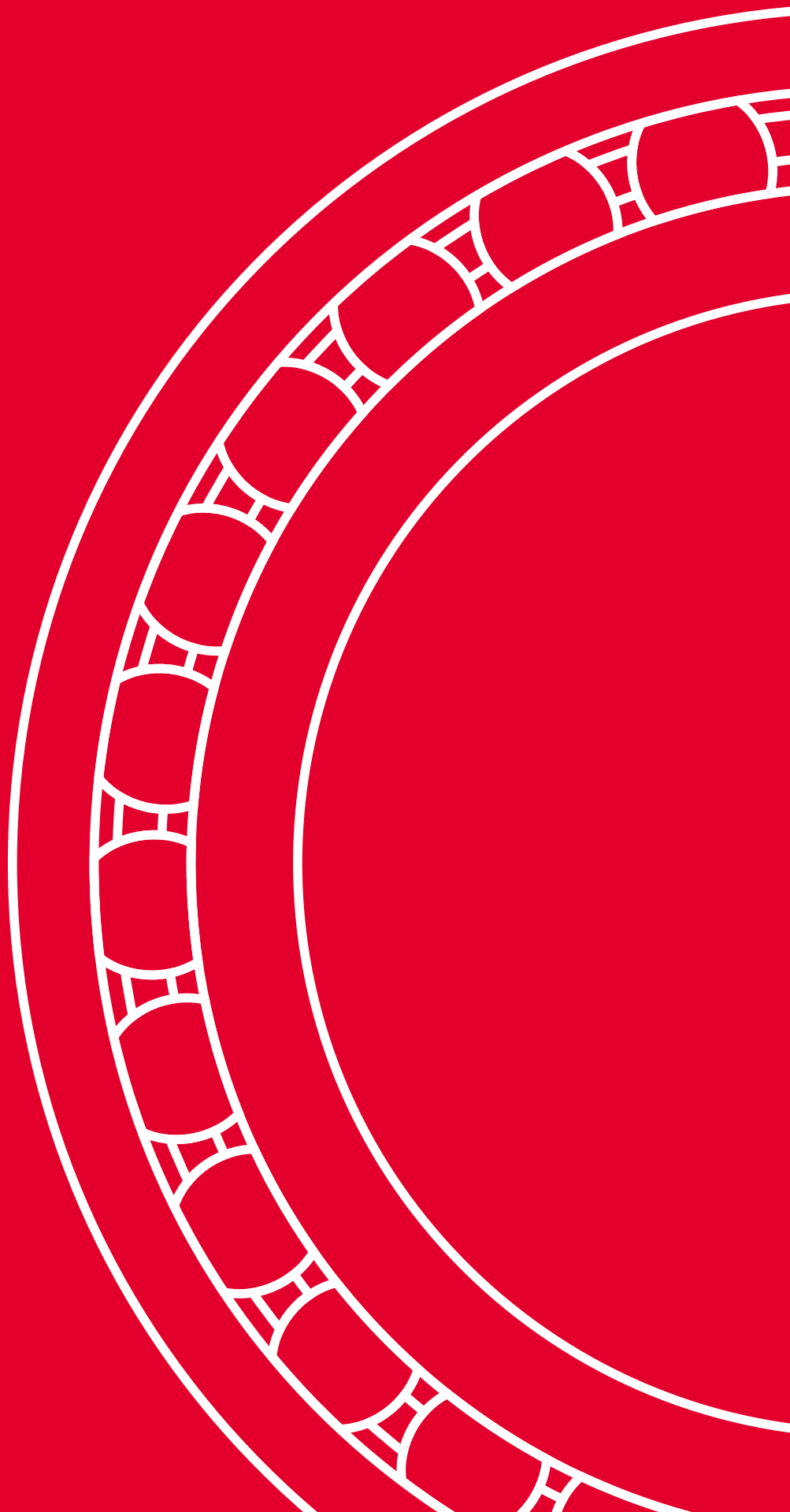


# CEMENT

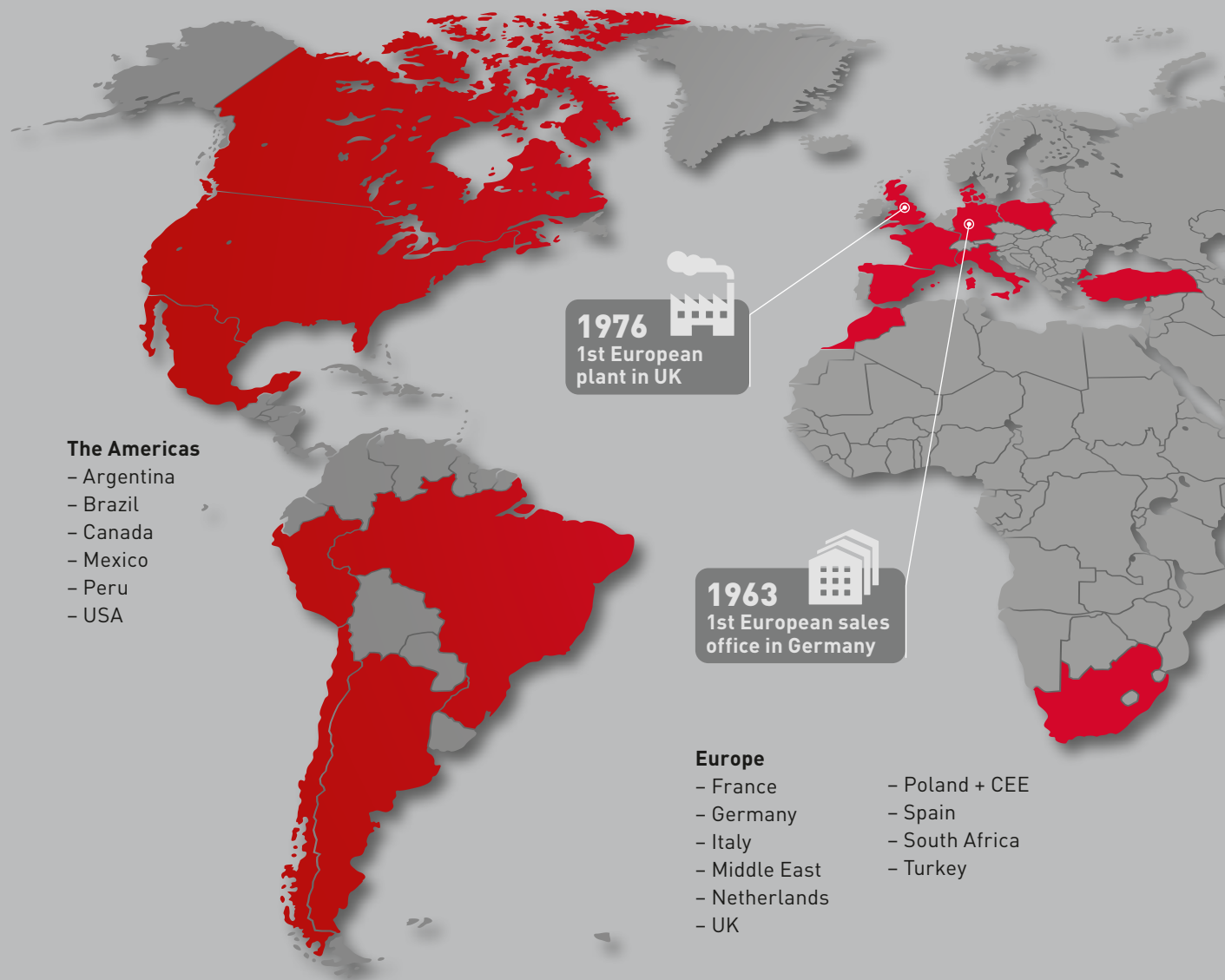
MOTION & CONTROL™

**NSK**



# OUR MOST IMPORTANT PRODUCT: OUR CUSTOMERS' SATISFACTION

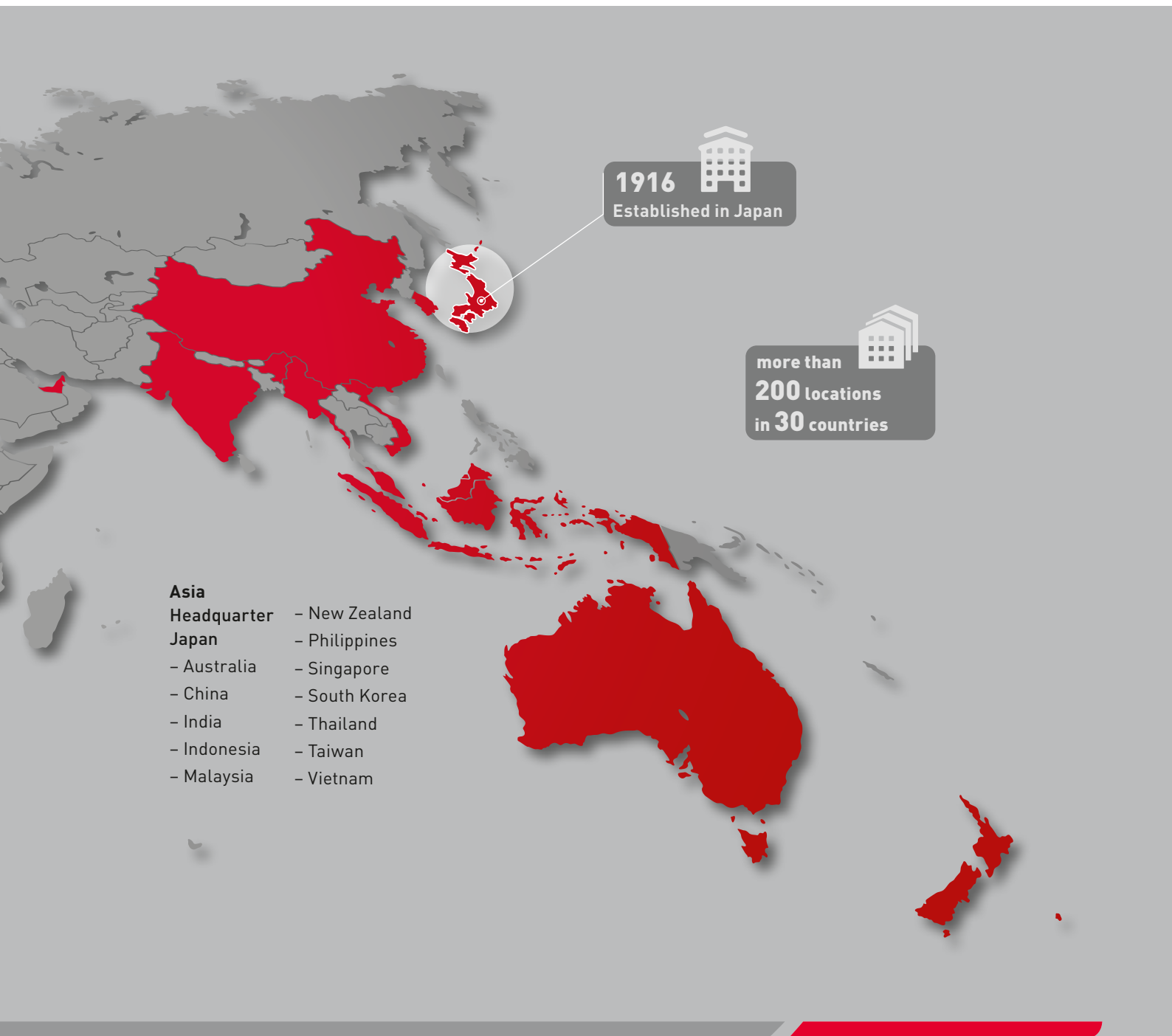
We are among the leading manufacturers worldwide for rolling bearings, linear technology components and steering systems. One reason for this is that our products are reliable and energy efficient in demanding environments and even under the harshest conditions. To achieve this, we do research in core technology areas such as material engineering and tribology, we are always optimising every process phase in terms of quality and our products undergo continuous development for applications



in a wide variety of industries. One thing motivates us here: we want to help you increase the reliability of your vehicles and equipment, not only with excellent products, but above all with excellent service. Our experienced engineers have a deep understanding of systems – together with you, they work to optimise products and processes and develop solutions for the future. The goal that we are dedicated to every day is ensuring that you remain competitive over the long run.



Dr. Ulrich Nass, CEO of NSK Europe Ltd.







