Remarks	General purpose lubricant.	Good low temperature and torque characteristics. Often used for small motor and instrument bearings.	Mainly for high temperature applications. Unsuitable for bearings under high speed or heavy load conditions or for sliding contact areas (roller bearings).	Long and short fiber types available. Long fiber grease is not suitable for high speeds or for sliding contact areas (roller bearings).	Not suitable for high temp. and heavy loads. Extreme pressure grease containing high viscosity oil and extreme pressure additive (Pb soap, etc.) is available.	Often used for roller bearings and large ball bearings.	Suitable for extreme pressures. Mechanically stable.	Medium and high temperature lubricant.	Recommended for special environments with very high and low temperatures, acids, alkalis, radioactivity, and exposure to flames.

Note: (1) The grease properties shown here can vary between different brands.
(2) the values listed are percentages of the limiting speeds given in the bearing tables.

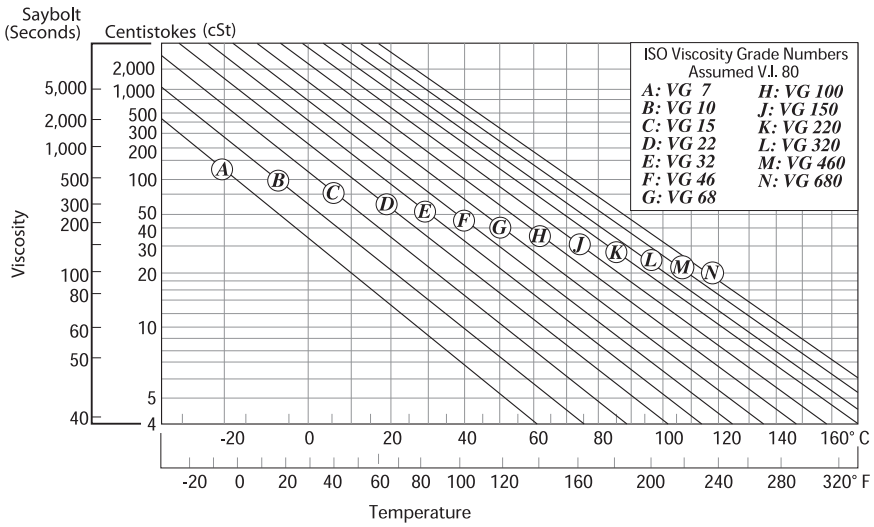
Lubricating Oil

Lubricating oil used for bearings is usually a highly refined mineral or synthetic oil which has a high film strength and superior oxidation and corrosion resistance. When selecting an oil, the viscosity of the operating conditions is very important. If the viscosity is too low, a proper oil film is not formed and abnormal wear and seizure may occur. On the other hand, if the viscosity is too high, excessive viscous resistance may cause heating or a large power loss. In general, low viscosity oils should be used at high speeds. Higher viscosity oils should be used for heavy loads or for the larger bearings. The following table shows the generally recommended viscosity for certain bearing types.

Table J.41 - Recommended Viscosity by Bearing Type

Bearing Types	Proper Viscosity at the Operating Temperature
Ball Bearings and Cylindrical Roller Bearings	Higher than 13 cSt
Tapered Roller Bearings and Spherical Roller Bearings	Higher than 20 cSt
Spherical Roller Thrust Bearings	Higher than 32 cSt

Figure J.4 - Temperature - Viscosity Chart



This chart shows the relationship between temperature and viscosity for use in selection of the proper lubricating oil.

Oil Replacement Interval – The oil replacement interval depends on the operating conditions and oil quantity. In those cases where the operating temperature is less than 120°F and the environmental conditions are good, oil should be replaced approximately once a year. However, where the oil temperature is about 212°F the oil must be changed at least once every three months.

In dirty environmental conditions, or if moisture or foreign material is mixed in the oil, the replacement interval must be shortened.

Mixing different brands of lubricating oil should be avoided.

Lubrication - The Purpose

Lubrication is needed to reduce friction and wear inside the bearing. Proper lubrication and procedures will allow the bearing to reach its expected life.

Primarily, lubrication serves the following purposes:

- Reduces Friction and Wear – Direct metallic contact between the bearing rings, rolling elements and cage is prevented by an oil film which reduces the friction and heat at the contact areas.
- Extends Bearing Life – The rolling fatigue life of bearings depends in a large part on the viscosity and film thickness of the lubricant. A proper film thickness prolongs the bearing fatigue life.
- Cooling – Circulating oil can be used to carry heat away from the bearing. A circulating system is normally used when excessive heat is generated by the bearing due to high speeds, high loads, or when heat from a source adjacent to the bearing can affect its operation. Oils deteriorate at high temperatures; therefore it is important to keep both the oil and the bearing cool.
- Other Purposes – Proper lubrication also helps to prevent foreign material from entering the bearings, and protects against corrosion or rusting.

Selecting The Correct Lubrication Method

Lubrication can be accomplished by using either oil or grease. The most satisfactory bearing performance will be achieved by selecting the method most suitable for a specific application. This of course will also depend on the conditions under which the bearing will operate.

Oil lubrication is superior in lubricating efficiency, however, grease lubrication allows a simpler structure around the bearings. The following table compares oil and grease lubrication.

Table J.42 - Grease vs. Oil Lubrication

Operating Factor	Grease Lubrication	Oil Lubrication
Housing Structure and Sealing Method	Simple	May be complex. Careful maintenance required.
Speed	Limiting speed is 65 % to 80% that of oil lubrication	High limiting speed
Cooling Effect	Poor	Heat transfer is possible using forced oil circulation lubrication
Fluidity	Poor	Good
Full Lubrication Replacement	Sometimes difficult	Easy
Removal of Foreign Matter	Removal of particles from grease is impossible	Easy
External Contamination Due to Leakage	Surroundings seldom contaminated by leakage	Often leaks without proper countermeasures. Not suitable if external contamination must be avoided.

Grease Lubrication

Grease Quantity

The quantity of grease to be packed in a housing depends on the housing design, rotational speeds of the bearings, characteristics of the grease selected, and the ambient temperature conditions. These factors are critical to satisfactory performance.

In applications where the operating speed does not exceed one-half the rated limiting speed of the bearing, the housing should be packed one-half to two-thirds full. If the speed of the bearing exceeds one-half the limiting speed, the quantity of grease should be reduced to one-third to one-half full and periodic regreasing scheduled. When operating conditions are not severe, the original pack of grease should last a long time without replenishment. If the operating conditions become severe, it will be necessary to regrease periodically.

Care should be taken to avoid excessive greasing as this will cause bearings to overheat.

Replacement of Grease

Grease, once packed, usually need not be replenished for a long time; however, for severe operating conditions, grease should be frequently replenished or replaced. In such cases, the bearing housing should be designed to facilitate grease replenishment and replacement.

When replacement intervals are short, provide replenishment and discharge ports at appropriate positions so deteriorated grease is replaced by fresh grease. For example, the housing space on the grease supply side can be divided into several sections with partitions. The grease on the partitioned side gradually passes through the bearings and old grease forced from the bearing is discharged through a release valve. If a grease valve is not used, the space on the discharge side is made larger than the partitioned side so it can retain the old grease, which is removed periodically by removing the cover.

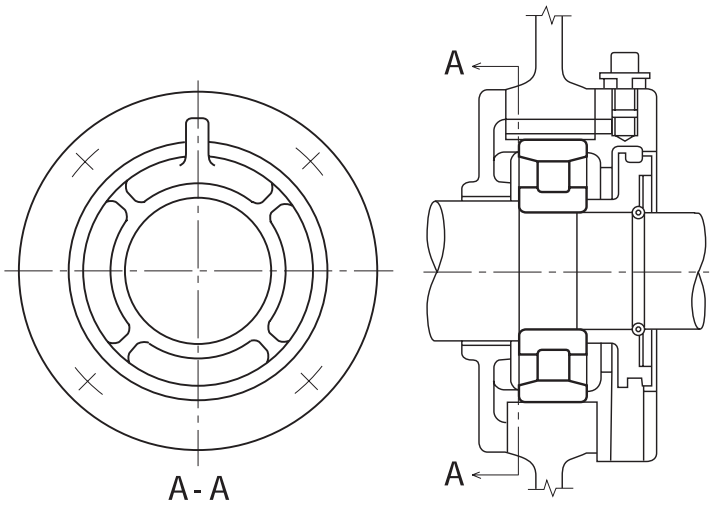


Figure J.5 - Combination of Partitioned Grease Reservoir and Grease Valve

Replenishment Interval

Even if high-quality grease is used, there is deterioration of its properties with time; therefore, periodic replenishment is required. Figure J.6 shows the replenishment time intervals for various bearing types running at different speeds.

- Temperature

If the bearing temperature exceeds 70°C, the replenishment time internal must be reduced by half for every 15°C temperature rise of the bearings.

