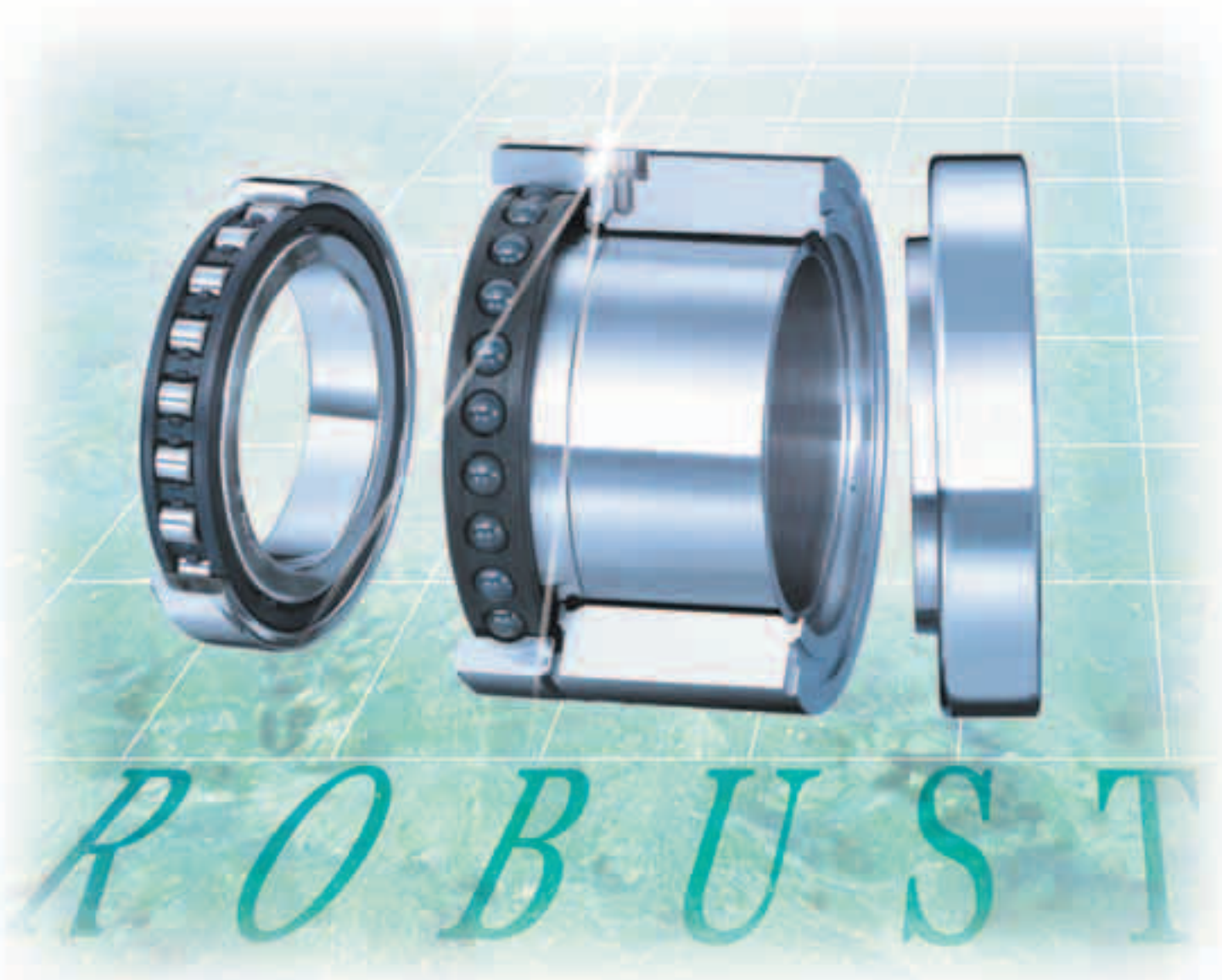


High-Speed Precision Bearings

ROBUST Series

ROBUST Series was developed using NSK's material, evaluation, and analysis technologies to improve the performance of machine tools.



Building on the new technologies of today to meet the requirements of tomorrow

NSK continually develops and provides new products and solutions for customers. In 1998, the ROBUST Series was developed.

During the last JIMTOF 2002, NSK emphasized the themes of "Environmentally Sound," "Easy Handling," and "Economy."

Now the themes for the future are "Fast," "Friendly," "Firm," and "Fine."

NSK contributes to the machine tool industry by providing new and continuously improved products.