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# Sector Brochure

Bearing Solutions for the  
Cement Industry



# BEARING SOLUTIONS FOR THE CEMENT INDUSTRY



BRANDS OF **NSK EUROPE**

**NSK**

RHP bearings



neuweg



[www.nsk-literature.com/en/cement-industry-bearings/](http://www.nsk-literature.com/en/cement-industry-bearings/)

## SETTING THE FUTURE IN MOTION

We are among the leading manufacturers for rolling bearings, linear technology components and steering systems worldwide. We can be found on almost every continent – with production facilities, sales offices and technology centres – because our customers appreciate short decision-making channels, prompt deliveries and local service.



### The NSK company

NSK commenced operations as the first Japanese manufacturer of rolling bearings back in 1916. Ever since, we have been continuously expanding and improving not only our product portfolio but also our range of services for various industrial sectors. In this context our worldwide research and production facilities are linked together in a global network. Here we concentrate not only on the

development of new technologies, but also on the continuous optimisation of quality – at every process stage. Among other things, our research activities include product design, simulation applications using a variety of analytical systems and the development of different steels and lubricants for rolling bearings.

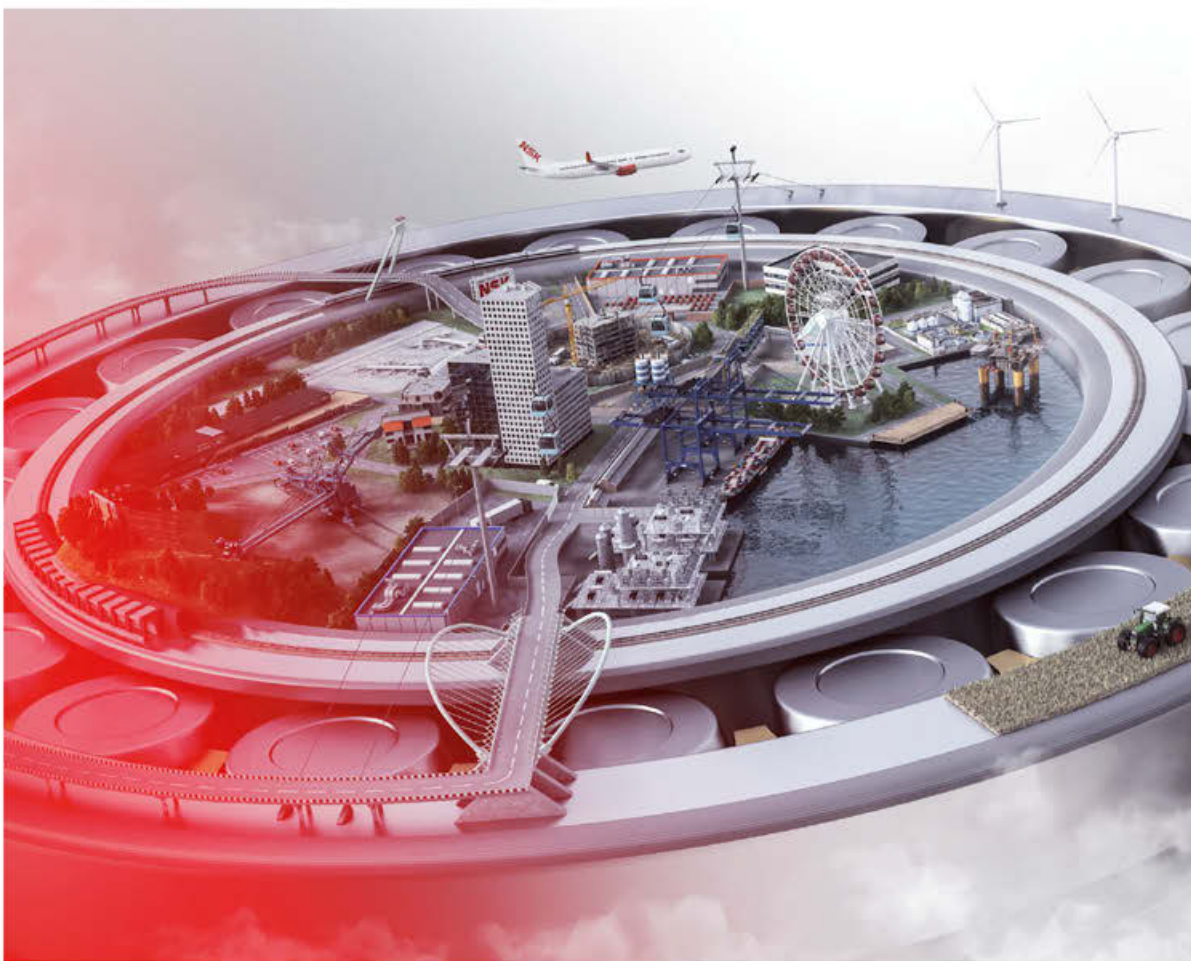
Trademarks: All NSK product and service names listed in this catalogue are trademarks or registered trademarks of NSK Ltd.



## OUR MOST IMPORTANT PRODUCT: OUR CUSTOMERS' SATISFACTION

One thing keeps us moving: we want to help you increase the reliability of your vehicles and equipment, not only with excellent products, but above all with excellent service. Our experienced engineers have a deep understanding of systems – together with you, they work to optimise products and processes and develop solutions for the future. The goal that we are dedicated to every day is ensuring that you remain competitive over the long run.

More about NSK on [www.nskeurope.com](http://www.nskeurope.com)



## CEMENT INDUSTRY

Leaders in our field, we are not content simply to supply a range of products to meet the needs of today. At NSK we go much further: constantly challenging accepted thinking, exploring new and better methods of design and manufacture and, above all, looking beyond the needs of today to meet customers' requirements in the future.

Cement is one of the World's most important building materials – and its production one of the most severe processing environments, and so demands outstanding performance. NSK bearings provide the Cement and related industries with the reliability, sustainability and toughness required to withstand the critical processing factors of water, dust and grit, extreme temperatures, vibration and huge loads. Like other extreme processing and extraction industries, Cement machinery must continuously operate under these challenging conditions. NSK understands your production environments and maintenance issues, and that the solution to sustainable productivity lies in new technology.

As such our bearings are based on proprietary state-of-the-art technology, combined with the experience and knowledge from working with industry leaders. We have designed bearings to ensure your processes continue to run smoothly. NSK bearings exceed the limits of conventional bearings in terms of long operating life and high limiting speed to give you the toughness you require.

### **NSK Reliability helping you maintain your production momentum**

NSK bearings offer the Cement industry plant operators and equipment manufacturers longer service life under some of the most challenging operating conditions. Maximising uptime and reducing maintenance costs for improved productivity at Cement plants. Durability and reliability are of paramount importance where failure of a single component can impact the entire Cement manufacturing process. Our superior bearings offer high performance with robust design, helping you improve profitability and productivity.

We continue to deliver the reliability required by Cement plants around the world.

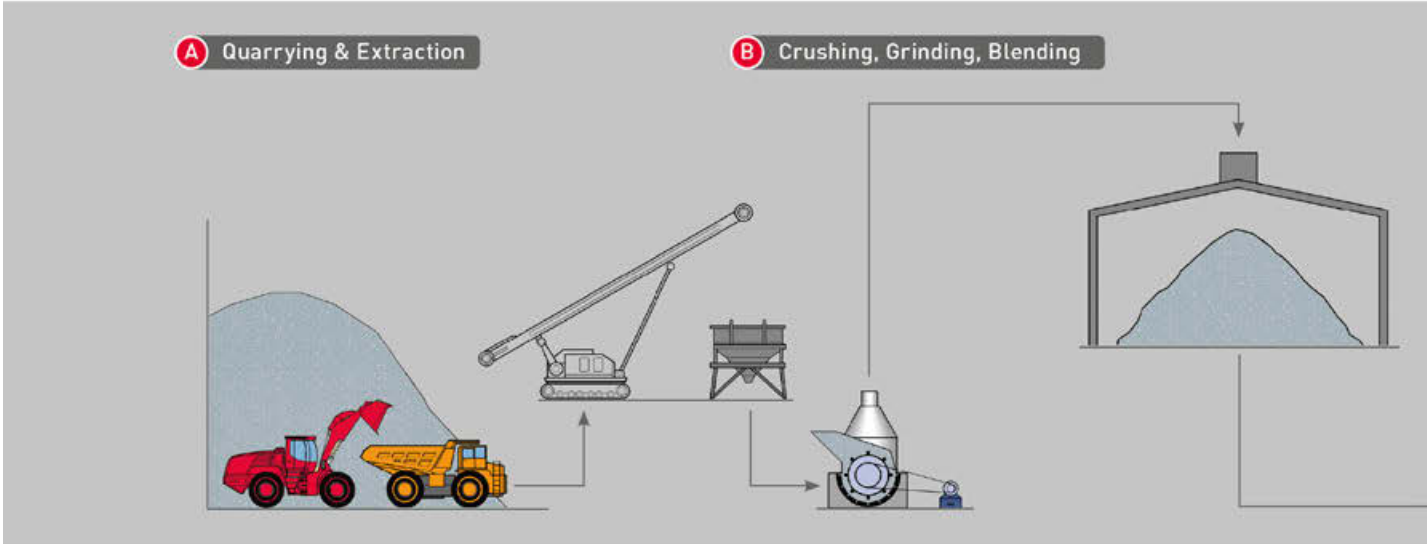






# CEMENT INDUSTRY PROCESS

STEP 1



## A Quarrying & Extraction



Spherical Roller Bearings  
-NSKHPS Series  
-ECAM/CAM Series  
-VS/EVB Series (vibrating applications)