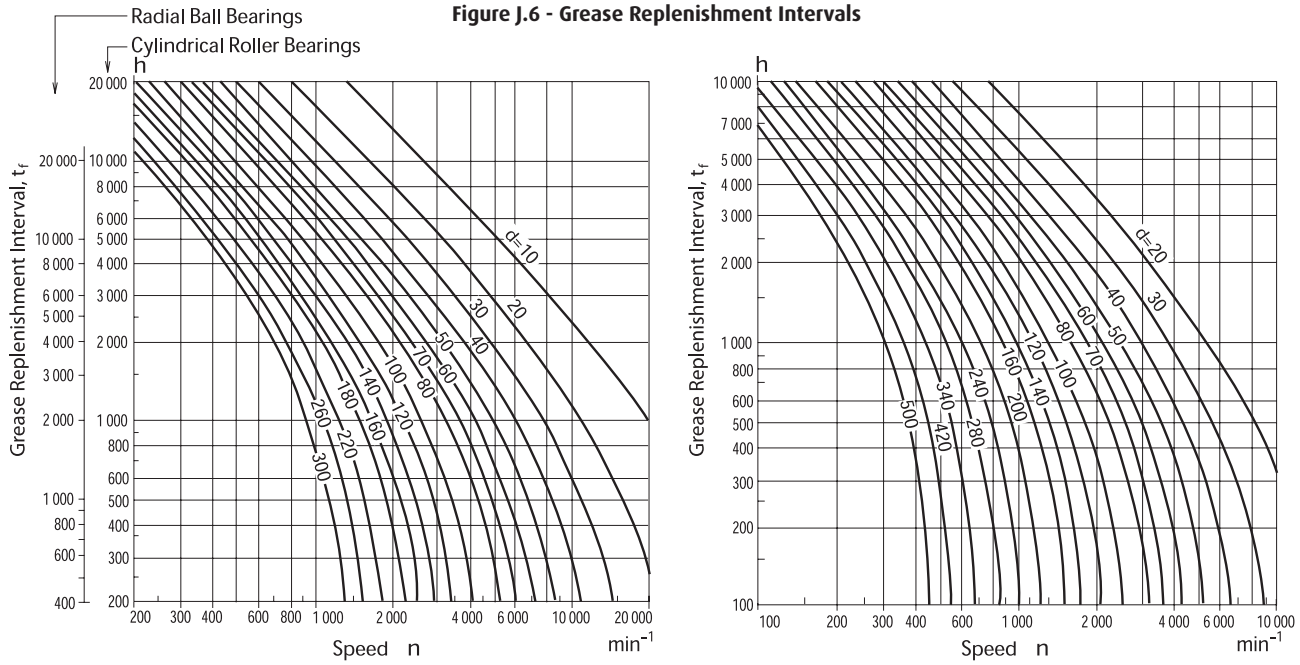
- Grease

In case of ball bearings especially, the replenishing time internal can be extended depending on used grease type. For example, high quality lithium soap-synthetic oil grease may extend about two times of replenishing time interval. If the temperature of the bearings is less than 70°C, the usage of lithium soap-mineral oil grease or lithium soap-synthetic oil grease is appropriate.

- Load

The replenishing time interval depends on the magnitude of the bearing load. If P/C exceeds 0.16, it is advisable to consult NSK.

Figure J.6 - Grease Replenishment Intervals



(1) Radial Ball Bearings, Cylindrical Roller Bearings

(2) Tapered Roller Bearings, Spherical Roller Bearings

(3) Load factor

P/C	0.06	0.1	0.13	0.16
Load factor	1.5	1	0.65	0.45

Grease Replenishment

Frequent grease replenishment is required when operating conditions are severe such as in high ambient temperatures or where contaminants can enter bearing housings. Routine regreasing schedules should be established. In cases where extremely severe conditions exist or the bearings are in a remote area, the bearing housing should be designed to make replenishment and replacement as simple as possible. Automatic grease systems are available and should be used.

For normal operating conditions, it may be necessary to regrease the bearing periodically to replace any grease which has leaked from the housing and to eliminate any deteriorated grease.

Oil Lubrication

When the operating speed exceeds the grease limiting speed listed for the bearing, oil lubrication should be used. Several methods are available and are described below. The best method to use will depend on operating conditions.

Oil Bath Lubrication is a common method used where bearings are operating below the listed oil limiting speed. The static oil level should be set at the center of the lowest rolling element. An oil sight level gauge should be included in the system so that proper oil level can be quickly monitored.

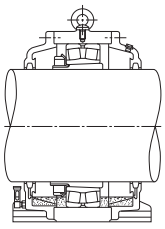


Figure J.7 - Oil Bath Lubrication

Drip Feed Lubrication is often used for small bearings operated at relatively high speeds. In the illustration, a visible oiler is used. The oil drip rate is controlled by a screw valve located at the top of the oil cup.

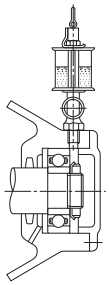


Figure J.8 - Drip Feed Lubrication

Splash Lubrication – In this lubricating method, oil is splashed onto the bearings by gears or by a simple rotating disc. This method is commonly used in automobile transmissions, differentials and gear boxes. The illustration shows splash lubrication used on a reduction gear.

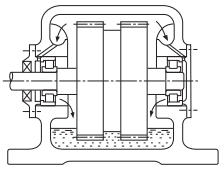


Figure J.9 - Splash Lubrication

Circulating System lubrication is commonly used for high speed operation and for bearings used at high temperatures. As shown in the illustration, oil from the supply pipe circulates through the bearings and exits to an external reservoir. After cooling in the reservoir it returns to the bearing through a pump and filter. In a circulating system, the oil outlet should be larger in diameter than the supply pipe so that an excessive amount of oil will not remain in the housing.

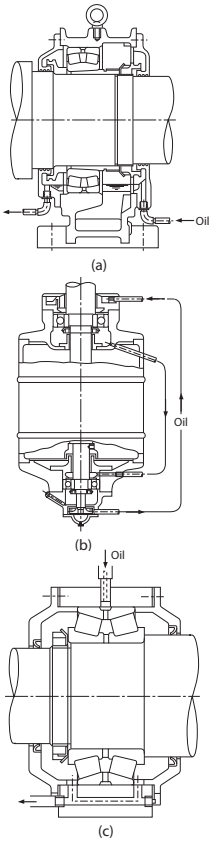


Figure J.10 - Circulation Lubrication

Jet Lubrication is often used for ultra-high speed bearings, such as the bearings in jet engines with a d_{mn} valve (d_m: pitch diameter of rolling element set in mm, n: rotational speed in min^{-1}) exceeding one million. Lubrication oil is sprayed under pressure from one of more nozzles directly into the bearing.

Figure J.11 shows an example of ordinary jet lubrication. The lubricating oil is sprayed on the inner ring and cage guide face. In the case of high speed operation, the air surrounding the bearing rotates with it causing the oil jet to be deflected. The jetting speed of the oil from the nozzle should be more than 20% of the circumferential speed of the inner ring outer surface (which is also the guide face for the cage).

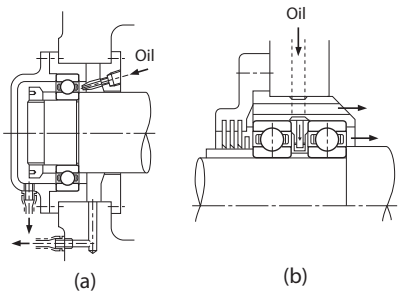


Figure J.11 - Jet Lubrication

More uniform cooling and a better temperature distribution are achieved using more nozzles for a given amount of oil. It is desirable for the oil to be forcibly discharged so the agitating resistance of the lubricant can be reduced and the oil can effectively carry away the heat.

Oil mist lubrication, also called oil fog lubrication, utilizes an oil mist sprayed into a bearing. This method has the following advantages:

(a) Because of the small quantity of oil required, the oil agitation resistance is small, and higher speeds are possible.
(b) Contamination of the vicinity around the bearing is slight because the oil leakage is small.
(c) It is relatively easy to continuously supply fresh oil; therefore, the bearing life is extended.

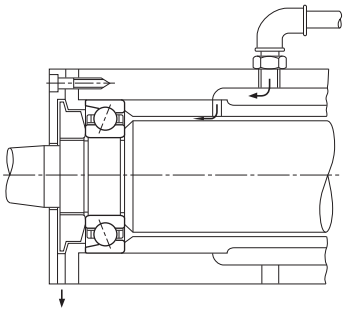


Figure J.12 - Oil Mist Lubrication

This lubricating method is used in bearings for the high speed spindles of machine tools, high speed pumps, roll necks of rolling mills, etc. For oil mist lubrication of large bearings, it is advisable to consult NSK.