Future

THE NEXT STAGE

Fast

2006

Firm

**NSK
Technology
Designed
to
Move**

2005

Friendly

Fine

2004

2003— Ball Screw Support Angular Contact Thrust Ball Bearings with Seal
Angular Contact Ball Bearings with Seal

2002— Grease Replenishing System High-Rigidity,
Double-Row Cylindrical Roller Bearings with TB Cage

2001— High Accuracy Cylindrical Roller Bearings

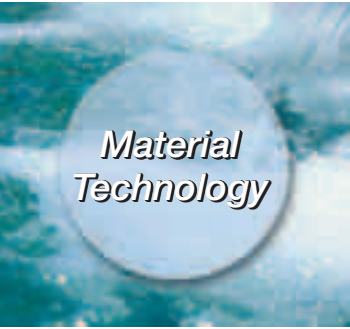
2000— ROBUST Ultra High-Speed Cylindrical Roller Bearings
with PEEK Cage

1999— ROBUST High Accuracy Angular Contact Ball Bearings

1998— ROBUST Ultra High-Speed Angular Contact Ball Bearings

1997— SHX material

ROBUSTseries



Material
Technology

Ceramic rolling element
Taking advantage of ceramics
material properties to improve
the performance and the
reliability of bearings

SHX Steel
Suitable for ultra high-
speed operation, and
extends fatigue life



Evaluation
Technology

**Cages for Angular
Contact Ball Bearings**
TYN Cage—Optimum
performance with grease
lubrication, with silent
operation
T Cage—Optimum bearing
performance and reliability
at high-speed operation

Core Technology



Analysis
Technology

**High-strength cages for Cylindrical
Roller Bearings**
By adopting an engineered polymer and
utilizing FEM analysis in design,
NSK has developed an extremely
high strength cage.

ROBUST Series
Continuous Improvement

The ROBUST Series was developed using NSK's material, evaluation, and analysis technologies. These technologies and the ROBUST Series are being continuously improved to deliver the highest quality and performance.

Angular Contact Ball Bearings

● Rolling elements
Ceramics
SUJ2

● Rings
SHX
SUJ2

● Cage
Polyamide
Phenolic
PEEK

Type	Rings	Rolling elements	Cage
S	SUJ2	SUJ2	Polyamide 46 (TYN) Phenolic (T) PEEK (T42)
H	SUJ2	Ceramics	
X	SHX	Ceramics	

Cylindrical Roller Bearings

● Rolling elements
Ceramics
SUJ2

● Rings
SHX
SUJ2

● Cage
PEEK (Single row)
PPS (Double row)

Type	Rings	Rolling elements	Cage
RS	SUJ2	SUJ2	PEEK (TP)
RX	SHX	SHX	
RXH	SHX	Ceramics	
NN	SUJ2	SUJ2	PPS (TB)

ROBUST Series

Angular Contact Ball Bearings

- **BNR 18** Ultra High-Speed Angular Contact Ball Bearings
Contact angle: 18 degrees
- **BER 25** Ultra High-Speed Angular Contact Ball Bearings
Contact angle: 25 degrees
- **BAR 30** High-Speed Angular Contact Thrust Ball Bearings
Contact angle: 30 degrees

- **BTR 40** High-Speed Angular Contact Thrust Ball Bearings
Contact angle: 40 degrees
- **BSP 15** Ultra High Precision Angular Contact Ball Bearings
Contact angle: 15 degrees
- **TAC 60** Angular Contact Thrust Ball Bearings for Ball Screw Support
Contact angle: 60 degrees

Limiting $d_m n$ of each cage
Polyamide 46 (TYN) 1,400,000
Phenolic (T) 2,800,000
PEEK (T42) 3,500,000
 $d_m n$: "Pitch circle diameter of
rolling elements (mm) "x" Speed (min⁻¹)"