Angular Contact Ball Bearings - NSKHPS Series



Deep Groove Ball Bearings - Sealed

## B Crushing, Grinding, Blending



Cylindrical Roller Bearings - EW/EM Series



Tapered Roller Bearings



Deep Groove Ball Bearings - HR Series



Angular Contact Ball Bearings - NSKHPS Series



TF Series



Molded-Oil Bearings



Deep Groove Ball Bearings - Sealed



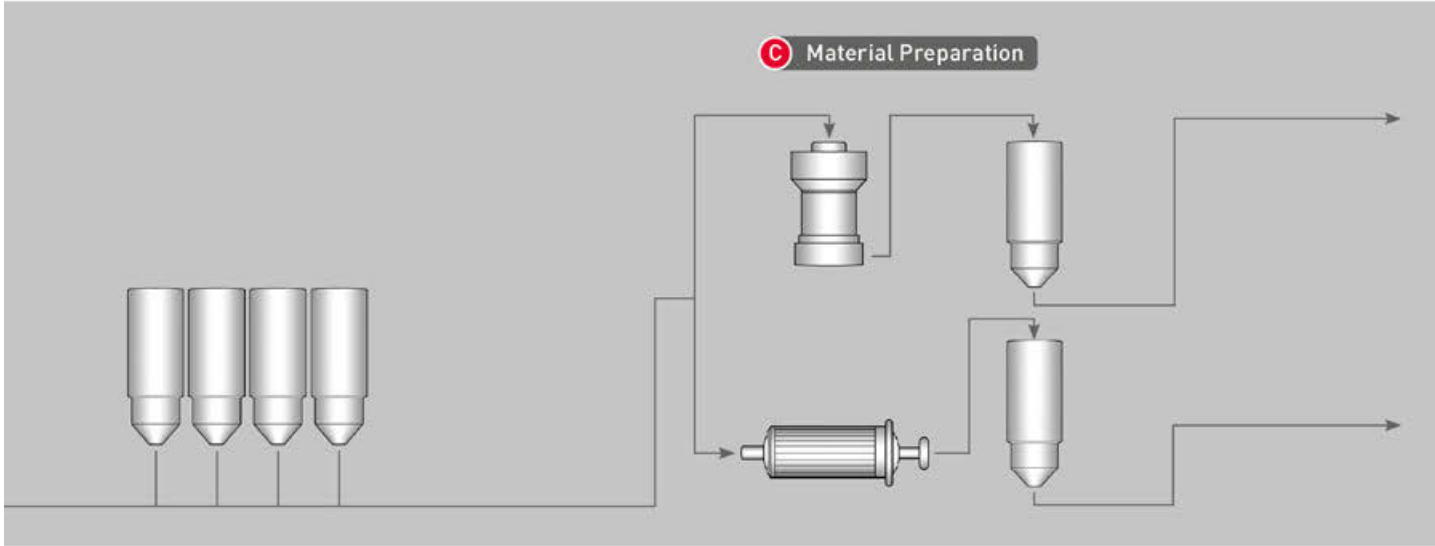
Self-Lube® Units



Mounted Units



Triple Lip Seal



**C** Material Preparation



Spherical Roller Bearings  
-NSKHPS Series  
-ECAM/CAM Series



Deep Groove Ball Bearings -  
HR Series

**D** Pre-homogenisation



Spherical Roller Bearings  
-NSKHPS Series  
-ECAM/CAM Series



Cylindrical Roller Bearings -  
EW(EM Series



Angular Contact Ball Bearings -  
Double Row



Cylindrical Roller Bearings -  
EW(EM Series



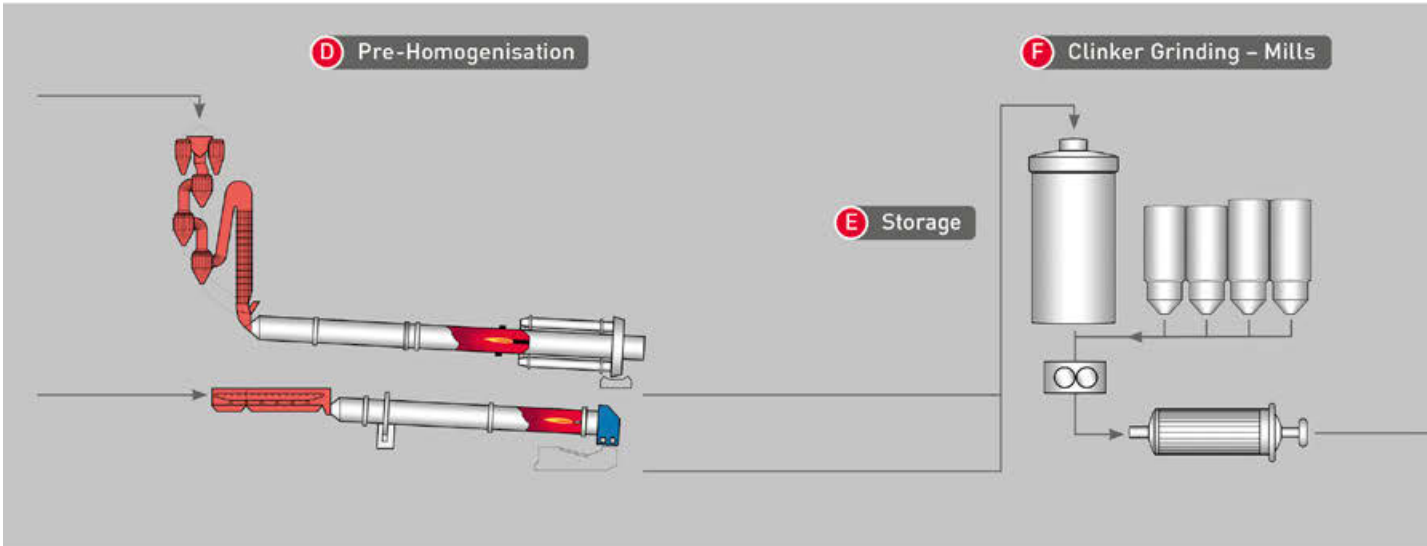
Tapered Roller Bearings



TF Series

# CEMENT INDUSTRY PROCESS

STEP 3



## E Storage



Self-Lube® Units



Plummer Block Housings



Spherical Roller Bearings  
-NSKHPS Series  
-ECAM/CAM Series

## F Clinker Grinding - Mills



Spherical Roller Bearings  
-NSKHPS Series  
-ECAM/CAM Series



Cylindrical Roller Bearings -  
EW/EM Series



Tapered Roller Bearings -  
Double-Row



TF Series



Angular Contact Ball Bearings -  
Double Row

## G Conveying



Spherical Roller Bearings  
-NSKHPS Series  
-ECAM/CAM Series



Self-Lube® Units



Mounted Units



HLT Inserts

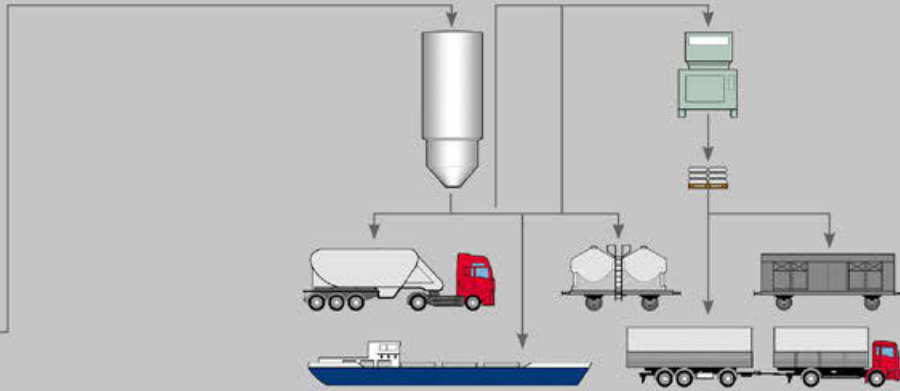


Deep Groove Ball Bearings -  
HR Series



**G** Conveying

**H** Packing & Shipping



**H** Packing & Shipping



Angular Contact Ball Bearings - NSKHPS Series



Spherical Roller Bearings - NSKHPS Series - ECAM/CAM Series



HLT Inserts



Cylindrical Roller Bearings - EW/EM Series



Molded-Oil Bearings



Mounted Units



Tapered Roller Bearings



TF Series



Triple Lip Seal



TF Series



Deep Groove Ball Bearings - Sealed



Self-Lube® Units

## BEARING TYPES



### Spherical Roller Bearings – NSKHPS Series

- High load capacity
- High limiting speed
- High strength cage (steel or brass)
- Low noise and vibration



### Spherical Roller Bearings – CAM/ECAM Series

- Tough machined brass cage
- Self-aligning ability with floating ring guide
- Controlled roller skew
- High dynamic and static load ratings
- High speed performance – low operating temperature rise
- High resistance to heavy & shock loading
- High temperature dimensional stability
- High cage strength



### Spherical Roller Bearings – Long-life VS

- Improved surface roughness on rollers, inner & outer ring
- Specifically designed for Vibrating Screens
- Load rating increased by 1.25 times
- Dampened vibration
- Better roller guidance & smooth running
- Reduced bearing damage from slippage, surface fatigue, flaking



### Spherical Roller Bearings – EVB Series

- Extra capacity vibratory bearings
- Heat stabilised up to 200°C
- One-piece machined brass cage
- Special ring tolerances to withstand vibration, shock loads & misalignment



#### Cylindrical Roller Bearings – EM Series

- Extra capacity internal design
- High strength brass cage – reduces wear and improves performance in vibrating equipment
- Special cage pocket profiling improves oil / grease flow
- 30% higher load rating than conventional bearings



#### Cylindrical Roller Bearings – EW Series

- High radial load capacity
- High speed applications
- High strength pressed steel, machined brass or polyamide cage
- Low noise & heat generation



#### Deep Groove Ball Bearings – Sealed

- Viton®\* seals (black); Standard seals (brown)
- High temperature Viton®\* seals can run up to 200°C
- Standard seals can run up to 120°C
- Low noise level

\* DuPont Performance Elastomers LLC



#### Deep Groove Ball Bearings – HR Series

- Special internal design
- Bigger rolling elements
- Increased dynamic load rating
- Increased life in operation
- Interchangeable with the standard range
- Extra clean Z steel as standard

## BEARING TYPES



### Self-Lube® Units

- Range of diverse casting and pressed steel and thermoplastic housings
- 3 main seal options – standard, triple lip, or flinger/standard
- All cast housings supplied with re-greasing facility
- Secure locking shaft for all speed, load and vibration conditions
- Protector caps available



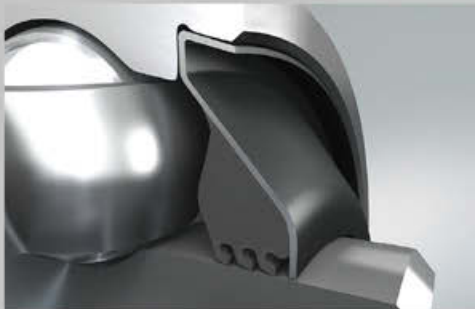
### HLT Inserts

- Special internal geometry (cage & internal features) designed to operate at extreme temperatures
- High performance Klüber grease operating at extreme temperatures [-40°C and +180°C]
- Durable silicone rubber seals offer protection at extreme temperatures



### J-Line - Mounted Units (JIS)

- Sealed single-row ball bearing in a Pillow block or flanged housing
- RHP units feature "flingers" that keep contaminants away
- Housings available in ductile cast iron, cast steel or stainless steel
- Variety of shaft locking mechanisms



### Triple Lip Seal

- Nitrile rubber triple lip seals
- Longer life due to superior seal performance
- Extended lubrication intervals – increases productivity of machines and reduces maintenance costs





#### **Plummer Blocks**

- Split housing allows easy mounting and dismounting
- Various sealing options available – V-ring seals, labyrinth or heavy duty taconite
- Multi lubrication points



#### **Tapered Roller Bearings**

- Inch & metric sizes
- Standard steel / carburised steel / HTF treatment
- Custom-made sets with spacers



#### **Taper Roller Bearings – Double Row**

- Inch & metric sizes
- Standard steel / carburised steel / HTF treatment
- Also available with heavy-duty seals



#### **Molded-Oil Bearings**

- Grease-free property with no oil refilling
- Operating life more than twice as long as grease lubrication [in water/dust contaminated environments]
- Extended maintenance-free performance

## BEARING TYPES



### TF Series

- Innovative materials
- Special heat treatment technology
- Up to 10 times service life in contaminated lubrication
- Up to 4 times service life at 160°C
- 40% improvement on seizure resistance



### Angular Contact Ball Bearings – NSKHPS Series

- Optimised internal design
- High strength ball guided cage – available in brass, polyamide or L-PPS
- High running accuracy P5 (ISO Class 5)
- High load ratings
- Universal facing as standard
- 40 degree Contact Angle



### Angular Contact Ball Bearings – Double Row

- High quality – Ultra clean steel
- Steel or polyamide cage
- Super finished raceways, minimises noise and improves lubricant distribution
- Open or Shielded (ZZ or 2Z)
- Sealed DDU or 2RS



# SUCCESS STORY

**Industry: Cement**  
**Application: Slurry Pump**  
**Cost Savings: € 51 476**

## Introduction

A cement plant was experiencing premature bearing failures due to a contamination in their slurry pumps. Bearings were only lasting two to three months causing frequent downtime and high maintenance costs. NSK was contacted to evaluate the problem and the NSK engineers suggested an improved bearing design together with a recommendation to increase bearing fitting standards. After the implementation bearing life was doubled.

## Key Facts

- Slurry pump
- Premature bearing failure
- NSK solution: ACBB with HTF material followed by a training on installation and maintenance of bearings
- Increased lifetime
- Significant cost saving realised

## Value Proposals

- NSK experts performed an Application Review
- The review show that the used bearing was failing due to contamination
- NSK recommended to use ACBB with HTF material
- With the new bearing, the lifetime was doubled
- Training was provided on improved installation and maintenance of bearings



Concrete Plant



Angular Contact Ball Bearing with special HTF Steel

## Product Features

- Angular Contact Ball Bearing with special HTF steel
- Innovative heat treatment technology
- Outperforming standard bearing steel

## Cost Saving Breakdown

Before	Cost p.a.	NSK Solution	Cost p.a.
Total bearing cost	€ 96 916	Total bearing cost	€ 42 940
No formal training	€ 0	Training for the maintenance team	€ 2 500
<b>Total Costs</b>	<b>€ 96 916</b>	<b>Total Costs</b>	<b>€ 45 440</b>



# Success Stories



Concrete Pipe Cutting



Slurry Pump



Concrete Thickener

## Success Story

Industry: Cement

Application: Concrete Pipe Cutting

**Cost Savings: € 38 400**

### Introduction

A customer was experiencing repeated bearing failure every 2-3 months, on the blade support of a concrete pipe slotting machine, with 8 hours downtime per failure. NSK Engineers examined the application and determined that ingress of concrete dust was causing premature failure of the bearings. NSK recommended changing to Molded-Oil bearings, which would give a better service life. This resulted in much improved performance with bearing life quadrupled from 2-3 months to 12 months.

### Key Facts

- Concrete pipe slotting
- Bearing replacement every 2-3 months with 8 hours breakdown per failure
- Concrete dust environment
- NSK solution: Molded-Oil bearings
- Significant reduction in downtime and maintenance costs
- Quadrupled bearing life from 2-3 months to 12 months



↑ Concrete pipe

### Value Proposals

- The customer was experiencing poor performance of the bearing on a blade support for a concrete pipe slotting machine.
- A failed bearing analysis concluded that ingress of cement dust contaminating the grease was the route cause of premature bearing failure.
- An application review showed that the existing shielded Deep Groove Ball Bearings were inadequate.
- NSK recommended Molded-Oil bearings with a DDU seal.
- A trial was conducted and the results showed no failures in a 12 months period.
- This resulted in a significant reduction in maintenance costs, improved productivity and zero lost production providing a large cost saving for the customer.