Using the oil/air lubricating method, a very small amount of oil is discharged intermittently by a constant-quantity piston into a pipe carrying a constant flow of compressed air. The oil flows along the wall of the pipe and approaches a constant flow rate.
The major advantages of oil/air lubrication are:

(a) Since the minimum necessary amount of oil is supplied, this method is suitable for high speeds because less heat is generated.
(b) Since the minimum necessary amount of oil is fed continuously, bearing temperature remains stable. Also, because of the small amount of oil, there is almost no atmospheric pollution.
(c) Since only fresh oil is fed to the bearings, oil deterioration need not be considered.
(d) Since compressed air is always fed to the bearings, the internal pressure is high, so dust, cutting fluid, etc. cannot enter.

For these reasons, this method is used in the main spindles of machine tools and other high-speed applications.

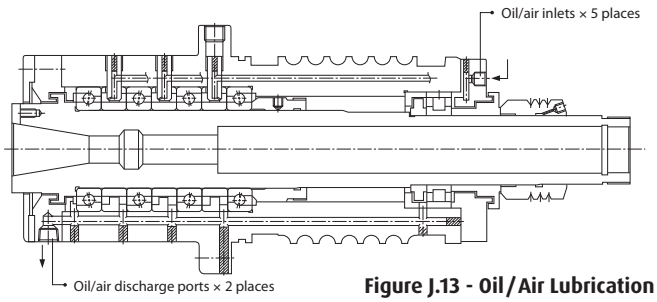


Figure J.13 - Oil / Air Lubrication

Grease Life of Sealed Ball Bearings

When grease is packed into single-row deep groove ball bearings, the grease life may be estimated using the equation below or Figure J.14.

General purpose grease [1]

$$\log t = 6.54 - 2.6 \frac{n}{N_{max}} - (0.025 - 0.012 \frac{n}{N_{max}})/T$$

Wide range grease [2]

$$\log t = 6.12 - 1.4 \frac{n}{N_{max}} - (0.018 - 0.006 \frac{n}{N_{max}})/T$$

Where:

- **t:** Average grease life (h)
- **n:** Speed (min^{-1})
- **N_{max}:** Limiting speed with grease lubrication (min^{-1}) (values for ZZ and VV types listed in the bearing tables)
- **T:** Operating temperature ^0C

Equations above and Figure J.14 apply under the following conditions:

(a) Speed, n

$$0.25 \leq \frac{n}{N_{max}} \leq 1$$

When $\frac{n}{N_{max}} < 0.25$, assume $\frac{n}{N_{max}} = 0.25$

(b) Operating Temperature, T

For general purpose grease [1]

$70^0C \leq T \leq 110^0C$

For wide-range grease [2]

$70^0C \leq T \leq 130^0C$

When $T < 70^0C$ assume $T = 70^0C$

(c) Bearing Loads The bearing loads should be about 1/10 or less of the basic load rating C_r.

Notes:

(1) Mineral-oil base greases (e.g. lithium soap base grease) which are often used over a temperature range of around -10 to 110^0C.

(2) Synthetic-oil base greases are usable over a wide temperature range of around -40 to 130^0C.

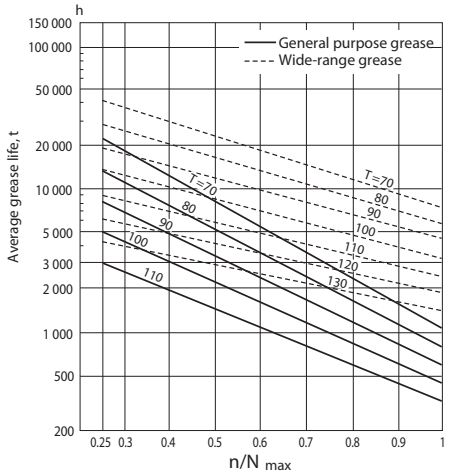


Figure J.14 - Grease Life of Sealed Ball Bearings

Oil Replacement Intervals

Oil replacement intervals depend on the operating conditions and oil quality.

In those cases where the operating temperature is less than 50°C, and the environmental conditions are good with little dust, the oil should be replaced approximately once a year. However, in cases where the oil temperature is about 100°C, the oil must be changes at least once every three months.

If moisture may enter or if foreign matter may be mixed in the oil, then the oil replacement interval must be shortened.

Mixing different brands of oil must be prevented for the same reason given previously for grease.

Table J.43 - Examples of Selecting Lubricating Oils

Operating Temperature	Speed	Light or Normal Load	Heavy or Shock Load
-30 to 0°C	Less than limiting speed	ISO VG 15, 22, 32 (refrigerating machine oil)	--
0 to 50°C	Less than 50% of limiting speed	ISO VG 32, 46, 68 (bearing oil, turbine oil)	ISO VG 46, 68, 100 (bearing oil, turbine oil)
	50 to 100% of limiting speed	ISO VG 15, 22, 32 (bearing oil, turbine oil)	ISO VG 22, 32, 46 (bearing oil, turbine oil)
	More than limiting speed	ISO VG 10, 15, 22 (bearing oil)	--
50 to 80°C	Less than 50% of limiting speed	ISO VG 100, 150, 220 (bearing oil)	ISO VG 150, 220, 320 (bearing oil)
	50 to 100% of limiting speed	ISO VG 46, 68, 100 (bearing oil, turbine oil)	ISO VG 68, 100, 150 (bearing oil, turbine oil)
	More than limiting speed	ISO VG 32, 46, 68 (bearing oil, turbine oil)	--
80 to 100°C	Less than 50% of limiting speed	ISO VG 320, 460 (bearing oil)	ISO VG 460, 680 (bearing oil, gear oil)
	50 to 100% of limiting speed	ISO VG 150, 220 (bearing oil)	ISO VG 220, 320 (bearing oil)
	More than limiting speed	ISO VG 68, 100 (bearing oil, turbine oil)	--

Remarks: 1. For the limiting speed, use the values listed in the bearing tables.
2. Refer to Refrigerating Machine Oils (JIS K 2211), Bearing Oils (JIS K 2239), Turbine Oils (JIS K 2213), and Gear Oils (JIS K 2219).
3. If the operating temperature is near the high end of the temperature range listed in the left column, select a high viscosity oil.
4. If the operating temperature is lower than -30°C or higher than 110°C, it is advisable to consult NSK.

How to Handle Bearings and Mounting - Factors to Consider

How to Handle Bearings

Rolling bearings are high precision machine parts and need to be handled carefully. When installing or removing a bearing, correct procedures should be followed. Careless handling during mounting and removal could result in a serious accident, injuring people and damaging property.

Whether installing, removing, mounting, dismounting, replacing or inspecting, a few simple precautions must be followed:

Keep Bearings and Surroundings Clean!

Dust and dirt, even if invisible to the naked eye, can harm bearings. To prevent the entry of dust and dirt, keep bearings and their environment as clean as possible. Never remove a bearing from its package until you are ready to mount it.

Handle With Care!

Heavy shocks during handling may cause bearings to be scratched or otherwise damaged. Excessively strong impacts when mounting, dismounting or handling may cause brinelling, breaking or cracking.

Use Proper Tools!

Always use the proper equipment and tools to install or remove bearings. Avoid using general purpose tools such as hammers, screwdrivers, wrenches and pliers.

Protect Bearings From Corrosion!

Keep hands clean when handling bearings. Perspiration and other contaminants on the hands can cause corrosion on the bearings. Wear gloves, if possible. Apply oil or grease to non-sealed bearings immediately after installation for further protection.

Mounting - Factors to Consider

Bearings are very precise and their mounting requires careful attention. The following items must be considered:
- Cleaning related parts
- Dimensions and finish of related parts
- Mounting procedures
- Inspection after mounting
- Supply of lubricants

Prelubricated bearings and bearings lubricated with ordinary oil or grease should not be washed before installation. The preservative used on the bearing to protect it during storage is compatible with most common lubricants.

Bearings used for instruments or high speed applications, such as machine tool bearings, can be washed before installation to remove the anti-corrosion agent used in manufacturing. These bearings must be washed in clean, filtered oil and protected from corrosion until they are installed and lubricated. However with NSK's new packaging this is not always necessary. Consult NSK if you have questions.

Bearing mounting methods depend on bearing type and the type of fit. As bearings are usually used with rotating shafts, the inner rings require a tight fit. Bearings with cylindrical bores are usually mounted by pressing through the inner ring on the shafts (press fit) or heating them to expand their diameter (shrink fit). Bearings with tapered bores can be mounted directly on tapered shafts or on cylindrical shafts by using tapered sleeves·

Bearings are usually mounted in housings with a loose fit. However, if the outer ring has an interference fit, a press may be used. Bearings can be interference fitted by cooling before mounting, using dry ice. If this is done, a rust preventive treatment must be applied to the bearings because moisture in the air will condense on bearing surfaces.

Mounting Bearings with Cylindrical Bores

Before Fitting Bearings:
- Leave preservative oil on bearing
- Compatible with most oils and greases
- Provides complete protection until run
- Only remove preservative oil when bearing is to be used with special oils or greases

Press Fits – Fitting with a press is widely used for small bearings. Before mounting, oil should be applied to the fitted shaft surface to make insertion smoother. A mounting tool is placed on the inner ring as shown in Figure J.15. The mounting tool must not be placed on the outer ring for press mounting, because this may damage the bearing. The bearing is slowly pressed onto the shaft until the side of the inner ring rests against the shoulder of the shaft.