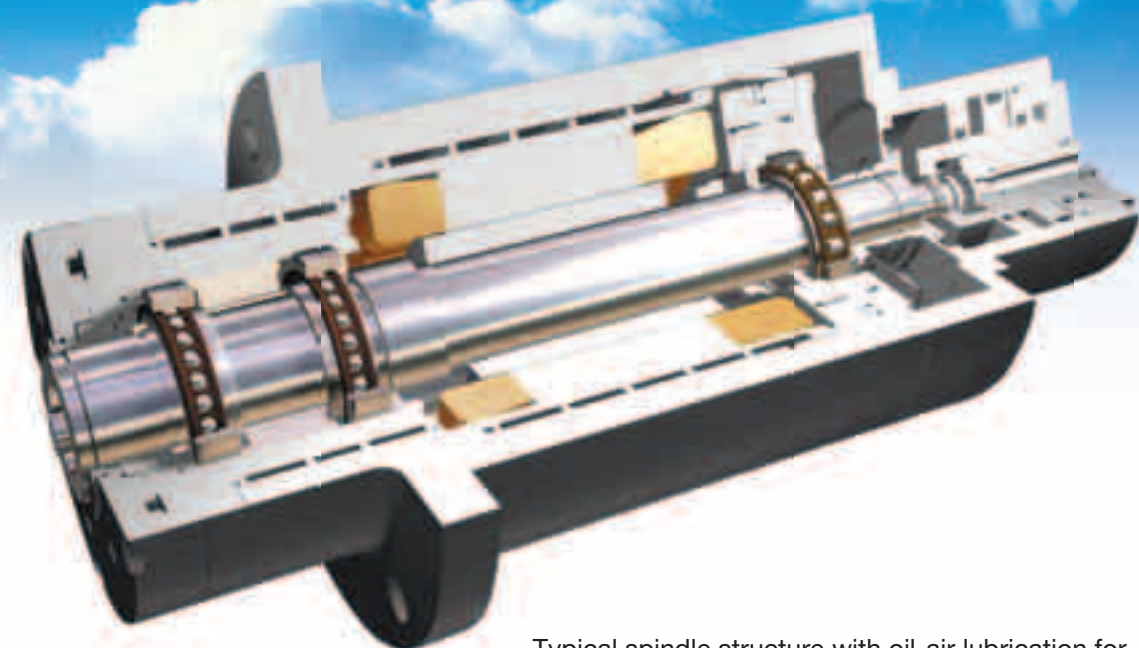
Cylindrical Roller Bearings

- **N10** Ultra High-Speed, Single-Row Cylindrical Roller Bearings
N10 series
- **NN** High-Rigidity, Double-Row Cylindrical Roller Bearings
NN30 series

Fast

Ultra High-Speed with Silent Operation

Acknowledging increased demand for silent operation during high-speed, NSK provides the solution with oil-air lubrication.



Typical spindle structure with oil-air lubrication for ultra high-speed machining centers

Typical application

Molding die machining
Aerospace components machining

Bearings for ultra high-speed machining centers with oil-air lubrication

Ultra High-Speed Angular Contact Ball Bearings Spin-Shot II



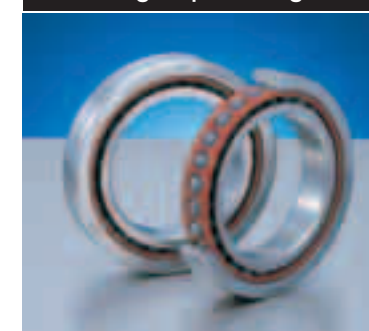
BNR 18° XE BER 25° XE



Higher speed with silent operation

Spin-Shot II provides spindles with the capability of both silent operation and higher speed under optimised lubrication conditions. Spin-Shot II can maintain excellent performance even when the conventional air supply is reduced by 1/3.

Ultra High-Speed Angular Contact Ball Bearings



BNR 18° S H X BER 25° S H X

Low temperature rise designed for higher speed operation

ROBUST Angular Contact Ball Bearings have achieved low temperature rise during high-speed operation through optimised design.