## Product Features

- Molded-Oil provides continuous supply of lubrication oil
- Stainless steel for corrosive environments
- Grease-free property with no oil refilling keeps operating environments clean
- Operating life more than twice as long as grease lubrication, in water or dust contaminated environments
- Contact-seal type available in standard inventory for ball bearings
- Achieves extended maintenance-free performance as Molded-Oil provides a continuous supply of lubricant
- Available for high speed applications
- Available in ball bearing, spherical roller bearing and tapered roller bearings types



↑ Molded-Oil

## Cost Saving Breakdown

Before	Cost p.a.	NSK Solution	Cost p.a.
 4 failures per year		No failures over one year	
 8 hours downtime per failure €1.200 per hour downtime costs	€ 38.400	NSK Molded-Oil bearings operated without failure for 12 months	€ 0
<b>Total Costs</b>	<b>€ 38 400</b>		<b>€ 0</b>

## Success Story

Industry: Cement

Application: Slurry Pump

**Cost Savings: € 51 476**

### Introduction

A cement plant in the US was experiencing premature bearing failures due to a contamination in their slurry pumps. Bearings were only lasting two to three months causing frequent downtime and high maintenance costs. NSK was contacted to evaluate the problem and the NSK engineers suggested an improved bearing design together with a recommendation to increase bearing fitting standards. After the implementation bearing life was doubled.

### Key Facts

- Slurry pump
- Premature bearing failure
- NSK solution: ACBB with HTF material followed by a training on installation and maintenance of bearings
- Increased lifetime
- Significant cost saving realised



↑ Concrete Plant

### Value Proposals

- NSK experts performed an Application Review
- The review show that the used bearing was failing due to contamination
- NSK recommended to use ACBB with HTF material
- With the new bearing, the lifetime was doubled
- Training was provided on improved installation and maintenance of bearings



## Product Features

- Angular Contact Ball Bearing with special HTF steel
- Innovative heat treatment technology
- Outperforming standard bearing steel



↑ Angular Contact Ball Bearing with special HTF Steel

## Cost Saving Breakdown

Before	Cost p.a.	NSK Solution	Cost p.a.
 Total bearing cost	96 916 €	Total bearing cost	42 940 €
 No formal training	0 €	Training for the maintenance team	2 500 €
<b>Total Costs</b>	<b>€ 96 916</b>		<b>€ 45 440</b>



## Success Story

Industry: Cement

Application: Concrete (sett) thickener

**Cost Savings: € 32 100**

### Introduction

A paving producer in Poland was experiencing frequent breakdowns due to bearing failures in a vibrating thickener machine. The bearings were mounted in an electric motor which supported unbalanced weights providing the vibration. In a period of 4 months the customer experienced 10 failures and each time it took 2 hours to replace the bearings. The existing bearings were experiencing grease leakage and high operating temperatures in excess of 110°C. NSK engineers performed an application review and recommended that the existing shielded bearings be replaced with NSK high integrity fluoride rubber contact seals.

### Key Facts

- Concrete (sett) thickener
- High temperature and vibrating conditions
- Grease leakage and high temperature identified as cause of bearing failure
- NSK solution: Deep Groove Ball Bearings with high temperature fluorine DDU seals and special material rings with increased clearance
- Extended lifetime resulted in zero maintenance requirement after NSK bearings were fitted
- Cost saving based on reduced failures and minimum maintenance requirement



↑ Vibrating Thickener

### Value Proposals

- The customer experienced many failures in a vibrating motor application. NSK engineers performed a failed bearing analysis which showed grease leakage and high operating temperatures as the cause
- An application review showed that the existing shielded deep groove ball bearings were inadequate. NSK recommended high temperature contact seals in combination with special material rings and C3 clearance
- A trial was conducted on the NSK options and the results showed zero failures in the second 4 months period
- This resulted in a significant reduction in maintenance costs, improved productivity and zero lost production providing a large cost saving for the customer

## Product Features

- Steel Cage
- Heat stabilised rings
- C3 Internal clearance
- High temperature grease
- High performance in contaminated environment
- Temperature stability: up to 150°C
- Longer bearing life through superior seal performance (Viton® Seals)
- Reduced noise level "E" class for electrical applications



↑ High Temperature Sealed Deep Groove Ball Bearings

## Cost Saving Breakdown

Before	Cost p.a.	NSK Solution	Cost p.a.
 Regular bearing failure - up to 20 per 8 months season	€200	No bearing failures within a 4 months season	€100
 Maintenance: 20 electric motor à 100 € each	€2.000	No maintenance within a 4 months season	€0
 Lost in production per year: 40 hours à 750 € each downtime	€30.000	No lost of production within a 4 months season	€0
<b>Total Costs</b>	<b>€ 32 200</b>		<b>€ 100</b>



# Innovative Products

TF Series Bearings

NSKHPS Angular Contact  
Ball Bearings

Molded-Oil Bearings

Long-life-Vibrating Screen  
Roller Bearings

Integrated Bearing  
Assemblies



MOTION & CONTROL™  
**NSK**

# TF SERIES BEARINGS

NSK's TF Series Bearings have been designed for outstanding toughness under harsh conditions. They combine longer service life & superior resistance against wear, seizure & heat (also in contaminated lubrication).

## PRODUCT FEATURES

- › Special material
- › Innovative heat treatment technology
- › Outperforming standard bearing steel
- › TF, NTF, HTF STF, WTF – material to cater to all your environments
- › TF series materials can be applied to a wide range of bearings:
  - Cylindrical & Taper Roller Bearings
  - Spherical Roller Bearings
  - Deep Groove Ball Bearings
  - Angular Contact Ball Bearings

## BENEFITS

- › Up to 10 times service life with contaminated lubrication
- › Up to twice the service life under clean lubrication
- › Up to 4 times the service life at 160°C
- › Less than one-third the rate of wear
- › 40% improvement in seizure resistance

## INDUSTRIES



Cement



Material Handling



Power Generation



Power Transmission



Quarrying, Mining and Construction



Wind Energy



## NSKHPS Angular Contact Ball Bearings

NSKHPS Angular Contact Ball Bearings for industrial machinery and applications in pumps and compressors. These Bearings are designed for easy handling, long-life, low vibration and quiet running in application. This development supercedes the high performance angular contact ball bearings.

### Product Features

- Optimised internal design
- High load ratings
- Increased limiting speed
- High tech ball guided cages (polymers or machined brass)
- High dimensional (P6) and running (P5) accuracy
- Narrow axial clearances or preloads

### Benefits

- Long-life
- Cage material dedicated to application:- Machined brass for API pumps- L-PPS for screw compressors - Polyamide for standard applications
- Reduced heat generation, vibration & noise
- Easy handling & installation due to universal facing
- Possibilities of downsizing

### Condition Description

- High Load
- High Speed
- High Temperature
- Vibration

### Industries

- Cement
- Ceramic
- Fans and Blowers
- Industrial Pumps and Compressors
- Material Handling



72 08 B EA MR SU CNB

#### Description

72	Bearing Series
08	Bore number
B	Contact Angle (B: 40°)
EA	Extra Capacity
MR	Cage
SU	Arrangement (SU: Single Universal)
CNB	Preload (CNB: Standard axial clearance or GA: Light preload)

## Molded-Oil Bearings

Molded-Oil Bearings are lubricated with NSK's original oil-impregnated material, Molded-Oil, and are suitable for corrosive and dust-contaminated environments.

### Product Features

- Molded-Oil
- Stainless steel for corrosive environments

### Benefits

- Grease-free property with no oil refilling keeps operating environments clean
- Operating life more than twice as long as grease lubrication, in water or dust-contaminated environments
- Contact-seal type available in standard inventory for ball bearings
- Achieves extended maintenance-free performance as Molded-Oil provides a continuous supply of lubricant. Available for high speed applications
- Available in ball bearing, spherical roller bearing and tapered roller bearings types

### Condition Description

- Contamination
- Corrosive Environment
- Lubrication

### Industries

- Agriculture
- Chemical and Pharmaceutical
- Food and Beverage
- Material Handling
- Oil and Gas



6001 | L11 | -H20 | ZZ (DDU)

#### Description

6001	Basic Bearing Number
L11	Molded-Oil
-H20	Material
ZZ (DDU)	Shield (Seal)

# Long-life Vibrating Screen Spherical Roller Bearings

NSK's Long-Life Vibrating Screen Series of Spherical Roller Bearings are engineered specifically to withstand the harsh working environments and frequent vibration of the mining, quarrying and construction industries. (Supersedes the CA series VS bearings).

## Product Features

- Precision machined tough one piece brass cage, contoured roller pockets
- Improved surface roughness on rollers & inner & outer ring
- Special heat treatment rollers, prevent cracks from vibrations & shock loads
- Self aligning ability with floating guide ring
- Controlled roller skew
- Internal radial clearance set at 2/3 ISO standard bearings
- Outer dimensions set at 1/2 of ISO standard bearings
- 40mm - 200mm bore diameter

## Benefits

- Twice the service life of conventional bearings
- Reduced maintenance costs
- High dynamic & static load ratings - load rating increased by 1.25 times
- Dampened vibration & highly resistant to heavy or shock loads
- High speed performance & low operating temperature rise
- Better roller guidance & smooth running - reduced bearing damage from slippage, surface fatigue, flaking

## Condition Description

- High Load
- Misalignment
- Vibration

## Industries

- Material Handling
- Oil and Gas
- Paper
- Quarrying, Mining and Construction
- Utilities



223	20	CAM	E4	-VS3(4)
-----	----	-----	----	---------

### Description

223	Bearing type and series
20	Bearing Bore
CAM	Cage
E4	Outer Ring with Groove & Oil Holes
-VS3(4)	Vibrating Screens + Special dimensional Tolerance + Radial Internal Clearance

## Integrated bearing assemblies

Integrated bearing assemblies for vibratory screen manufacturers. These bespoke assemblies with high strength housings and vibratory specific bearings reduce the need for in-house design and sub-assembly. The ease of assembly & installation benefits help reduce costs for screen manufacturers.

### Product Features

- Bespoke housings
- High strength SG iron housing
- Vibratory specification bearings - CAM-VS
- Labyrinth & contact seals
- Pre-greased & ready to fit with bearing location features

### Benefits

- Integrated assembly reduces manufacturers need to re-work designs in-house
- Vibration & noise level reduced by 50-60%
- Increased fatigue strength against vibration & shock loads, wear & corrosion.
- Installation ease & benefits reduce manufacturers in-house costs
- Can be re-greased

### Condition Description

- Corrosive Environment
- High Load
- Low Noise
- Lubrication
- Vibration

### Industries

- Quarrying, Mining and Construction



SX 162

#### Description

SX Special Assembly

162 Drawing Number







# Product Catalogues

Angular Contact Ball  
Bearings

Molded-Oil Bearings



## NSKHPS HIGH PERFORMANCE STANDARD

ANGULAR CONTACT BALL BEARINGS - HIGH CAPACITY



[www.nsk-literature.com/en/nskhps-acbb/](http://www.nsk-literature.com/en/nskhps-acbb/)

## SETTING THE FUTURE IN MOTION

We are among the leading manufacturers for rolling bearings, linear technology components and steering systems worldwide. We can be found on almost every continent – with production facilities, sales offices and technology centres – because our customers appreciate short decision-making channels, prompt deliveries and local service.