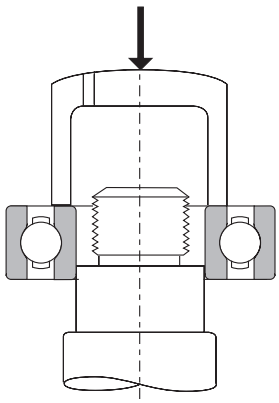


Figure J.15 - Press Mounting of Inner Ring

Using a hammer for mounting should only be done if pressing equipment is not available. Any time a hammer is used, a mounting tool must be placed on the inner ring. For tight interference fits or for medium and large bearings, a hammer should never be used.

When both the inner and outer rings of non-separable bearings, such as deep groove ball bearings, require a tight fit, a mounting tool should be placed on both rings and both rings fitted at the same time using a screw or hydraulic press. See Figure J.16.

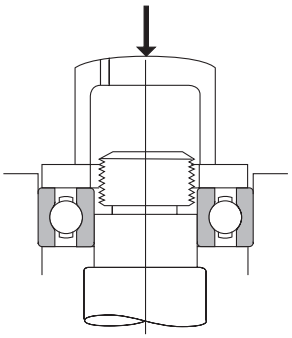


Figure J.16 - Simultaneous Press Mounting of Inner & Outer Ring

When mounting separable bearings, such as cylindrical roller bearings and tapered roller bearings, the inner and outer rings may be mounted separately.

Shrink Fits – Shrink fitting is often used to avoid the large force involved in press fitting large bearings. This method eliminates the need to impose excessive force on the bearings. For shrink fitting, the bearings are first heated in oil, or in an induction heater, to expand them, then mounted and allowed to cool.

This amount of expansion of the inner ring for various temperature differences and bearing sizes are shown in Figure J.17.

A few precautions to be considered when making shrink fits:
- Do not heat bearings to more than 248°F.
- Put bearings on a wire netting or suspend them in the oil tank to prevent them from touching the tank bottom.
- Heat bearings to a temperature 36°F to 54°F higher than the lowest temperature required for mounting, because the inner ring will cool a little during mounting.

After mounting, the bearings will shrink in the axial direction as well as the radial direction while cooling. Therefore, while mounting, press the bearing firmly against the shaft shoulder to avoid excessive clearance between the bearing and the shoulder.

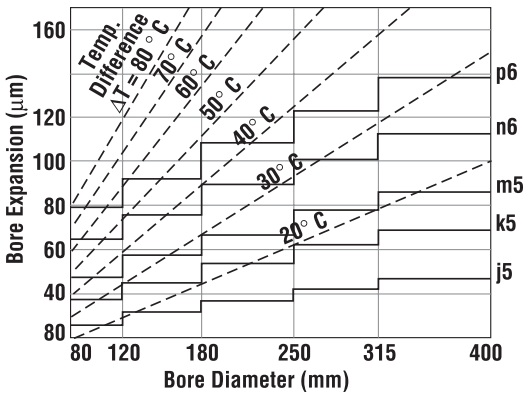
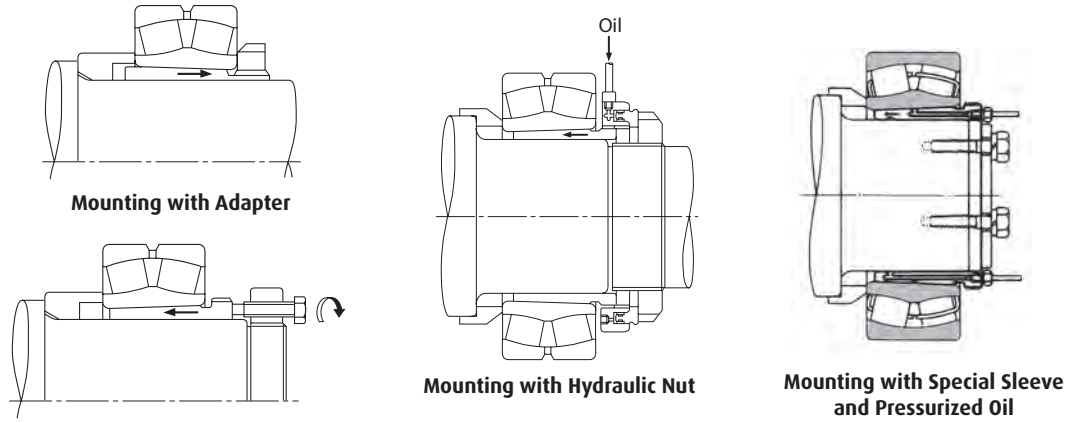


Figure J.17 - Temperature & Expansion of Inner Ring

Mounting Bearings with Tapered Bores

Bearings with tapered bores can be mounted on tapered shafts directly or on cylindrical shafts by using tapered adapters or withdrawal sleeves.

Large spherical bearings are often mounted using hydraulic pressure. Figure J.18 shows two different hydraulic mounting methods. One method is a sleeve with a hydraulic nut. The other method uses a sleeve with pressurized oil. Holes drilled in the sleeve are used to feed oil under pressure to the bearing seat. As the bearing expands radially, the sleeve is inserted axially with adjusting bolts.



Mounting with Adapter

Mounting with Withdrawal Sleeve

Mounting with Hydraulic Nut

Mounting with Special Sleeve and Pressurized Oil

Figure J.18 - Mounting Bearing with Tapered Bores

The internal clearance of a tapered bore bearing varies with the tightness of the interference fit. It is necessary to check the clearance often as the bearing is being mounted. The bearing should be pressed until the reduction of radial clearance is within the range shown in Table J.44 on page J-43.

Table J.44 - Reduction of Radial Clearance for Spherical Roller Bearings with Tapered Bores

Units: inch

Nominal Bore Diameter (mm)		Radial Internal Clearance (Inch)						Reduction in Radial Clearance		Axial Displacement*			
		CN		C3		C4				Taper 1:12		Taper 1:30	
over	incl	min	max	min	max	min	max	min	max	min	max	min	max
30	40	0.0014	0.0020	0.0020	0.0026	0.0026	0.0033	0.0010	0.0012	0.016	0.018	-	-
40	50	0.0018	0.0024	0.0024	0.0031	0.0031	0.0039	0.0012	0.0014	0.018	0.022	-	-
50	65	0.0022	0.0030	0.0030	0.0037	0.0037	0.0047	0.0012	0.0014	0.018	0.022	-	-
65	80	0.0028	0.0037	0.0037	0.0047	0.0047	0.0059	0.0016	0.0018	0.024	0.028	-	-
80	100	0.0031	0.0043	0.0043	0.0055	0.0055	0.0071	0.0018	0.0022	0.028	0.034	0.069	0.085
100	120	0.0039	0.0053	0.0053	0.0067	0.0067	0.0087	0.0020	0.0024	0.030	0.035	0.075	0.089
120	140	0.0047	0.0063	0.0063	0.0079	0.0079	0.0102	0.0024	0.0028	0.035	0.043	0.089	0.108
140	160	0.0051	0.0071	0.0071	0.0091	0.0091	0.0118	0.0026	0.0031	0.039	0.051	0.098	0.128
160	180	0.0055	0.0079	0.0079	0.0102	0.0102	0.0134	0.0028	0.0035	0.043	0.055	0.108	0.138
180	200	0.0063	0.0087	0.0087	0.0114	0.0114	0.0146	0.0031	0.0039	0.051	0.063	0.128	0.157
200	225	0.0071	0.0098	0.0098	0.0126	0.0126	0.0161	0.0035	0.0043	0.055	0.067	0.138	0.167
225	250	0.0079	0.0106	0.0106	0.0138	0.0138	0.0177	0.0039	0.0047	0.063	0.075	0.157	0.187
250	280	0.0087	0.0118	0.0118	0.0154	0.0154	0.0193	0.0043	0.0055	0.067	0.087	0.167	0.217
280	315	0.0094	0.0130	0.0130	0.0169	0.0169	0.0213	0.0047	0.0059	0.075	0.095	0.187	0.236
315	355	0.0106	0.0142	0.0142	0.0185	0.0185	0.0232	0.0055	0.0067	0.087	0.106	0.217	0.266
355	400	0.0118	0.0157	0.0157	0.0205	0.0205	0.0256	0.0059	0.0075	0.095	0.118	0.236	0.295
400	450	0.0130	0.0173	0.0173	0.0224	0.0224	0.0283	0.0067	0.0083	0.106	0.130	0.266	0.325
450	500	0.0146	0.0193	0.0193	0.0248	0.0248	0.0311	0.0075	0.0094	0.118	0.146	0.295	0.364
500	560	0.0161	0.0213	0.0213	0.0268	0.0268	0.0343	0.0083	0.0106	0.134	0.169	0.335	0.433
560	630	0.0181	0.0236	0.0236	0.0299	0.0299	0.0386	0.0091	0.0118	0.146	0.189	0.364	0.472
630	710	0.0201	0.0264	0.0264	0.0335	0.0335	0.0429	0.0102	0.0130	0.165	0.209	0.413	0.512
710	800	0.0224	0.0295	0.0295	0.0378	0.0378	0.0480	0.0110	0.0146	0.177	0.232	0.453	0.591
800	900	0.0252	0.0331	0.0331	0.0421	0.0421	0.0539	0.0122	0.0161	0.197	0.260	0.492	0.650
900	1000	0.0280	0.0366	0.0366	0.0469	0.0469	0.0598	0.0134	0.0181	0.217	0.291	0.551	0.728

*Axial displacement values apply only to solid steel shafts or hollow steel shafts where the bore is equal to or less than one-half of the outside diameter. If the material is other than steel, or if thin walled shafting is used, please consult NSK.