Ultra High-Speed Cylindrical Roller Bearings



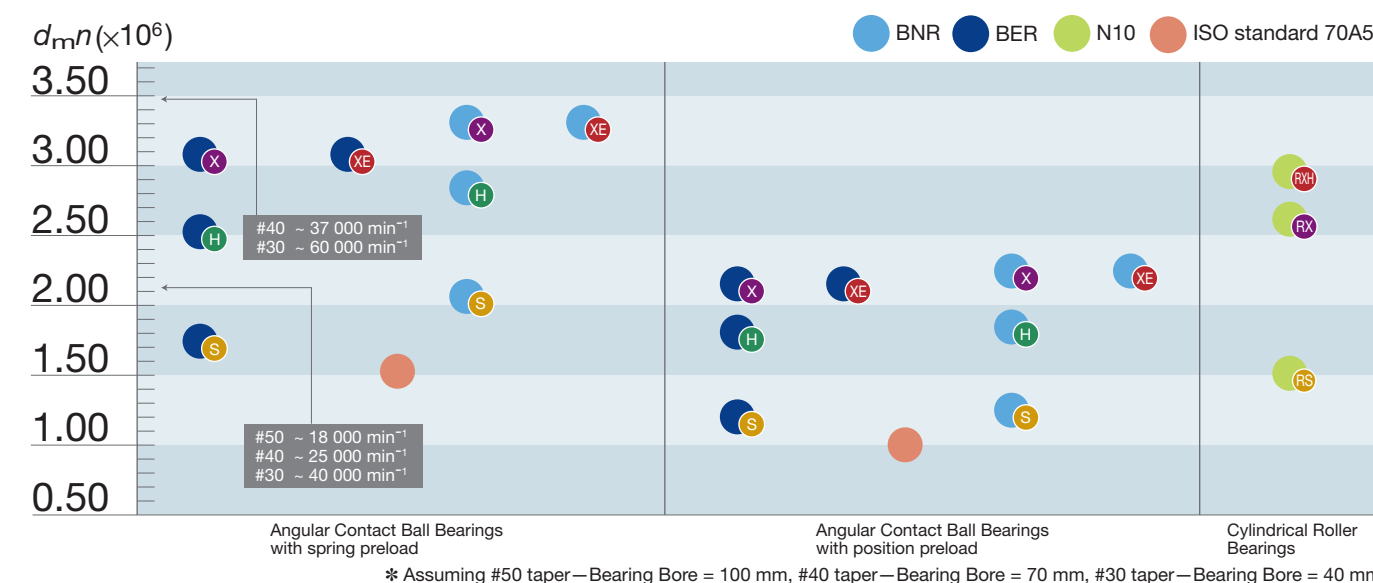
N10 RS RX RXH

Achieved 3.0M $d_m n$

ROBUST Cylindrical Roller Bearings simplify the structure of the spindle and also achieve 3.0M $d_m n$: twice the current speed.

Bearing Selection Guide

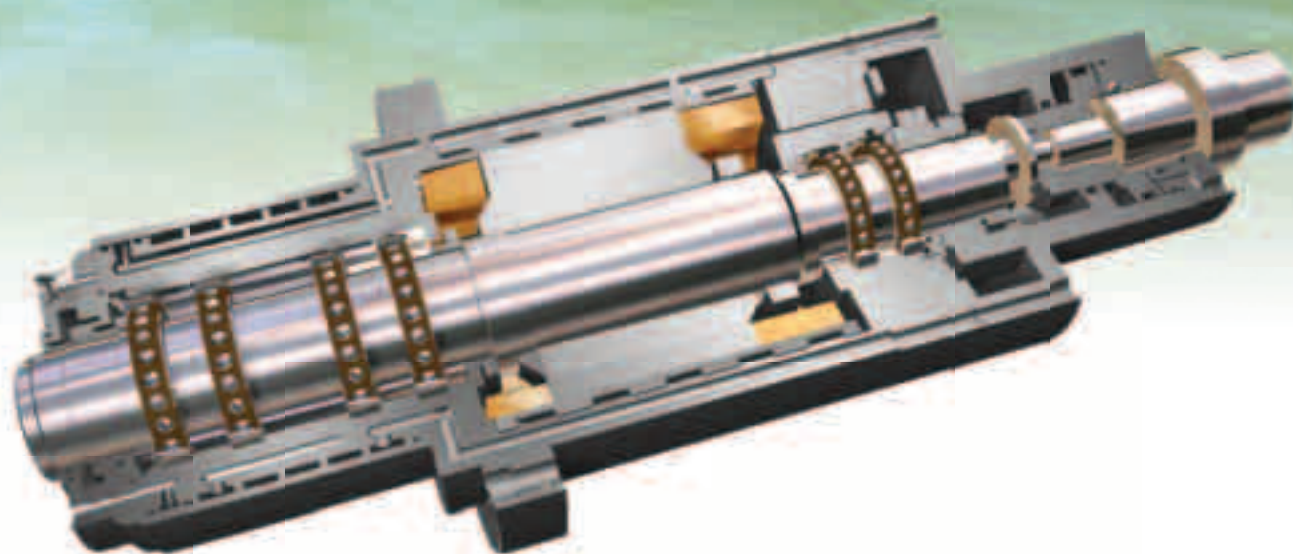
Bearing type based on preload method and rotational speed



Friendly

Silent Operation and Gentle on the Environment

Acknowledging increased demand to reduce environmental impact while maintaining high machine tool performance, NSK provides the solution with grease lubrication.



Typical spindle structure with grease lubrication for high-speed machining centers.

Typical application

Molding die machining
Automotive parts machining

Bearings for high-speed machining centers with grease lubrication

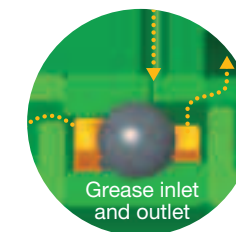
Grease Replenishing System



Higher speed with silent operation

This system feeds a small amount of grease to the bearing at regular intervals, enabling speeds up to 1.8M $d_m n$ with position preload. The Grease Replenishing System enables longer grease life, consumes less air, and is quieter relative to an oil-air system.

MTE grease developed by NSK is used in the system. MTS and MTE grease provide the best performance for normal grease lubrication.

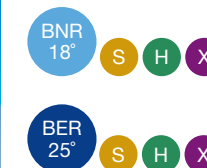


NSK Grease

MTE: for high-speed and heavy load
MTS: for ultra high-speed



High-Speed Angular Contact Ball Bearings (Photo: Angular Contact Ball Bearings with Seal)



Angular Contact Ball Bearings with TYN Cage, suited for grease lubrication; seal enables longer grease life.