### The NSK company

NSK commenced operations as the first Japanese manufacturer of rolling bearings back in 1916. Ever since, we have been continuously expanding and improving not only our product portfolio but also our range of services for various industrial sectors. In this context our worldwide research and production facilities are linked together in a global network. Here we concentrate not only on the

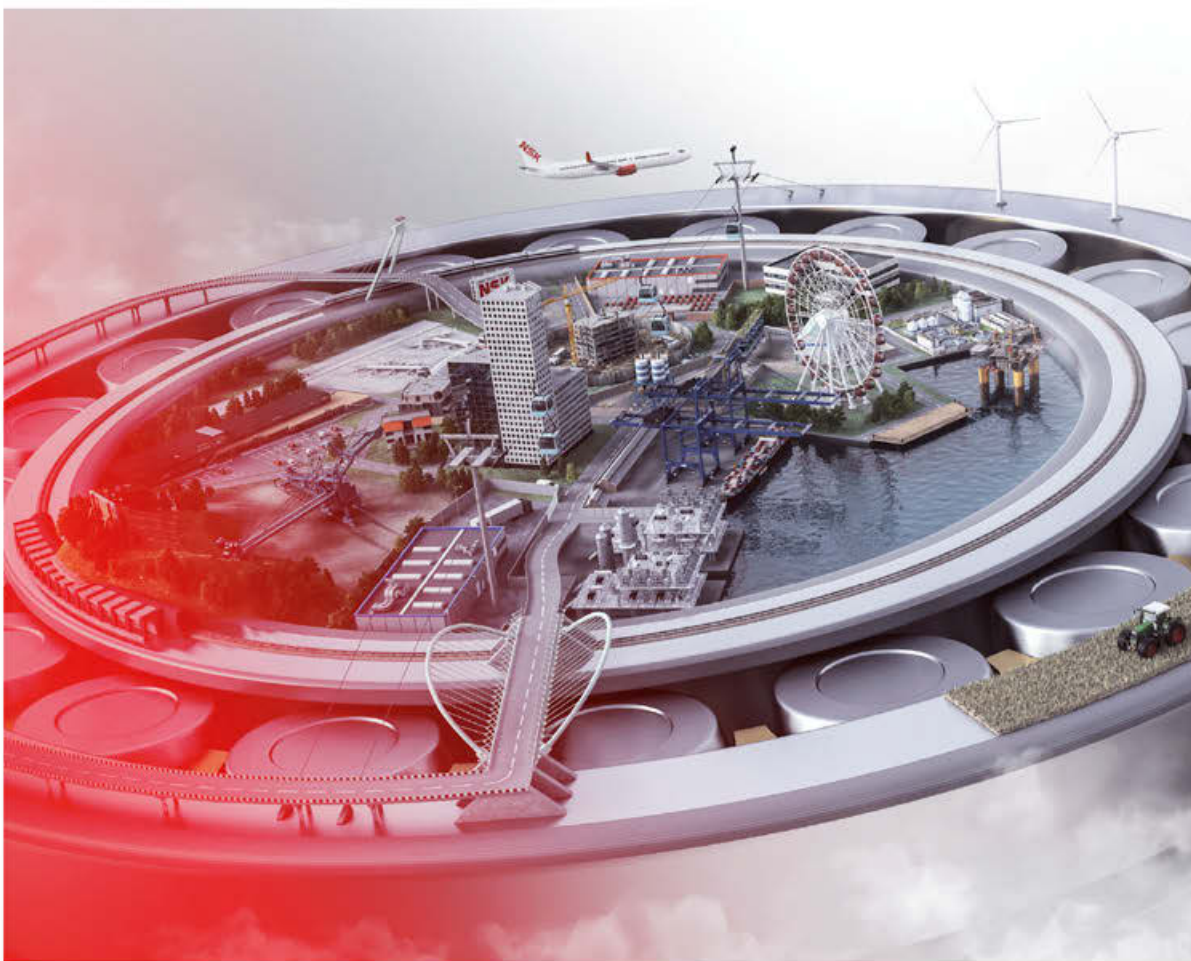
development of new technologies, but also on the continuous optimisation of quality – at every process stage. Among other things, our research activities include product design, simulation applications using a variety of analytical systems and the development of different steels and lubricants for rolling bearings.

Trademarks: All NSK product and service names listed in this catalogue are trademarks or registered trademarks of NSK Ltd.

## OUR MOST IMPORTANT PRODUCT: OUR CUSTOMERS' SATISFACTION

One thing keeps us moving: we want to help you increase the reliability of your vehicles and equipment, not only with excellent products, but above all with excellent service. Our experienced engineers have a deep understanding of systems – together with you, they work to optimise products and processes and develop solutions for the future. The goal that we are dedicated to every day is ensuring that you remain competitive over the long run.

More about NSK on [www.nskeurope.com](http://www.nskeurope.com)





## ANGULAR CONTACT BALL BEARINGS - HIGH CAPACITY

### NSK Ball Bearings

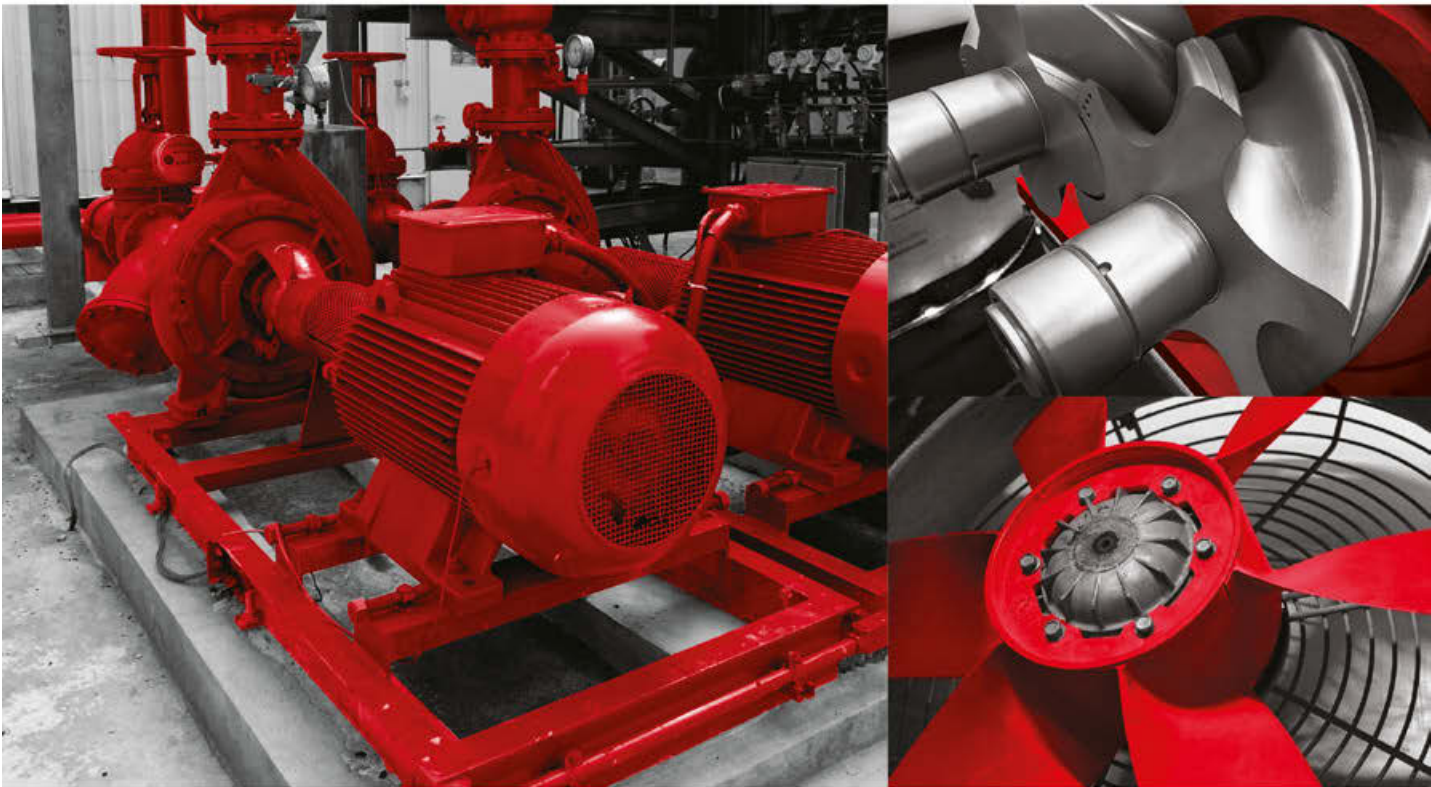
NSK high capacity angular contact ball bearings are designed to operate under high loads, at high speeds, with accuracy, in mission-critical machinery and equipment.

In API pumps for petroleum and chemical industries. ANSI pumps in pulp and paper production. In screw compressors, fans and blowers supplying air, gas and refrigerant to production processes in a wide range of industries.

Unexpected component failure in this machinery can bring production to a standstill. At a significant cost.

Reliability is paramount.

With a lineup that is designed to accommodate diverse operating stresses and increasing demands on bearing performance, NSK high capacity angular contact ball bearings optimize machine performance, deliver predictable reliability and promote total cost-efficiency.





### Performance you can count on

With our NSKHPS series high capacity angular contact ball bearings, NSK delivers a high performance standard engineered to exceed the demands of their industrial applications. Through proprietary materials, optimized design and applied precision manufacturing technologies, our NSKHPS series contributes to highly efficient machine and equipment performance with:

- Increased load capacity derived from optimized internal design
- Bearing fatigue life increased as much as 90%
- Higher limiting speeds, increased by 15-20%
- Highly accurate axial positioning achieved with high precision tolerances and standard universal arrangement
- Reduced heat generation, vibration and noise

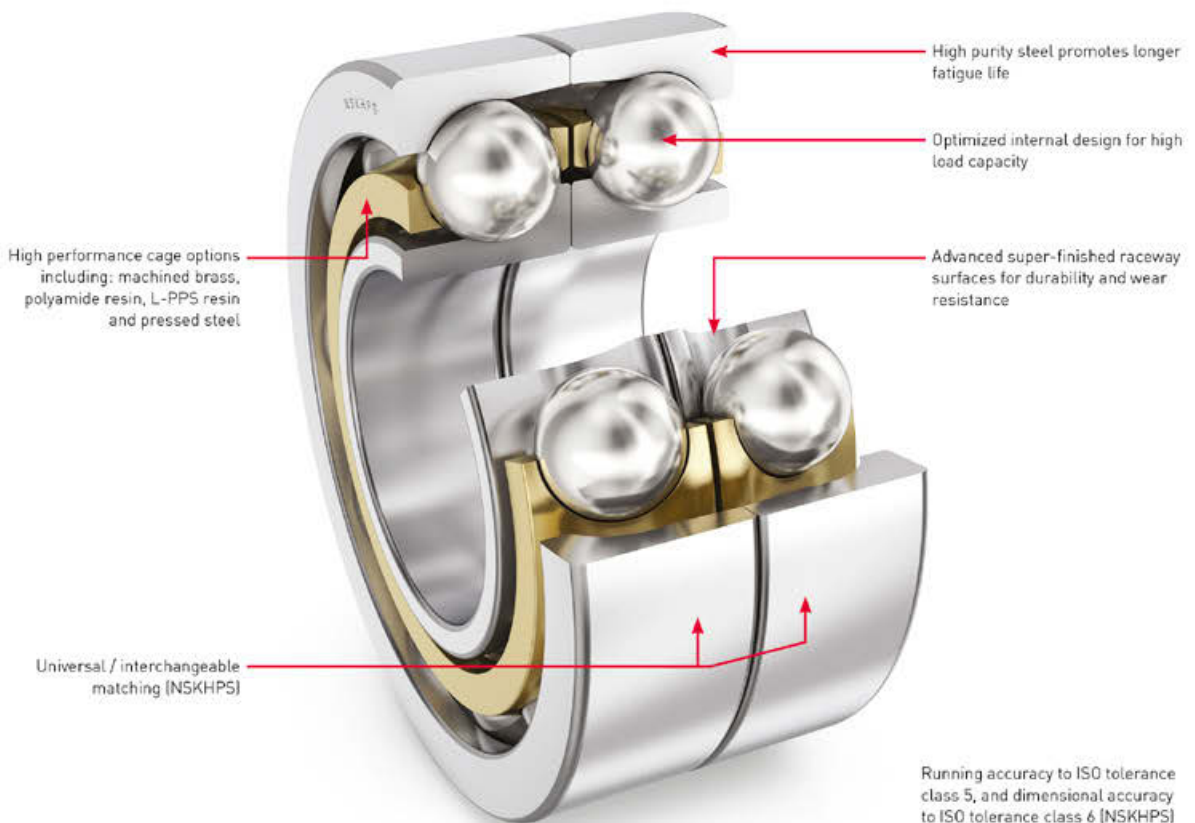
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## DESIGN FEATURES AND OPERATING ADVANTAGES

NSK High Capacity Angular Contact Ball Bearings have an optimized internal design that delivers significantly higher load carrying capabilities. Under conventional application conditions this translates into longer operating life with reduced maintenance intervals, but also facilitates downsizing the design envelope for certain applications.