1:12 Taper applies to Series 222, 223, 230, 231, 232, 233 and 239.
1:30 Taper applies to Series 240, 241 and 242.
For Pe less than 0.13Cr, use the lower half of the reduction range. For heavier loads or Pe greater than 0.13Cr, carburized or TL inner rings should be specified and the upper half of the reduction range can be used.

Radial internal clearance can be measured during mounting using a feeler gauge or other appropriate gauges. In this process, the clearances for both rows of rollers must be measured simultaneously and the two values kept roughly the same by adjusting the relative position of the outer and inner rings. This is shown in Fig. J.19. The average of the two measurements taken for both rows may be used as the residual internal clearance.

In large bearings (over 200mm), the outer ring may deform slightly into an elliptical shape due to its own weight. In this case, for best results, measurements should be taken at locations **a**, **b**, and **c** (see Fig. J.20) and entered into the following equation:

radial clearance = (**a** + **b** + **c**)/2

This method is used where the bearing is supported by its inner ring (radial clearance c at bottom). When a self-aligning ball bearing is mounted on a shaft adapter, sufficient clearance for easy alignment of the outer ring must be allowed.

For Radial Clearance Reduction example, please see page D-4.

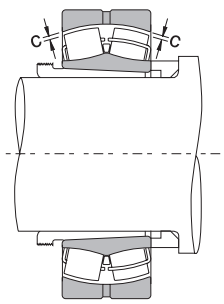


Figure J.19

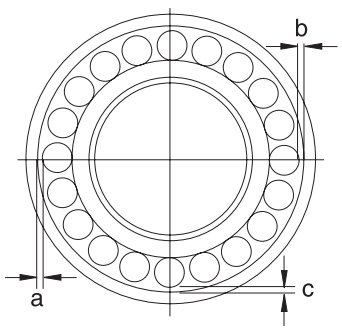


Figure J.20

Mounting of Self-Aligning Ball Bearings on an Adapter Sleeve

Axial Drive-Up Method

1. Before mounting, smear the thread and the side face of the nut with a molybdenum disulphide paste or similar lubricant.
2. Smear the shaft and outside diameter of sleeve with a light oil.
3. Open the sleeve slightly by inserting and twisting a screw driver into the slit in the sleeve and position the sleeve on the shaft.
4. Slide bearing, lockwasher and locknut onto sleeve and tighten nut with a 'C' spanner until all slackness is removed.
5. Measure distance from end tapered sleeve to the face of locknut or to the face of the inner ring and note the dimension.
6. From the chart note the required "axial drive up" and tighten the locknut until the bearing has moved the required distance up the taper of the sleeve indicated by the reduction or increase in the measured distance originally noted. If the original dimension was from the end of the tapered sleeve to the face of the locknut then the dimension will increase but if the measurement was from the end of the tapered sleeve to the face of the inner ring the dimension will be reduced.
7. A self-aligning ball bearing with normal clearance when adjusted correctly should rotate freely but should have some resistance to swiveling.
8. Align one tab on the lock washer with a slot in the locknut and bend it into the slot, if no tabs line up with the slots slightly tighten the locknut until one lines up. Never back off the nut to line up the tab with the slot.

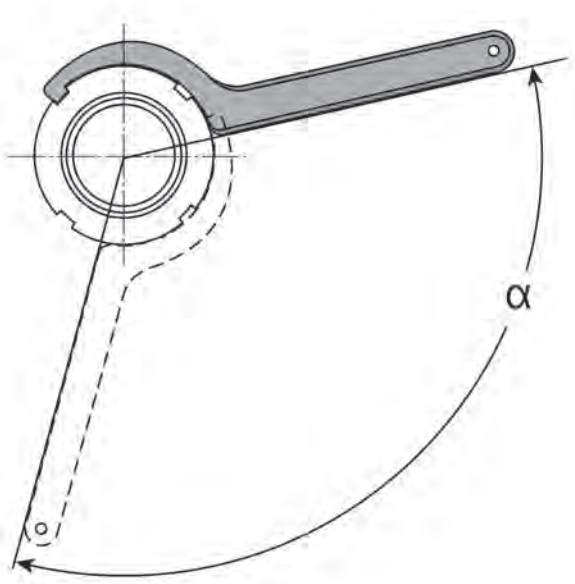


Figure J.21 - Mounting a Self-Aligning Ball Bearing on an Adapter Sleeve

Mounting of Self-Aligning Ball Bearings on an Adapter Sleeve

Tightening Angle Method

1. Before mounting, smear the thread and the side face of the nut with a molybdenum disulphide paste or similar lubricant.
2. Smear the shaft and outside diameter of sleeve with a light oil.
3. Open the sleeve slightly by inserting and twisting a screw driver into the slit in the sleeve and position the sleeve on the shaft.
4. Slide bearing, lockwasher and locknut onto sleeve and tighten nut with a 'C' spanner until all slackness is removed.
5. Tighten locknut through the required angle, taken from chart, and then reposition the 'C' spanner to 180° from its original position and give it a sharp tap with the hammer to straighten the bearing on its seating.
6. A self-aligning ball bearing with normal clearance when adjusted correctly should rotate freely but should have some resistance to swiveling.
7. Align one tab on the lock washer with a slot in the locknut and bend it into the slot, if no tabs line up with the slots, slightly tighten the locknut until one lines up. **Never back off the nut to line up the tab with the slot.**

Table J.45 - Mounting of Double Row Self-Aligning Ball Bearings with 1:12 Tapered Bores on to Adapter Sleeves

Bearing Bore Diameter (mm)		Tightening Angle (α) degrees	Approximate Axial Drive-Up (mm)
over	inclusive		
24	30	70	0.22
30	40	70	0.30
40	50	70	0.30
50	65	90	0.40
65	80	90	0.45
80	100	90	0.45
100	120	120	0.55
120	140	120	0.65
140	160	120	0.75

After mounting has been completed, a running test should be conducted to determine that the bearing has been mounted properly.

Small machines may be manually operated to assure that they rotate smoothly. Items to be checked include sticking due to foreign matter, visible flaws, uneven torque, and excessive torque caused by inadequate clearance, mounting error or seal friction.

Large machines which cannot be operated manually, may be started with no load, then the power immediately cut off to allow the machine to coast to a stop. There should be no abnormal vibration, noise or contact between rotating parts. Normal powered operation may be started after this examination. Powered operation should be started slowly, without load, and the operation should be observed until it is determined that no abnormalities exist. Items to be checked during the test operation include abnormal noise, excessive rise of bearing temperature, leakage and discoloration of lubricants. Abnormal noise conditions are indicated by a loud metallic sound or other irregular noise. Possible causes of noise may include incorrect lubrication, poor alignment of the shaft and housing, and foreign matter in the bearing.

Bearing temperature may generally be estimated by the temperature of the outside surface of the housing, but it is more desirable to directly measure the temperature of the outer ring using oil holes for access. Bearing temperature should rise gradually to the steady state level within one to two hours after operation. If the bearing or mountings are improper, bearing temperature may increase rapidly and become abnormally high. Possible causes may include an excessive amount of lubricant, insufficient clearance, incorrect mounting, or excessive friction of the seals. In the case of high speed operation, an incorrect selection of bearing type or lubricating method may also cause an abnormal temperature rise.

Possible causes and countermeasures for operating irregularities are shown in the table below.