TYN cage (ball guided, engineered polymer) suitable for grease lubrication, seal enables longer grease life.
Bore dia: 30 mm – 100 mm

High-Speed Cylindrical Roller Bearings (Photo: Z specification)

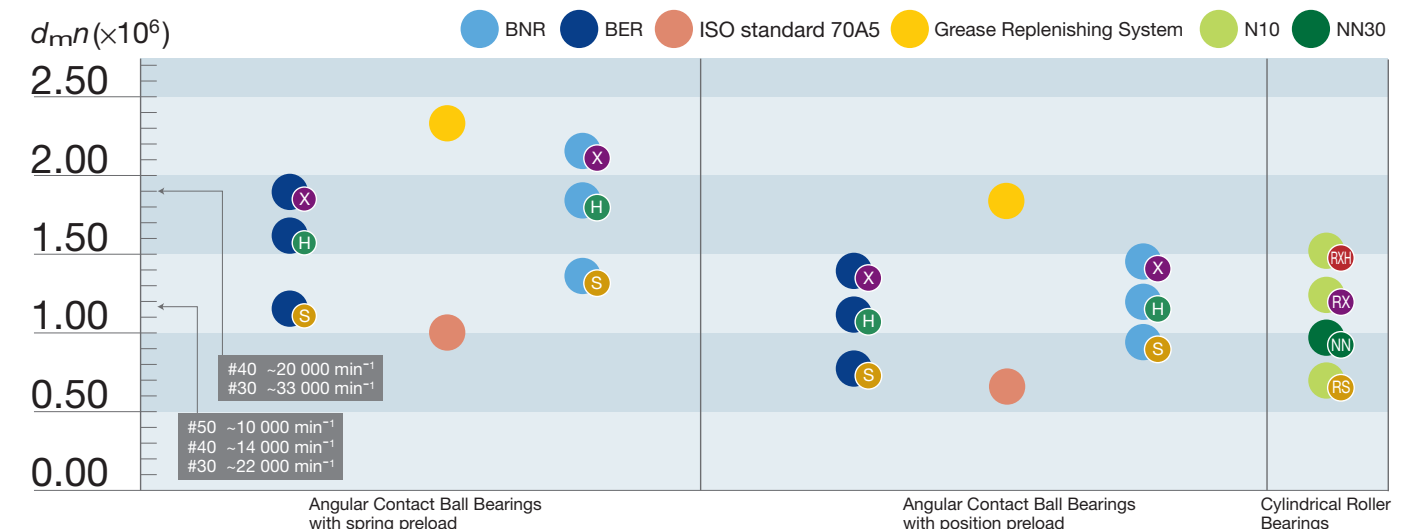


From NSK—"Low Heat Generation Cylindrical Roller Bearings"

By reducing the number of rollers by half (Z spec.), this specification of Cylindrical Roller Bearings is well-suited for the rear side of a spindle with a built-in motor. This new idea provides longer grease life.

Bearing Selection Guide

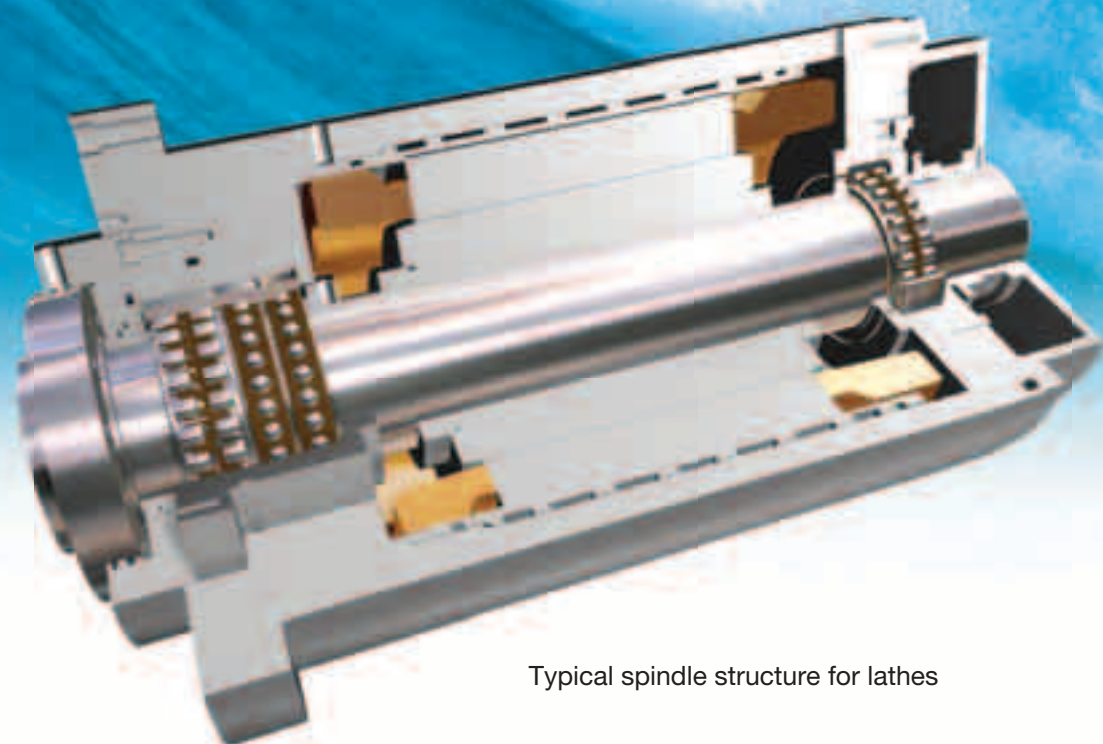
Bearing type based on preload method and rotational speed