### Design features

- Optimized internal design delivers high capacity and high speed performance
- Cage material options suited to a wide variety of applications
- Available in dimensional series 72 and 73 for bore diameters from 12 to 120 mm
- NSKHPS series available from 12 to 80 mm
- Running accuracy to ISO tolerance class 5, and dimensional accuracy to ISO tolerance class 6 (NSKHPS)
- Universal / interchangeable matching, ensuring highly accurate positioning (NSKHPS)
- Narrow axial clearance / preload range (NSKHPS)
- With 40° contact angle

# CAGE OPTIONS

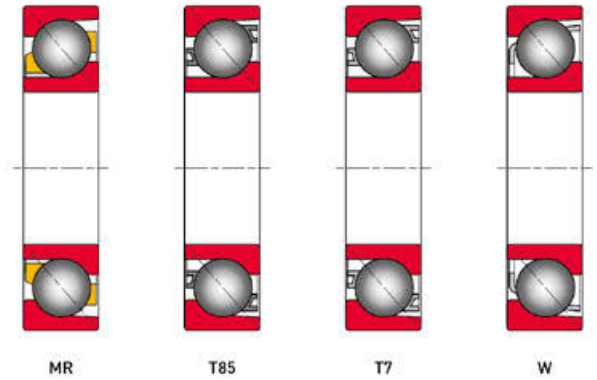
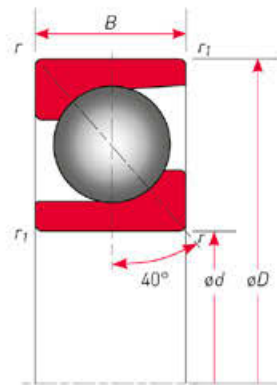
Cage selection can have a significant impact on rolling bearing performance. Operating stresses inherent to the application should be carefully considered. For high capacity angular contact ball bearings, NSK offers cage material options suited to a wide array of applications.

	<p><b>Machined Brass Cage (MR)</b></p> <ul style="list-style-type: none"> <li>- Heavy-duty design, well suited to high loads in chemical, petroleum, pulp and paper applications (API, ANSI)</li> <li>- Optimal internal geometry achieved with ball-guided design promotes improved lubricant flow and reduced heat generation during operation</li> </ul>
	<p><b>Polyamide Resin Cage (T85)</b></p> <ul style="list-style-type: none"> <li>- Well suited to standard duty, high speed applications</li> <li>- For operating temperatures ranging from -40 to 150°C</li> </ul>
	<p><b>L-PPS Resin Cage (T7)</b></p> <ul style="list-style-type: none"> <li>- Ideally developed for screw compressor applications</li> <li>- Exceptional resistance to oil and chemicals</li> <li>- Dimensional stability at temperatures as high as 200°C</li> </ul>
	<p><b>Pressed Steel Cage (W)</b></p> <ul style="list-style-type: none"> <li>- High-strength pressed steel design, suitable for medium to high loads and high speeds</li> </ul>

## Range of availability - cage type

Bearing Type	Cage Type	MR	T85	T7	W
	Series	Machined Brass	Polyamid Resin	L-PPS Resin	Pressed Steel
	72 NSKHPS	7206 to 7216	7201 to 7216	7203 to 7216	-
	72	7217 to 7224	7217 to 7224	7217 to 7224	-
	73 NSKHPS	7304 to 7316	7301 to 7316	7304 to 7316	-
	73	7317 to 7324	7317 to 7324	7317 to 7324	7307 to 7316

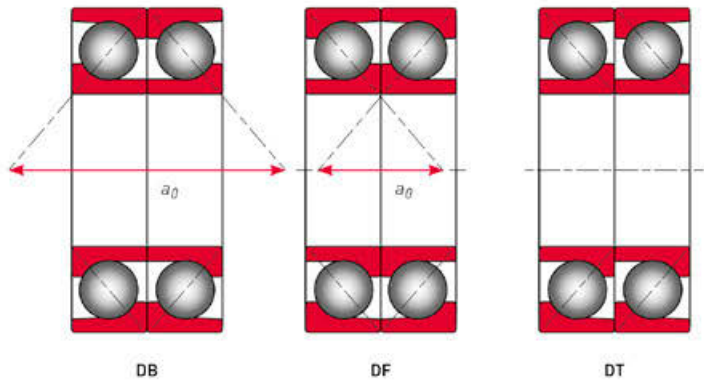
# BEARING DIMENSIONS



Bearing Numbers					Boundary Dimensions					Basic Load Ratings		Limiting Speeds	
Basic Number & Internal Design	Cage				(mm)					(kN)		(rpm)	
	MR	T85	T7	W	d	D	B	r <sub>(min.)</sub>	r <sub>1 (min.)</sub>	Dynamic	Static	Grease	Oil
7201BEA*		*			12	32	10	0.6	0.3	8.2	3.8	20 000	30 000
7301BEA*		*				37	12	1.0	0.6	11.1	5.0	18 000	26 000
7202BEA*		*			15	35	11	0.6	0.3	9.8	4.8	18 000	26 000
7302BEA*		*				42	13	1.0	0.6	14.3	6.9	16 000	22 000
7203BEA*		*	*		17	40	12	0.6	0.3	11.6	6.1	16 000	22 000
7303BEA*		*				47	14	1.0	0.6	16.8	8.3	14 000	20 000
7204BEA*		*	*		20	47	14	1.0	0.6	15.6	8.2	13 000	19 000
7304BEA*	*	*	*			52	15	1.1	0.6	19.8	10.5	13 000	18 000
7205BEA*		*	*		25	52	15	1.0	0.6	17.6	10.2	12 000	17 000
7305BEA*	*	*	*			62	17	1.1	0.6	27.2	14.9	10 000	15 000
7206BEA*	*	*	*		30	62	16	1.0	0.6	23.7	14.3	10 000	14 000
7306BEA*	*	*	*			72	19	1.1	0.6	36.5	20.6	9 000	13 000
7207BEA*	*	*	*		35	72	17	1.1	0.6	32.5	19.6	8 500	12 000
7307BEA*	*	*	*	*		80	21	1.5	1.0	40.5	24.4	8 000	11 000
7307BEAW				*		80	21	1.5	1.0	40.5	24.4	5 600	7 500

\* Denotes NSKHPS high capacity series single-row angular contact ball bearings, universally matched, with running accuracy to ISO tolerance class 5 and dimensional accuracy to ISO tolerance class 6 Bearing types 72/73BEA without asterisk are high capacity single-row angular contact ball bearings, universally matched, with running accuracy P6 and dimensional accuracy P6 Bearing types 73BEAW are high load capacity angular contact ball bearings with steel cage. Special accuracy and matched sets must be specified with order.





Arr.	Radial/axial	Moment load
DB	both directions	suitable
DF	both directions	less suitable
DT	heavy, one direction	less suitable

**Arrangements and moment loads** - suitability to accommodate moment loads is determined by the distance between the effective load centers ( $a_g$ ).

Bearing Numbers					Boundary Dimensions					Basic Load Ratings		Limiting Speeds	
Basic Number & Internal Design	Cage				(mm)					(kN)		(rpm)	
	MR	T85	T7	W	$d$	$D$	$B$	$r_{(min.)}$	$r_{1 (min.)}$	Dynamic	Static	Grease	Oil
7208BEA*	*	*	*		40	80	18	1.1	0.6	38.5	24.5	7 500	11 000
7308BEA*	*	*	*	*		90	23	1.5	1.0	53.0	33.0	7 100	10 000
7308BEAW				*		90	23	1.5	1.0	53.0	33.0	5 000	6 700
7209BEA*	*	*	*		45	85	19	1.1	0.6	40.5	27.1	7 100	10 000
7309BEA*	*	*	*	*		100	25	1.5	1.0	62.5	39.5	6 300	9 000
7309BEAW				*		100	25	1.5	1.0	62.5	39.5	4 500	6 000
7210BEA*	*	*	*		50	90	20	1.1	0.6	42.0	29.7	6 300	9 500
7310BEA*	*	*	*	*		110	27	2.0	1.0	78.0	50.5	5 600	8 000
7310BEAW				*		110	27	2.0	1.0	78.0	50.5	4 000	5 600
7211BEA*	*	*	*		55	100	21	1.5	1.0	51.5	37.0	6 000	8 500
7311BEA*	*	*	*	*		120	29	2.0	1.0	89.0	58.5	5 000	7 500
7311BEAW				*		120	29	2.0	1.0	89.0	58.5	3 600	5 000
7212BEA*	*	*	*		60	110	22	1.5	1.0	61.5	45.0	5 300	7 500
7312BEA*	*	*	*	*		130	31	2.1	1.1	102.0	68.5	4 800	6 700
7312BEAW				*		130	31	2.1	1.1	102.0	68.5	3 400	4 500
7213BEA*	*	*	*		65	120	23	1.5	1.0	70.0	53.5	4 800	7 100
7313BEA*	*	*	*	*		140	33	2.1	1.1	114.0	77.0	4 300	6 300
7313BEAW				*		140	33	2.1	1.1	114.0	77.0	3 200	4 300



# BEARING DIMENSIONS

Basic Number & Internal Design	Bearing Numbers				Boundary Dimensions					Basic Load Ratings		Limiting Speeds	
	Cage				(mm)					(kN)		(rpm)	
	MR	T85	T7	W	<i>d</i>	<i>D</i>	<i>B</i>	<i>r</i> <sub>(min.)</sub>	<i>r</i> <sub>1 (min.)</sub>	Dynamic	Static	Grease	Oil
7214BEA*	*	*	*		70	125	24	1.5	1.0	75.5	58.5	4 500	6 700
7314BEA*	*	*	*	*		150	35	2.1	1.1	124.0	87.5	4 000	6 000
7314BEAW				*		150	35	2.1	1.1	124.0	87.5	2 800	4 000
7215BEA*	*	*	*		75	130	25	1.5	1.0	78.5	63.5	4 300	6 300
7315BEA*	*	*	*	*		160	37	2.1	1.1	134.0	98.5	3 800	5 600
7315BEAW				*		160	37	2.1	1.1	134.0	98.5	2 800	3 800
7216BEA*	*	*	*		80	140	26	2.0	1.0	87.5	70.0	4 000	6 000
7316BEA*	*	*	*	*		170	39	2.1	1.1	144.0	110.0	3 600	5 300
7316BEAW				*		170	39	2.1	1.1	144.0	110.0	2 600	3 400

\* Denotes NSKHPS high capacity series single-row angular contact ball bearings, universally matched, with running accuracy to ISO tolerance class 5 and dimensional accuracy to ISO tolerance class 6 Bearing types 72/73BEA without asterisk are high capacity single-row angular contact ball bearings, universally matched, with running accuracy P6 and dimensional accuracy P6 Bearing types 73BEAW are high load capacity angular contact ball bearings with steel cage. Special accuracy and matched sets must be specified with order.

# BEARING NOMENCLATURE

Example: **73 10 B EA MR SU CNB**

73	Dimension Series	72	light duty type
		73	medium duty type
10	Bore Reference Number	multiply x 5 for bore diameter in mm available for bore numbers 01 to 24 (12 mm to 120 mm)	
B	Contact Angle	B	40° contact angle
EA	Internal Design	EA	high capacity design
MR	Cage Type	MR	machined brass
		T85	polyamide resin
		T7	L-PPS resin
		W	pressed steel
SU	Bearing Arrangement <sup>1</sup>	SU	single universal matching
		DB	duplex, back to back arrangement
		DF	face to face arrangement
		DT	tandem arrangement
CNB	Axial Internal Clearance <sup>2</sup>	CNB	standard axial clearance
		GA	light preload
-	Tolerance Class <sup>3</sup>	NSKHPS standard is running accuracy ISO tolerance class P5 and dimensional accuracy ISO tolerance class 6	

<sup>1</sup> Bearing types 72/73BEA with machined brass, polyamid and L-PPS resin cage types are universally matched (SU). For bearing types 73BEAW with pressed steel cages, matched sets (DB, DF, DT) must be specified with order.

<sup>2</sup> Refer to Matched Measured Axial Clearance table below. Bearing types 73BEAW with pressed steel cages have unique axial clearance and preload specifications - contact NSK.

<sup>3</sup> For bearing types BEAW with pressed steel cage, standard ISO tolerance class is P0. If a special accuracy class is required, please contact NSK.

## Matched measured axial clearance

Bore diameter mm		CNB µm		GA µm	
over	including	min	max	min	max
12	18	17	25		
18	30	20	28	-2	6
30	50	24	32		
50	80	29	41	-3	9



+ MOLDED-OIL BEARINGS



[www.nsk-literature.com/en/molded-oil/](http://www.nsk-literature.com/en/molded-oil/)

As one of the world's leading manufacturers of rolling bearings, linear technology components and steering systems, we can be found on almost every continent – with production facilities, sales offices and technology centres – because our customers appreciate short decision-making channels, prompt deliveries and local service.