Table J.46 - Causes and Countermeasures for Operating Irregularities

Irregularities		Possible Causes	Countermeasures
Noise	Loud Metallic Sound	Abnormal Load	Correction of fit, internal clearance, preload, position of housing shoulder, etc.
		Incorrect mounting	Correction of alignment of shaft and housing, accuracy of mounting method
		Insufficient or improper lubricant	Replenish lubricant or select proper lubricant
		Squeaking noise	Replacement by low-noise bearings, selection of small clearance bearings
		Sliding of balls	Adjustment of preload, selection of small clearance bearings, or adoption of softer grease
		Contact of rotating parts	Correction of labyrinth seal, etc.
	Loud Regular Sound	Flaws, corrosion, or scratches on the raceways	Replacement of bearing, cleaning, improvement of seals, and usage of clean lubricant
		Brinelling	Replacement of bearing and careful handling
		Flaking on the raceways	Replacement of bearing
	Irregular Sound	Excessive clearance	Correction of fit and clearance and correction of preload
		Penetration by foreign particles	Replacement of bearing, cleaning, improvement of seals, and relubrication using clean lubricant
		Flaws or flaking on the ball surfaces	Replacement of bearing
		Excessive amount of lubricant	Reduce amount of lubricant, select stiffer grease
Abnormal Temperature Rise		Insufficient or improper lubricant	Replenish lubricant or select proper lubricant
		Abnormal load	Correction of fit, internal clearance, preload, position of housing shoulder
		Incorrect mounting	Correction of alignment of shaft and housing, accuracy of mounting, or mounting method
		Creep of fitted surfaces, excessive seal friction	Correction of seals, replacement of bearing, correction of fit or mounting
Vibration		Brinelling	Replacement of bearings and careful handling
		Flaking	Replacement of bearing
		Incorrect mounting	Correction of squareness between shaft and housing shoulder or side of spacer
		Penetration by foreign particles	Replacement of bearing, cleaning, correction of seals
Leakage or Discoloration of Lubricant		Too much lubrication	Reduce amount of lubricant, select stiffer grease. Replace bearing or lubricant
		Penetration by foreign particles or abrasion chips	Clean housing and adjacent parts

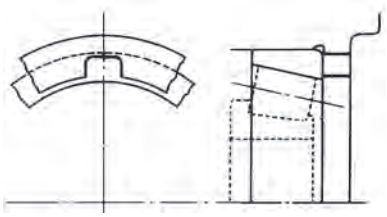
How to Dismount Bearings

It may be necessary to remove bearings for periodic inspection or for other reasons. If the removed bearing is to be used again, it should be dismounted as carefully as when it was mounted. If the bearing has a tight fit, removal may be difficult. Dismounting procedures and the sequence of removal should be studied carefully before beginning the job.

Dismounting of Outer Rings

Housings are not normally supplied with facilities to allow easy bearing removal. However, if it is necessary to periodically remove the bearing for inspection or replacement, special features can be incorporated to ease removal. One method is to provide tapped holes, in a minimum of three places equally spaced as illustrated in Figure J.22. Larger bearings will require more holes. By placing bolts in the holes and tightening evenly, the bearing will be forced out of the housing.

Another method is to provide slots in the housing shoulder as shown here. This allows the use of a press to allow safe removal of the bearing.



Dismounting of Bearings with Cylindrical Bores

If the mounting design allows space to press out the inner ring, this is an easy and fast method. In this method, the withdrawal force should be imposed only on the inner ring. When it is not possible to use a press, bearing pullers like those shown in Figure J.22 are often used. The claws of these tools must fully engage the face of the inner ring, therefore it may be necessary to cut grooves in the shoulder to accommodate the tools.

The oil injection method is usually used for the withdrawal of large bearings. Withdrawal is achieved easily by means of oil pressure applied through holes in the shaft. In the case of extra wide bearings, the oil injection method is often used along with bearing pullers.

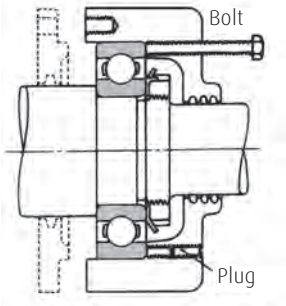
Induction heating is used to remove the inner rings of rollneck type, four row cylindrical roller bearings. The inner rings are expanded by brief local heating and then withdrawn.

Dismounting of Bearings with Tapered Bores

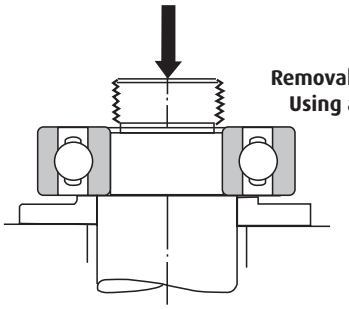
When dismounting relatively small bearings with adapter sleeves, the inner ring is held by a backing ring fastened to the shaft and the nut is loosened several turns. This is followed by hammering on the sleeve using a suitable tool. See Figure J.22. It may be possible to dismount a withdrawal sleeve by tightening the removal nut. If this procedure is difficult, it may be possible to drill and tap bolt holes in the nut and withdraw the sleeve by tightening the bolts. The two methods for removal of the sleeve are illustrated in Figure J.22.

Large bearings with tapered bores may be withdrawn easily using oil pressure. Figure J.22. illustrates the removal of a bearing by forcing oil under pressure through a hole and groove in a tapered shaft to expand the inner ring. When this method is used, the bearing may suddenly move axially when interference is relieved, so a stop nut is recommended for protection. Figure J.22. also shows a withdrawal using a hydraulic nut.

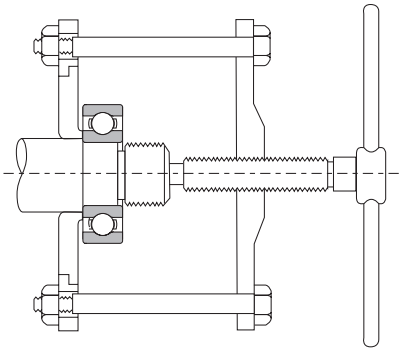
Figure J.22 - Bearing Removal

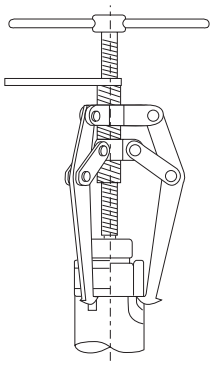


Removal of Outer Ring with Dismounting Bolts

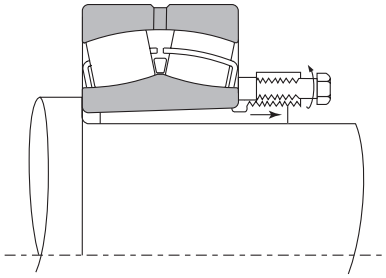


Removal of Inner Using a Press

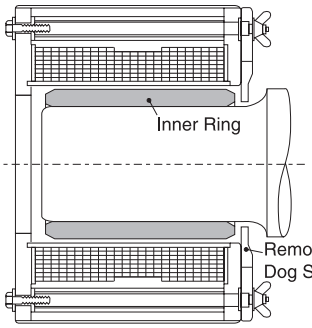




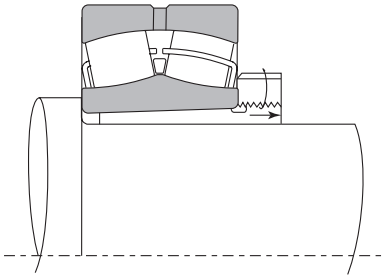
Removal of Inner Ring with Withdrawal Tools

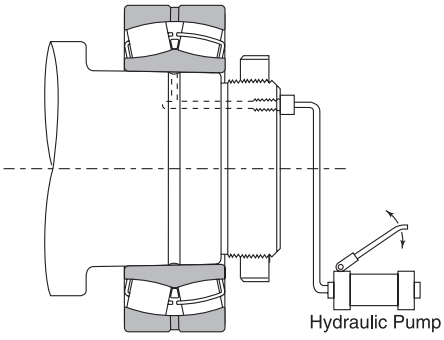


Removal of Withdrawal Sleeve with Withdrawal Nut

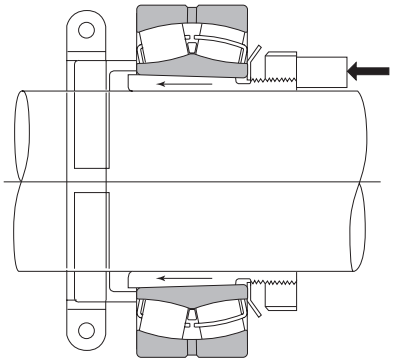


Removal of Inner Ring Using an Induction Heater

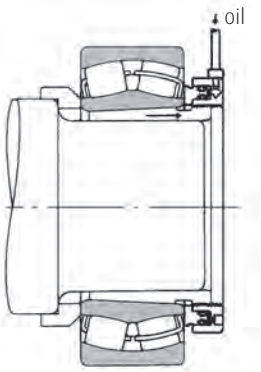




Removal Using Oil Injection



Removal of Adapter with Stop and Axial Pressure



Removal Using a Hydraulic Nut

Cleaning, Inspection and Evaluation

Cleaning Bearings

When bearings are inspected, their appearance should first be recorded and the amount and condition of the residual lubricant checked. After the lubricant has been sampled for examination, the bearing should be cleaned. In general, light oil or kerosene may be used as a washing solution. Dismounted bearings should first be given a preliminary cleaning followed by a finishing rinse. Each cleaning tank should be provided with a metal net to suspend the bearings in the oil without touching either the sides or bottom of the tank.