Firm

Strength and Long Life

Acknowledging increased demand for high rigidity in lathe applications, NSK provides the solution with bearings specifically designed for lathes.



Typical spindle structure for lathes

High-Speed, High-Rigidity, and High-Accuracy Bearings for Lathes

High-Rigidity, Double-Row Cylindrical Roller Bearings



NN

High speed and high rigidity with long grease life

ROBUST Cylindrical Roller Bearings with TB cage, made with the finest materials and optimised design, are suitable for lathes, and provide high-speed and high rigidity.



E44 symbol: standard oil holes and grooves on O.D.

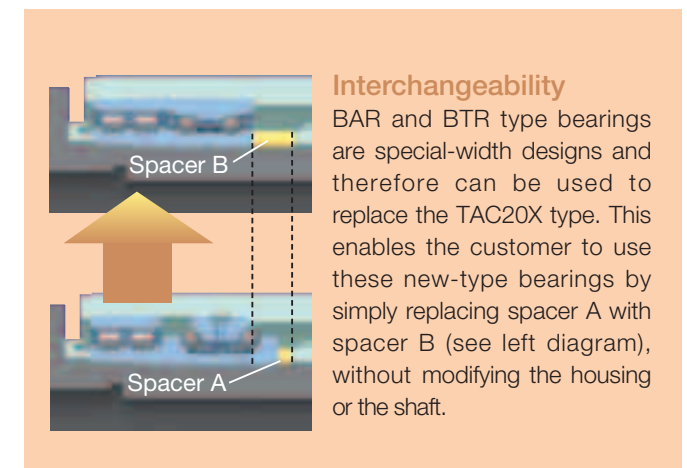
High-Speed Angular Contact Thrust Ball Bearings



BAR 30° S H
BTR 40° S H

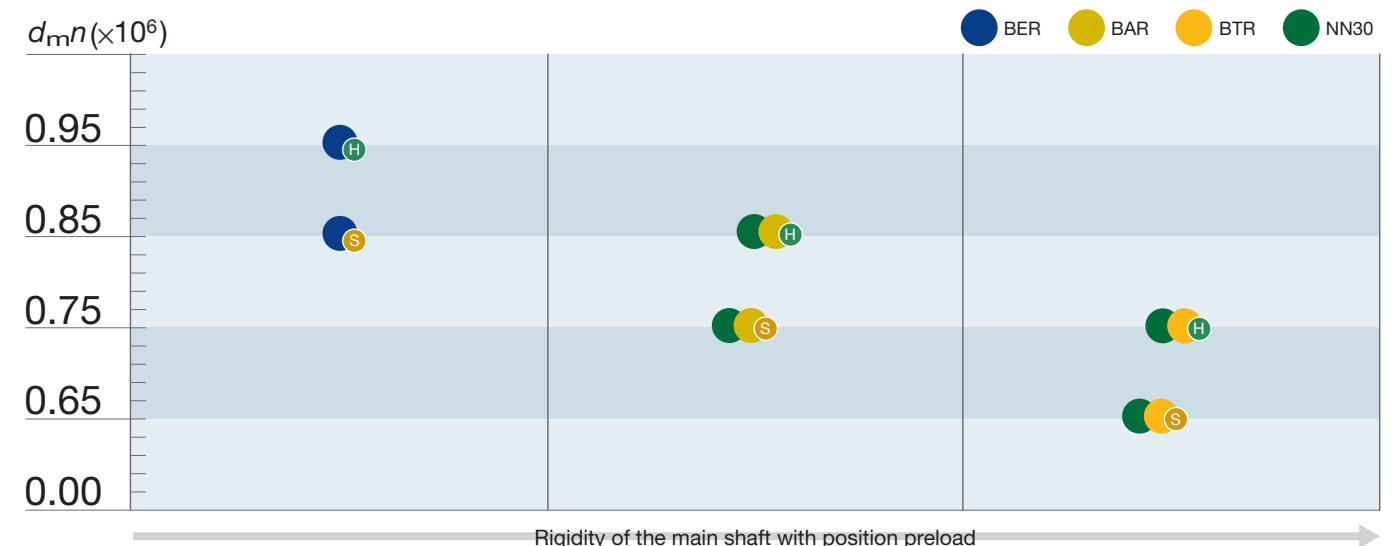
Low heat generation, high rigidity, and high accuracy

Low heat generation and high rigidity increase the reliability of the spindle.