### The NSK company

NSK commenced operations as the first Japanese manufacturer of rolling bearings back in 1916. Ever since, we have been continuously expanding and improving not only our product portfolio but also our range of services for various industrial sectors. In this context, we develop technologies in the fields of rolling bearings, linear systems, components for the automotive industry and mechatronic systems. Our research and production facilities in Europe, Americas and Asia are linked together in a global technology

network. Here we concentrate not only on the development of new technologies, but also on the continuous optimisation of quality – at every process stage.

Among other things, our research activities include product design, simulation applications using a variety of analytical systems and the development of different steels and lubricants for rolling bearings.



## Partnership based on trust – and trust based on quality

Total Quality by NSK: The synergies of our global network of NSK Technology Centres.  
Just one example of how we meet our requirements for high quality.

NSK is one of the leading companies with a long tradition in patent applications for machine parts. In our worldwide research centres, we not only concentrate on the development of new technologies, but also on the continual improvement

of quality based on the integrated technology platform of tribology, material technology, analysis and mechatronics.  
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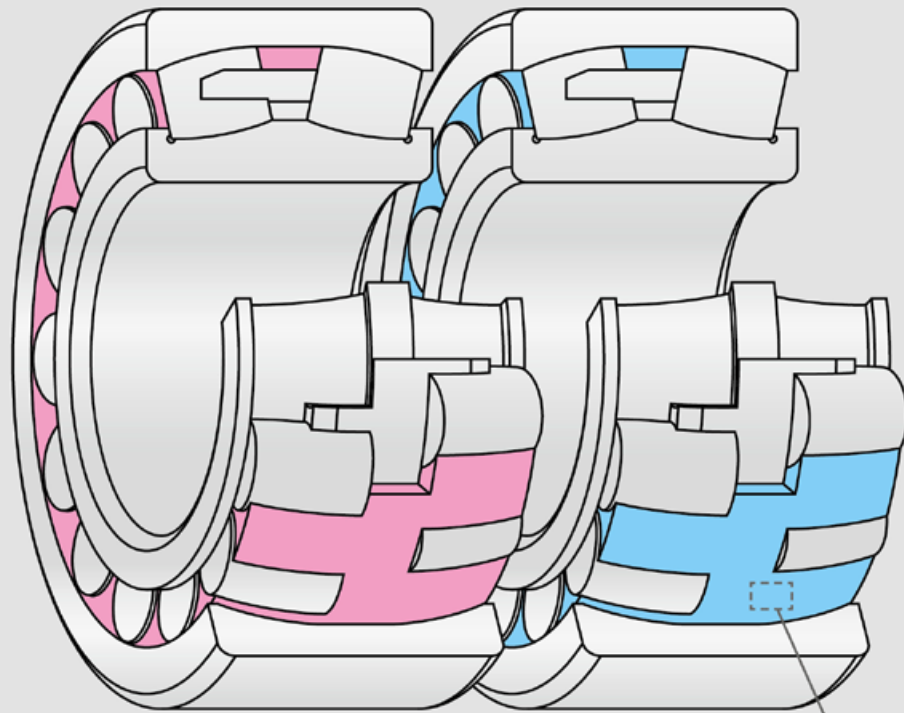


MOLDED-OIL BEARINGS 3



# Molded-Oil Bearings

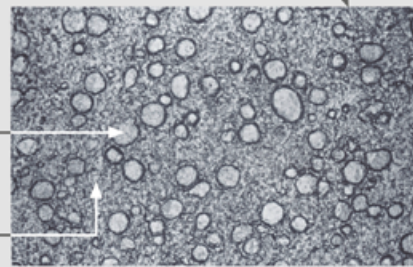
- For general use
- For high-speed operation



Close-up of Molded-Oil

**Portion containing mostly polyolefin**  
Polyolefin is used for packaging food in supermarkets, replacing dioxin-generating vinyl chloride.

**Portion containing mostly lubricating oil**  
The lubricating oil is mineral oil-based.



100 μm



Molded-Oil Bearings are lubricated with NSK's own oil-impregnated material – Molded-Oil – which consists of lubricating oil and polyolefin resin that has an affinity for oil. Lubricant slowly seeping from this material provides ample lubrication to the bearing for extended periods.

#### Features of Molded-Oil Bearings

##### › Excellent performance in water- and dust-contaminated environments

The bearings are designed to prevent liquids such as water (which can wash the lubricating oil out) and dust from getting inside the bearings. Sealed types can be used in environments exposed to water and dust.\*

##### › Environmentally friendly

Because they can be lubricated with minute quantities of oil that exudes from Molded-Oil, the bearings are able to minimise oil leakage.

##### › Low torque

Packing with Molded-Oil after providing the bearing surface with special treatment realises smooth rotation of rolling elements.

##### › Optimal composition and molding methods enable high-speed operation of Molded-Oil Bearings

Optimisation of composition and molding method of Molded-Oil improves strength and enables high-speed operation of Molded-Oil Bearings.

#### Applications

- › Steel mill equipment
- › Paper mill equipment
- › Liquid crystal display and semiconductor manufacturing equipment
- › Agricultural machines
- › Food processing equipment
- › Cleaning equipment and lines
- › Conveying equipment

\* Water and dust dramatically accelerate bearing damage. In order to realise stable operation, we recommend using seals to prevent water and dust from getting in the bearing.

## Molded-Oil Bearings



**Spherical roller bearing**  
**22311L12CAM**

- › For high-speed operation



**Deep groove ball bearings\***  
**6206L12DDU**

- › For high-speed operation



**Spherical roller bearing**  
**22311L11CAM**

- › For general use



**Deep groove ball bearings\***  
**6206L11DDU**

› For general use



**Deep groove ball bearings\***  
**6000L11-H-20DD**

› For general use



**Tapered roller bearing**  
**HR32013XJL11**

› For general use

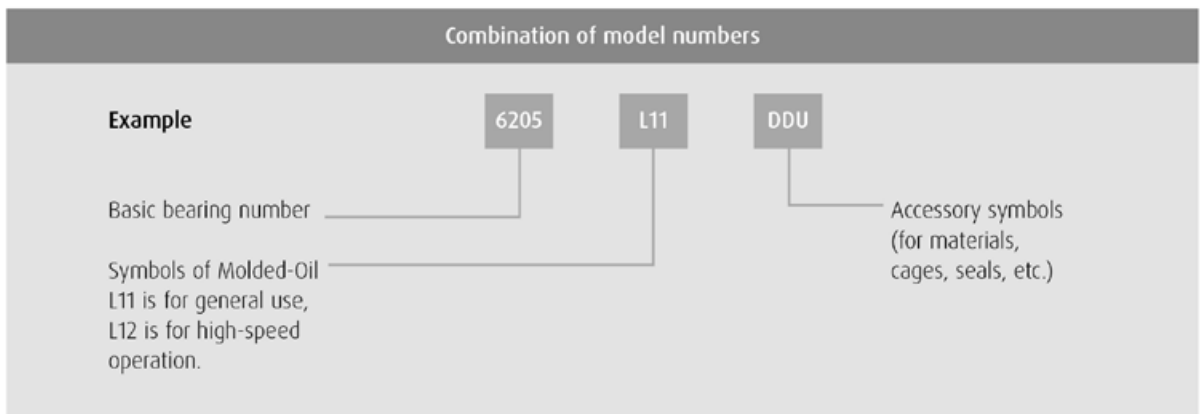
\* The bearings come with seals on both sides.

# Bearing Model Numbers

## Handling Precautions

To maintain the excellent long-term lubricating capacity of Molded-Oil Bearings, the following precautions should be observed:

- › Molded-Oil melts at about 120°C, therefore the bearings must not be heated over 100°C by using an induction heater. Additionally, the bearings should not be heated by the oil bath method.
- › The bearings should not be used under conditions involving liquid degreasing agents such as organic solvents that can affect Molded-Oil. The bearings also should not be used under conditions involving corrosive liquids or gases that can damage the parts of the bearing.



## Samples of model numbers

Bearing types	Molded-Oil types	Model numbers	Remarks
Spherical roller bearings	For general use	22311LT1CAM	Machined brass cage
	For high-speed operation	22311LT1EA	Pressed steel cage
Deep groove ball bearings	For general use	6205L1DDU	-
	For high-speed operation	6001L11-H-20DDU	Stainless-steel bearing
	For general use	6205L1ZDDU	-
Tapered roller bearings	For general use	HR32024X(L11)	-

# Spherical roller bearings



Bearing numbers	Boundary dimensions (mm)				Basic load ratings (N)		Molded-Oil Type*
	Bore diameter	Outside diameter	Width (min.)	Chamfer dimension (min.)	C <sub>r</sub>	C <sub>0r</sub>	
21307L12CAM	35	80	21	1.5	71,000	76,000	●
21308L11ACAM	40	90	23	1.5	82,000	93,000	●
22308L11CAM	40	90	33	1.5	122,000	129,000	●
22209L11CAM	45	85	23	1.1	78,000	88,000	●
22309L12CAM	45	100	36	1.5	148,000	167,000	●
22210L11CAM	50	90	23	1.1	82,000	93,000	●
22311L12CAM	55	120	43	2.0	209,000	241,000	●
22212L12CAM	60	110	28	1.5	127,000	154,000	●
22213L11CAM	65	120	31	1.5	152,000	190,000	●
22313L11CAM	65	140	48	2.1	265,000	315,000	●
22313L12CAM	65	140	48	2.1	265,000	315,000	●
22214L11CAM	70	125	31	1.5	163,000	205,000	●
22315L12CAM	75	160	55	2.1	340,000	415,000	●
22216L11CAM	80	140	33	2.0	181,000	232,000	●
22217L12CAM	85	150	36	2.0	215,000	276,000	●
22218L12CAM	90	160	40	2.0	256,000	340,000	●
22219L12CAM	95	170	43	2.1	296,000	395,000	●
23120L11CAM	100	165	52	2.0	345,000	530,000	●
22320L11CAM	100	215	73	3.0	600,000	785,000	●
22222L12CAM	110	200	53	2.1	425,000	585,000	●
23024L11CAM	120	180	46	2.0	315,000	525,000	●
23124L12CAM	120	200	62	2.0	465,000	720,000	●
22226L11CAM	130	230	64	3.0	565,000	815,000	●
23932L11CAM	160	220	45	2.0	360,000	675,000	●

\* ● = For general use, ● = For high-speed operation



# Deep groove ball bearings

## Bearing Steel



Bearing numbers	Shielded type		Boundary dimensions (mm)				Basic load ratings (N)		Molded-Oil Type*
	Shielded type	Sealed type	Bore diameter	Outside diameter	Width (min.)	Chamfer dimension (min.)	C <sub>r</sub>	C <sub>0r</sub>	
6900L11	ZZ1	DD1	10	22	6	0.3	2,700	1,270	●
6000L11	ZZ	DD	10	26	8	0.3	4,550	1,970	●
6200L11	ZZ	DDU	10	30	9	0.6	5,300	2,390	●
6901L11	ZZ2	DD1	12	24	6	0.3	2,890	1,460	●
6001L11	ZZ	DDU	12	28	8	0.3	5,300	2,370	●
6201L11	ZZ	DDU	12	32	10	0.6	6,800	3,050	●
6902L11	ZZ1	DD1	15	28	7	0.3	4,350	2,260	●
6002L11	ZZ	DDU	15	32	9	0.3	5,600	2,830	●
6202L11	ZZ	DDU	15	35	11	0.6	7,650	3,750	●
6903L11	ZZ	DDU	17	30	7	0.3	4,600	2,550	●
6003L11	ZZ	DDU	17	35	10	0.3	6,000	3,250	●
6203L11	ZZ	DDU	17	40	12	0.6	9,550	4,800	●
6904L11	ZZ	DDU	20	37	9	0.3	6,400	3,700	●
6004L11	ZZ	DDU	20	42	12	0.6	9,400	5,000	●
6204L11	ZZ	DDU	20	47	14	1.0	12,800	6,600	●
6905L11	ZZ	DDU	25	42	9	0.3	7,050	4,550	●
6005L11	ZZ	DDU	25	47	12	0.6	10,100	5,850	●
6205L11	ZZ	DDU	25	52	15	1.0	14,000	7,850	●
6906L11	ZZ	DDU	30	47	9	0.3	7,250	5,000	●
6006L11	ZZ	DDU	30	55	13	1.0	13,200	8,300	●
6206L11	ZZ	DDU	30	62	16	1.0	19,500	11,300	●
6907L11	ZZ	DDU	35	55	10	0.6	10,600	7,250	●
6007L11	ZZ	DDU	35	62	14	1.0	16,000	10,300	●
6207L11	ZZ	DDU	35	72	17	1.1	25,700	15,300	●
6908L11	ZZ	DDU	40	62	12	0.6	13,700	10,000	●
6008L11	ZZ	DDU	40	68	15	1.0	16,800	11,500	●
6208L11	ZZ	DDU	40	80	18	1.1	29,100	17,900	●
6909L11	ZZ	DDU	45	68	12	0.6	14,100	10,900	●
6009L11	ZZ	DDU	45	75	16	1.0	20,900	15,200	●
6209L11	ZZ	DDU	45	85	19	1.1	31,500	20,400	●
6010L11	ZZ	DDU	50	80	16	1.0	21,800	16,600	●
6210L11	ZZ	DDU	50	90	20	1.1	35,000	23,200	●

\* ● = For general use, ● = For high-speed operation

**Note:** Bearing numbers other than those given in the table can also be produced. Not applicable to deep groove ball bearing with plastic cages.