If the bearings are rotated with foreign matter in them during cleaning, the raceways may be damaged. The lubricant and other deposits should be removed in the oil bath during the initial rough cleaning with a brush or other means. After the bearing is relatively clean, it should be given a finishing rinse. The bearing should be rotated while immersed in the rinsing oil. The rinsing oil must always be kept clean.

Inspection and Evaluation

After being thoroughly cleaned, bearings should be examined for the condition of their raceways and external surfaces, the amount of cage wear, the increase in internal clearance and degradation of tolerances. These must be carefully checked to determine the possibility of bearing reuse.

In the case of small non-separable ball bearings, hold the bearing horizontally in one hand and rotate the outer ring to confirm that it turns smoothly. Separable bearings such as tapered roller bearings, may be checked by individually examining their rolling elements and the outer ring raceway. Large bearings cannot be rotated manually. However, the rolling elements, raceway surfaces, cages and contact surface of the ribs should be carefully examined visually.

The determination to reuse a bearing should be made only after considering the degree of bearing wear, the function of the machine, the importance of the bearing in the machine, operating condition, and the time until next inspection. If any of the following defects exist, the bearing should be replaced:

- Cracks or dents in the inner or outer ring raceways, rolling elements or cage
- Flaking of the raceways or rolling elements
- Significant scratching of the raceway surfaces, ribs or rolling elements
- Worn cages or loose rivets
- Rust or flaws on the raceway surfaces or rolling elements
- Significant impact or brinell traces on the raceway surfaces or rolling elements
- Discoloration by heat
- Significant damage to the seals or shields of grease sealed bearings

Maintenance and Inspection

Correcting Irregularities

In order to maintain the original performance of a bearing for as long as possible, proper maintenance and inspection should be performed. If proper procedures are used, many bearing problems can be avoided. Periodic maintenance following specified procedures is mandatory. This includes supervision of operating conditions, supply or replacement of lubricants, and regular periodic inspection.

Items that should be regularly checked during operation include bearing noise, vibration, temperature and lubrication. If an irregularity is found during operation, the cause should be determined and the proper corrective action taken immediately. If necessary, the bearing should be dismounted and examined in detail. Refer to Table J.46 on page J-46 for causes and corrections of operating irregularities.

It is very important to detect signs of irregularities early in operation. The NSK Bearing Monitor is a device that checks the condition of bearings and gives a warning of any abnormality. It can also be used to stop the machine automatically in order to prevent serious damage. It also helps to improve the level of and attention to maintenance schedules and procedures. Contact NSK for further information.

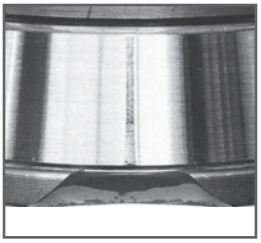
Bearing Failures – Cause and Correction

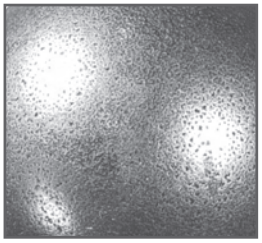
In general, if rolling bearings are correctly used, they will survive to their predicted fatigue life. Premature failure is usually caused by improperly mounting or dismounting, improper lubrication, penetration of foreign material, or inadequate inspection and maintenance.

It is often difficult to determine the real causes of premature failure. If all the conditions leading up to the time of failure are studied, it may be possible to avoid or reduce similar failures in the future.

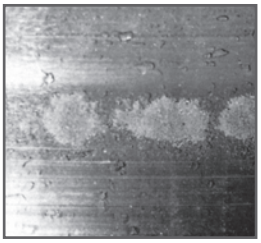
The most frequent types of bearing failure, along with causes and corrective actions, are shown in Table J.47 on page J-51.

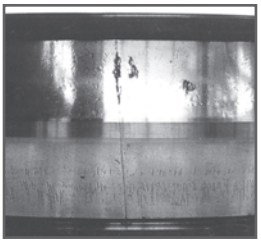

Flaking


Fracture


Pitting

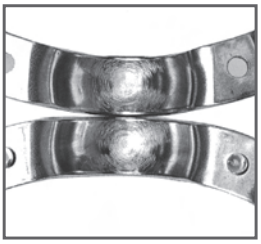

Creep

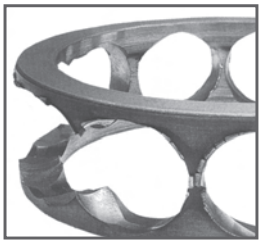

Peeling

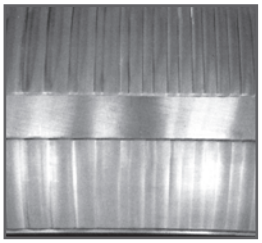

Cracks

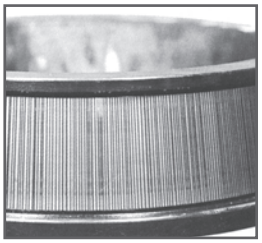

Fretting

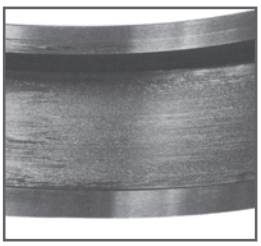

Seizure

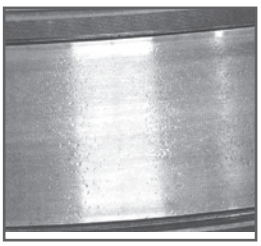

Scoring

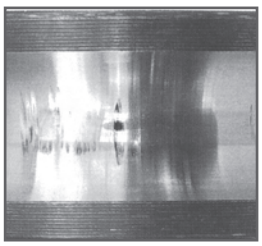

Cage Damage

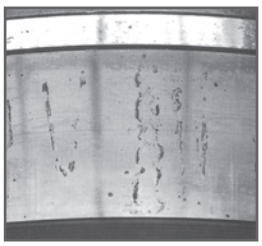

Wear


Electrical Corrosion


Smearing


Denting


False Brinelling


Rust and Corrosion

Bearing Failures (cont.)

Table J.47 - Bearing Failures - Cause and Correction

Type of Failure		Probable Cause	Countermeasures
Flaking	Flaking of one-side of the raceway of radial bearings. Flaking of the raceways of double row bearings	Abnormal axial load	A loose fit should be used when mounting the outer ring of free-end bearings to allow axial expansion of the shaft
	Flaking of the raceway in a symmetrical pattern	Out of roundness of the housing bore	Correct the faulty housing
	Flaking pattern inclined relative to the raceway in radial ball bearings. Flaking near the edge of the raceway and rolling surfaces in roller bearings	Improper mounting, deflection of shaft, inadequate centering, inadequate tolerances for shaft and housing	Use care in mounting and centering, select a bearing with a larger clearance, and correct the squareness of the shaft and housing shoulder
	Flaking of raceway with same spacing as rolling elements	Large shock load during mounting, rusting while bearing is out of operation for a prolonged period	Use care in mounting and apply a rust preventive when machine operation is suspended for a long time
	Premature flaking of raceways and rolling elements	Insufficient clearance, excessive load, improper lubricant, rust, etc.	Select proper fit, bearing clearance, and lubricant
	Premature flaking of duplex bearing	Excessive preload	Adjust the preload
Scoring and Smearing	Scoring or smearing between raceway and rolling surfaces	Inadequate initial lubrication, excessively hard grease and high acceleration in starting	Use a softer grease and avoid rapid acceleration
	Spiral scoring or smearing of raceway surface of thrust ball bearing	Raceway rings are not parallel and excessive speed	Correct the mounting, apply a preload, or select another bearing type
	Scoring or smearing between the end face of the rollers and guide rib	Inadequate lubrication, incorrect mounting and large axial load	Select proper lubricants and modify the mounting
Cracks	Crack in outer or inner ring	Excessive shock load, excessive interference fit, incorrect shaft cylindricity, improper amount of sleeve taper, large fillet radius, development of thermal cracks and advancement of flaking	Examine the loading conditions, modify the fit of bearing sleeve. The fillet radius must be smaller than the bearing chamfer
	Crack in rolling element. Break in rib	Advancement of flaking, shock applied to the rib during mounting or dropped during handling	Be careful in handling and mounting
	Fracture of cage	Abnormal loading of cage due to incorrect mounting and improper lubrication	Reduce the mounting error and review the lubricating method and lubricant
Indentation	Indentations on raceway in same pattern as rolling elements	Shock load during mounting or excessive load when not rotating	Use care in handling
	Indentations on raceway and rolling elements	Foreign matter such as metallic chips or sand	Clean the housing, improve the seals, and use a clean lubricant
Abnormal Wear	False brinelling (phenomenon similar to brinelling)	Vibration of the bearing without rotation during shipment or rocking motion of small amplitude	Secure the shaft and housing, use oil as a lubricant and reduce vibration by applying a preload
	Fretting	Slight wearing of the fitting surface	Increase interference and apply oil
	Wearing of raceway, rolling elements, rib and cage	Penetration by foreign matter, incorrect lubrication, and rust	Use a different type of seal, clean the housing, and use a clean lubricant
	Creep	Insufficient interference or insufficient tightening of sleeve	Modify the fit or tighten the sleeve
Seizure	Discoloration or welding of raceway, rolling elements, and rib	Insufficient clearance, incorrect lubrication, or improper mounting	Review the internal clearance and bearing fit, supply an adequate amount of the proper lubricant and improve the mounting method and related parts
Eletric Burns	Fluting or corrugation or insulate the bearing	Melting due to electric arcing	Install a ground wire to stop flow of electricity
Corrosion and Rust	Rust and corrosion of fitting surfaces and bearing interior	Condensation of water from the air, fretting, or penetration by corrosive substances	Use care in storing and avoid high temperatures and high humidity; treatment for rust prevention is necessary when the operation is suspended for a long time