Bearing Selection Guide

Bearing type based on rotational speed



Firm

Strength and Long Life

For high rigidity, high reliability, and long life, NSK provides the solution for each application.

Fine

High Accuracy

With the finest surface finish, NSK provides the optimal solution, with high running accuracy.

Ball Screw Support Bearings

Ball Screw Support Angular Contact Thrust Ball Bearings



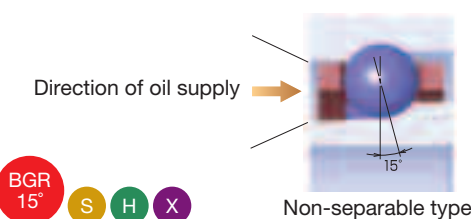
TAC
60°

Design optimised to produce high rigidity bearing for special applications

This bearing design has been improved to meet the requirements of this application. Using long life and high reliability material, fatigue life has been extended, and by increasing the number of the balls, the rigidity of this bearing has been increased.

Ultra High-Speed Bearings for Internal Grinders

Ultra High-Accuracy Angular Contact Ball Bearings

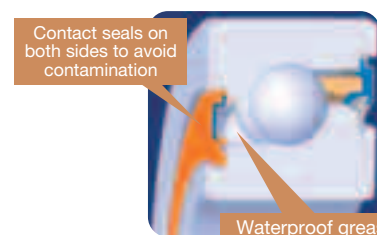


Ultra high-speed and accuracy provided by special design features

In order to meet the ultra high-speed capability and high running accuracy required in bearings for internal grinders, this series has the following features.

- Accuracy class: ISO Class 2
 - Inner ring counter-bore design allows for more efficient oil delivery to the bearing
- These universal combination bearings can be used in any combination.

Ball Screw Support Angular Contact Thrust Ball Bearings, with seal



* Different colored seal on each side to identify bearing orientation

TAC
60°

Easy handling and increased reliability

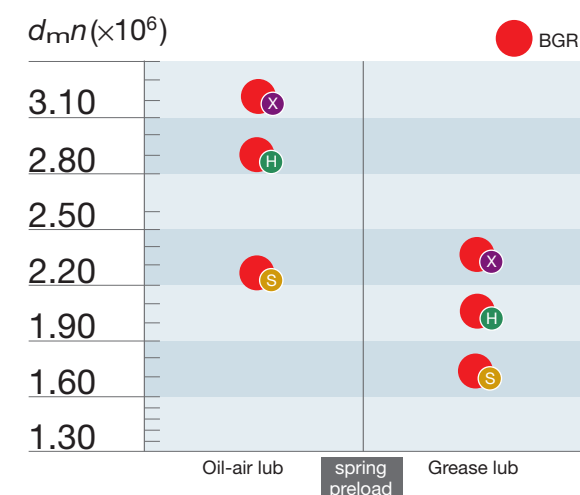
Superior seal design for typical ball screw applications increases the reliability of the bearings and provides for easy handling. Universal combination of this bearing provides extra flexibility.



Typical spindle structure for internal grinder

Bearing Selection Guide

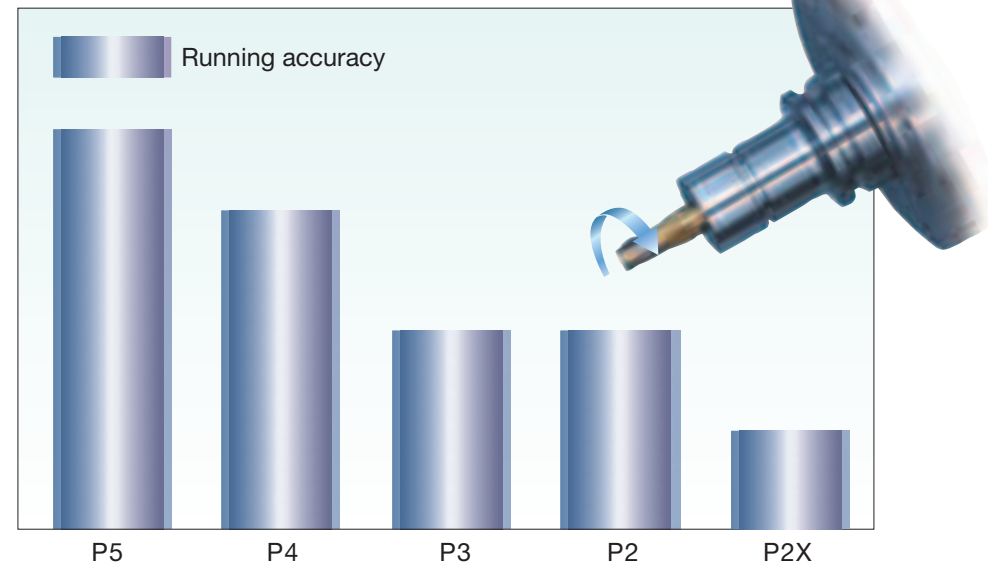
Bearing type based on lubrication method and rotational speed



Function for each application

Special high accuracy class: P2X

The lowest radial runout

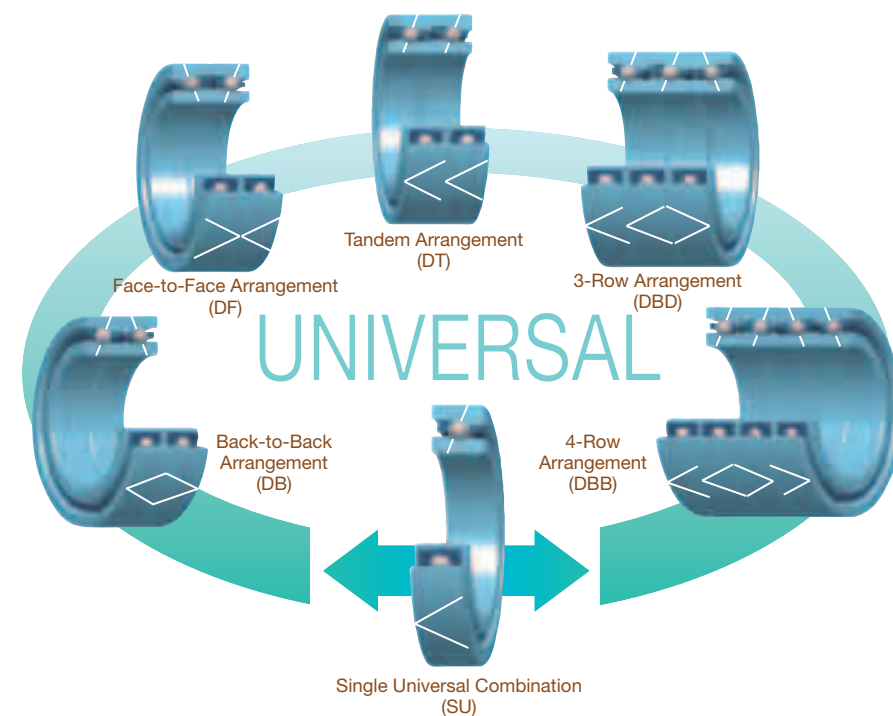


NSK accuracy	P5	P4	P3	P2	P2X
Dimensional accuracy	ISO CLASS 5	ISO CLASS 4	ISO CLASS 4	ISO CLASS 2	ISO CLASS 2
Running accuracy			ISO CLASS 2		Higher than ISO CLASS 2

Function for each application

Universal combination: SU (Single Universal)

Universal combination bearing can be used for any arrangement of DB, DT, DF, DBD, DBB



SUPER PRECISION BEARINGS Catalog



Catalog No. E1254

- Part 1. NSK Super Precision Bearings**
 - Global Network
 - Research and Development
 - Quality Control and Manufacturing Technology
- Part 2. Features of Precision Bearings**
 - Metallurgical Technology to Extend Bearing Life
 - Ceramic Rolling Elements
 - Cages
 - Product Range
 - Performance of Each Bearing Type
- Part 3. Selection of Precision Bearings**

- Part 4. Bearing Types**
 - Angular Contact Ball Bearings (ACBB)
 - Cylindrical Roller Bearings (CRB)
 - Angular Contact Thrust Ball Bearings
 - Angular Contact Thrust Ball Bearings for Ball Screw Support
 - Precision Deep Groove Ball Bearings
 - Gauges and Oil-Air Lubricators
- Part 5. Technical Guide**
- Part 6. Bearing Handling**
- Part 7. Appendices**

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 Chennai Plant tel: 04114-268002, 265313, 265363, 265365
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 Chennai tel: 044-2433-4732, 044-2434-3036, 3067

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 Maidenhead, U.K. www.eu.nsk.com tel: 01628-509800

France:
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NSK Americas, Inc. (American Headquarters)
 Ann Arbor, Michigan, U.S.A. tel: 734-913-7500

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