Conversion Factors

Table J.48 - Conversion Factors

	To Convert From	To	Multipy By	To Convert From	To	Multiply By
Length	Inch [in]	Millimeter [mm]	25.400000	Millimeter [mm]	Inch [in]	0.039370
	Foot [ft]	Meter [m]	0.304800	Meter [m]	Foot [ft]	3.280840
	Yard [yd]	Meter [m]	0.914400	Meter [m]	Yard [yd]	1.093613
	Mile (U.S. Statute) [mi]	Kilometer [km]	1.609347	Kilometer [km]	Mile (U.S. Statute) [mi]	0.621370
Area	Square Inch [in^2]	Square Millimeter [mm^2]	645.16	Square Millimeter [mm^2]	Square Inch [in^2]	0.002
	Square Foot [ft^2]	Square Meter [m^2]	0.092903	Square Meter [m^2]	Square Foot [ft^2]	10.763915
	Square Yard [yd^2]	Square Meter [m^2]	0.836127	Square Meter [m^2]	Square Yard [yd^2]	1.195991
	Square Mile [mi^2] (U.S. Statute)	Square Kilometer [km^2]	2.589998	Square Kilometer [km^2]	Square Mile [mi^2] (U.S. Statute)	0.386101
	Acre	Square Meter [m^2]	4046.873	Square Meter [m^2]	Acre	0.000247
	Acre	Hectare	0.404687	Hectare	Acre	2.471046
Volume	Cubic Inch [in^3]	Cubic Millimeter [mm^3]	16387.06	Cubic Millimeter [mm^3]	Cubic Inch [in^3]	0.000
	Cubic Foot [ft^3]	Cubic Meter [m^3]	0.028317	Cubic Meter [m^3]	Cubic Foot [ft^3]	35.314662
	Cubic Yard [yd^3]	Cubic Meter [m^3]	0.764555	Cubic Meter [m^3]	Cubic Yard [yd^3]	1.307950
	Gallon (U.S. Liquid) [gal]	Litre [l]	3.785412	Litre [l]	Gallon (U.S. Liquid) [gal]	0.264172
	Quart (U.S. Liquid) [qt]	Litre [l]	0.946353	Litre [l]	Quart (U.S. Liquid) [qt]	1.056688
Mass	Ounce [oz]	Gram [g]	28.349520	Gram [g]	Ounce [oz]	0.035274
	Pound [lb]	Kilogram [kg]	0.453592	Kilogram [kg]	Pound [lb]	2.204624
	Short Ton	Kilogram [kg]	907.185	Kilogram [kg]	Short Ton	0.001
Force	Pound-Force [lbf]	Kilogram [kg]	0.453592	Kilogram [kg]	Pound-Force [lbf]	2.204624
	Pound-Force [lbf]	Newton [N]	4.448222	Newton [N]	Pound-Force [lbf]	0.224809
Bending Moment	Pound-Force-Inch [lbf-in]	Newton-Meter [N-m]	0.112985	Newton-Meter [N-m]	Pound-Force-Inch [lbf-in]	8.850732
	Pound-Force-Foot [lbf-ft]	Newton-Meter [N-m]	1.355818	Newton-Meter [N-m]	Pound-Force-Foot [lbf-ft]	0.737562
Pressure, Stress	Pound-Force per Square [lbf/in^2]	Kilopascal [kPa]	6.894757	Kilopascal [kPa]	Pound-Force per Square Inch [$lbf-in^2$]	0.145038
	Foot of Water (39.2 F)	Kilopascal [kPa]	2.988980	Kilopascal [kPa]	Foot of Water (39.2 F)	0.334562
	Inch of Mercury (32 F)	Kilopascal [kPa]	3.386380	Kilopascal [kPa]	Inch of Mercury (32 F)	0.295301
Energy, Work, Heat	Foot-Pound-Force [ft-lbf]	Joule [J]	1.355818	Joule [J]	Foot-Pound-Force [ft-lbf]	0.737562
	British Thermal Unit [Btu]	Joule [J]	1055.056	Joule [J]	British Thermal Unit [Btu]	0.001
	Calorie [cal]	Joule [J]	4.186800	Joule [J]	Calorie [cal]	0.238846
	Kilowatt Hour [kW-h]	Joule [J]	3600000	Joule [J]	Kilowatt Hour [kW-h]	2.78-7
Power	Foot-Pound-Force /Second [ft-lbs/s]	Watt [W]	1.355818	Watt [W]	Foot-Pound-Force / Second [ft-lbs/s]	0.737562
	British Thermal Unit / Hour [Btu]	Watt [W]	0.293071	Watt [W]	British Thermal Unit / Hour [Btu/h]	3.412142
	Horsepower (550 Ft. Lbf/s) [hp]	Kilowatt [kW]	0.745700	Kilowatt [kW]	Horsepower (550 Ft. Lbf/s) [hp]	1.341022
Angle	Degree	Radian [rad]	0.017453	Radian [rad]	Degree	57.295788
Temperature	Degree Farenheit [F]	Degree Celsius [C]	(F° -32)/1.8	Degree Celsius [C]	Degree Fahrenheit [F]	1.8xC°+32

Conversion Factors (cont.)

Table J.49 - Metric Conversion

inch		mm
Fraction	Decimal	
1/64	0.0156	0.3969
1/32	0.0313	0.7938
	0.0394	1.0000
3/64	0.0469	1.1906
1/16	0.0625	1.5875
5/64	0.0781	1.9844
	0.0787	2.0000
3/32	0.0938	2.3813
7/64	0.1094	2.7781
	0.1181	3.0000
1/8	0.1250	3.1750
9/64	0.1406	3.5719
5/32	0.1563	3.9688
	0.1575	4.0000
11/64	0.1719	4.3656
3/16	0.1875	4.7625
	0.1969	5.0000
13/64	0.2031	5.1594
7/32	0.2188	5.5563
15/64	0.2344	5.9531
	0.2362	6.0000
1/4	0.2500	6.3500
17/64	0.2656	6.7469
	0.2756	7.0000
9/32	0.2813	7.1438
19/64	0.2969	7.5406
5/16	0.3125	7.9375
	0.3150	8.0000
21/64	0.3281	8.3344
11/32	0.3438	8.7313
	0.3543	9.0000
23/64	0.3594	9.1281
3/8	0.3750	9.5250
25/64	0.3906	9.9219
	0.3937	10.0000
13/32	0.4063	10.3188
27/64	0.4219	10.7156
	0.4331	11.0000
7/16	0.4375	11.1125
29/64	0.4531	11.5094
15/32	0.4688	11.9063
	0.4724	12.0000
31/64	0.4844	12.3031
1/2	0.5000	12.7000
	0.5118	13.0000
33/64	0.5156	13.0969
17/32	0.5313	13.4938
35/64	0.5469	13.8906
	0.5512	14.0000
9/16	0.5625	14.2875
37/64	0.5781	14.6844
	0.5906	15.0000
19/32	0.5938	15.0813
39/64	0.6094	15.4781
5/8	0.6250	15.8750
	0.6299	16.0000
41/64	0.6406	16.2719
21/32	0.6563	16.6688
	0.6693	17.0000
43/64	0.6719	17.0656
11/16	0.6875	17.4625
45/64	0.7031	17.8594
	0.7087	18.0000
23/32	0.7188	18.2563
47/64	0.7344	18.6531
	0.7480	19.0000
3/4	0.7500	19.0500
49/64	0.7656	19.4469
25/32	0.7813	19.8438
	0.7874	20.0000
51/64	0.7969	20.2406
13/16	0.8125	20.6375
	0.8268	21.0000
53/64	0.8281	21.0344
27/32	0.8438	21.4313
55/64	0.8594	21.8281
	0.8661	22.0000
7/8	0.8750	22.2250
57/64	0.8906	22.6219
	0.9055	23.0000
29/32	0.9063	23.0188
59/64	0.9219	23.4156
15/16	0.9375	23.8125
	0.9449	24.0000
61/64	0.9531	24.2094
31/32	0.9688	24.6063
	0.9843	25.0000
63/64	0.9844	25.0031
1	1.0000	25.4000

Notes

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