# Deep groove ball bearings

Stainless Steel



Bearing numbers			Boundary dimensions (mm)				Basic load ratings (N)		Molded-Oil Type*
Shielded type	Sealed type	Bore diameter	Outside diameter	Width (min.)	Chamfer dimension (min.)	C <sub>r</sub>	C <sub>0r</sub>		
6909L11-H-20	ZZ1	DD1	10	22	6	0.3	2,290	1,020	●
6009L11-H-20	ZZ	DD	10	26	8	0.3	3,900	1,580	●
6209L11-H-20	ZZ	DDU	10	30	9	0.6	4,350	1,910	●
6901L11-H-20	ZZ2	DD1	12	24	6	0.3	2,460	1,170	●
6001L11-H-20	ZZ	DDU	12	28	8	0.3	4,350	1,890	●
6201L11-H-20	ZZ	DDU	12	32	10	0.6	5,800	2,440	●
6902L11-H-20	ZZ1	DD1	15	28	7	0.3	3,700	1,810	●
6002L11-H-20	ZZ	DDU	15	32	9	0.3	4,750	2,270	●
6202L11-H-20	ZZ	DDU	15	35	11	0.6	6,500	2,980	●
6903L11-H-20	ZZ	DDU	17	30	7	0.3	3,900	2,040	●
6003L11-H-20	ZZ	DDU	17	35	10	0.3	5,100	2,600	●
6203L11-H-20	ZZ	DDU	17	40	12	0.6	8,150	3,850	●
6904L11-H-20	ZZ	DDU	20	37	9	0.3	5,400	2,940	●
6004L11-H-20	ZZ	DDU	20	42	12	0.6	7,950	4,000	●
6204L11-H-20	ZZ	DDU	20	47	14	1.0	10,900	5,250	●
6905L11-H-20	ZZ	DDU	25	42	9	0.3	5,950	3,600	●
6005L11-H-20	ZZ	DDU	25	47	12	0.6	8,550	4,650	●
6205L11-H-20	ZZ	DDU	25	52	15	1.0	11,900	6,300	●
6906L11-H-20	ZZ	DDU	30	47	9	0.3	6,150	4,000	●
6006L11-H-20	ZZ	DDU	30	55	13	1.0	11,300	6,600	●
6206L11-H-20	ZZ	DDU	30	62	16	1.0	16,500	9,050	●
6907L11-H-20	ZZ	DDU	35	55	10	0.6	9,000	5,800	●
6007L11-H-20	ZZ	DDU	35	62	14	1.0	13,600	8,200	●
6207L11-H-20	ZZ	DDU	35	72	17	1.1	21,800	12,200	●
6908L11-H-20	ZZ	DDU	40	62	12	0.6	11,600	8,000	●
6008L11-H-20	ZZ	DDU	40	68	15	1.0	14,200	9,250	●
6208L11-H-20	ZZ	DDU	40	80	18	1.1	24,800	14,300	●
6909L11-H-20	ZZ	DDU	45	68	12	0.6	12,000	8,700	●
6009L11-H-20	ZZ	DDU	45	75	16	1.0	17,800	12,200	●
6209L11-H-20	ZZ	DDU	45	85	19	1.1	26,600	16,300	●
6910L11-H-20	ZZ	DDU	50	72	12	0.6	12,400	9,400	●
6010L11-H-20	ZZ	DDU	50	80	16	1.0	18,500	13,300	●
6210L11-H-20	ZZ	DDU	50	90	20	1.1	29,800	18,600	●

\* ● = For general use, ● = For high-speed operation

Note: Bearing numbers other than those given in the table can also be produced. Not applicable to deep groove ball bearing with plastic cages.

# Bearing Types and Availability

Available Molded-Oil Bearing type, cage type, limiting speed, and size (outside diameter, mm)

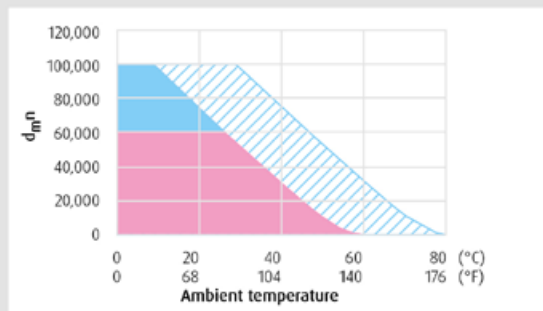
Bearing types	Molded-Oil types	Cage types	Limiting speeds ( $d_m n$ )	Sizes (outside diameter, mm)
Spherical roller bearings	● For general use (L11)	Machined brass (CA)	< 60,000	70 ≤ AD ≤ 250
		Pressed steel (EA)	< 30,000	70 ≤ AD ≤ 215
	● For high-speed operation (L12)	Machined brass (CA)	60,000 – 100,000	70 ≤ AD ≤ 215
Deep groove ball bearings	● For general use (L11)	Pressed steel	< 150,000	19 ≤ AD ≤ 250
	● For high-speed operation (L12)	Pressed steel	150,000 – 200,000	19 ≤ AD ≤ 215
Tapered roller bearings	● For general use (L11)	Pressed steel	< 40,000	80 ≤ AD ≤ 215

- ›  $d_m n = [(Bearing\ bore\ diameter, mm + Bearing\ outside\ diameter, mm) \div 2] \times inner\ ring\ rotational\ speed, min^{-1}$
- › Some large spherical roller bearing numbers may not be available
- › Conditions including abutment and fillet dimensions must be taken into consideration for tapered roller bearings
- › For tapered roller bearings and spherical roller bearings with pressed steel cages (EA), Molded-Oil Bearings for high-speed operation (L12) are not available
- › For the application under the condition of low speed and low temperature, Molded-Oil Bearings for general use (L11) are recommended

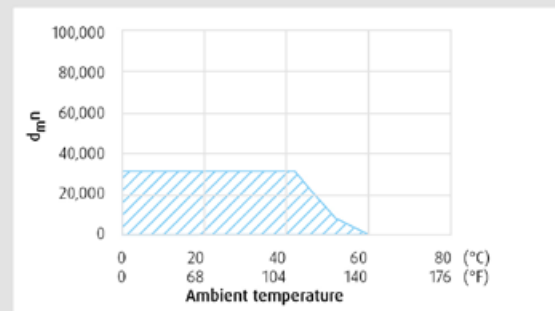
### Ambient temperature and limiting speed ( $d_m n$ )

The relation between limiting speed and ambient temperature is as follows:

#### a. Spherical roller bearings (CA)



#### b. Spherical roller bearings (EA)

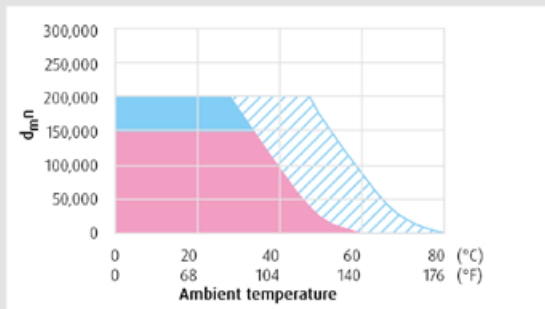


- L11 Applicable range
- L12 Applicable range
- ▨ L12 Intermittent operation applicable range

### Ambient temperature and limiting speed ( $d_{m,n}$ )

The relation between limiting speed and ambient temperature is as follows:

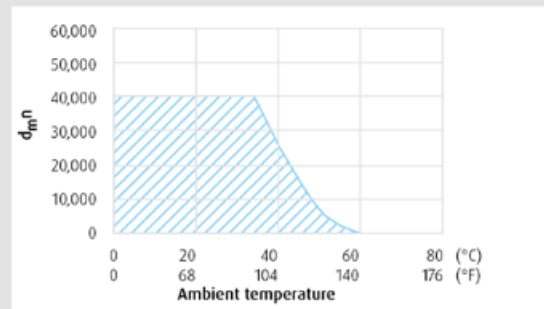
#### c. Deep groove ball bearings



● L11 Applicable range

● L12 Applicable range

#### d. Tapered roller bearings



▨ L12 Intermittent operation applicable range

Limiting speeds ( $d_{m,n}$ ) of "a" to "d" shown above are examples for general housing. If there is a source of heat near the bearings, or the cooling effect by the radiation or the heat transmission, the above limiting speed cannot be expected due to the application.

#### Precautions for Selecting

The following precautions should be considered to maintain the high performance of Molded-Oil Bearings:

- › For low-temperature applications, Molded-Oil Bearings for general use (L11) are recommended.
- › For the condition of high ambient temperature, Molded-Oil Bearings for high-speed operation (L12) are recommended.
- › To rotate the bearings properly, it is necessary to apply the radial load. As a standard of the radial load, more than 1% of the basic dynamic load rating is recommended.

- › Since Molded-Oil Bearings are lubricated by oil seeped from a Molded-Oil, the bearings cannot be used under the condition where the bearings are exposed to water directly for an extended period of time (the oil could be washed away). If the application requires such exposure, consider using extra seals.

# Performance Test

Molded-Oil Bearings feature a number of excellent functions. Extensive test data and field results demonstrate the outstanding performance of Molded-Oil Bearings.

### Durability test under conditions of exposure to water

Grease lubrication allows operation for extended periods of time even if exposed to mist or submerged in water. Continuous operation with grease lubrication: approximately 20 days; with Molded-Oil Bearings: 50 days or more Molded-Oil Bearings can be operated for longer time than the bearings with grease lubrication even if exposed to mist or submerged in water.

Environment where exposed to water - cleaning equipment is assumed		
Test conditions	Test bearings	6000-H-00 (stainless steel with contact seal)
	Rotational speed	1,000 min <sup>-1</sup>
	Radial load	79.4 N
	Axial load	29.4 N
	Water exposure	0.8 cm <sup>3</sup> /min
	Spray pressure	0.2 MPa

Environment of submerged condition - under water vehicle and facilities are assumed		
Test conditions	Test bearings	6000-H-00 (stainless steel with seal)
	Rotational speed	1,000 min <sup>-1</sup>
	Radial load	79.4 N
	Axial load	29.4 N

Fig. 1 Testing device under conditions of exposure to water

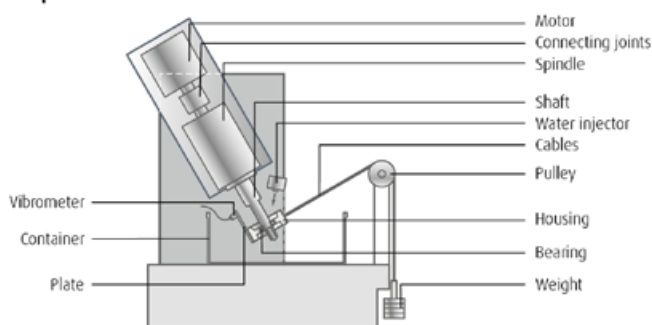


Fig. 2 Durability test results under exposing to water

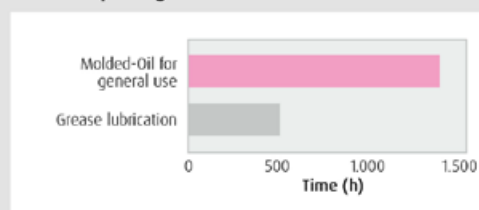
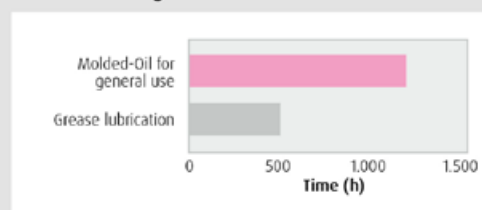


Fig. 3 Durability test results under submerged condition

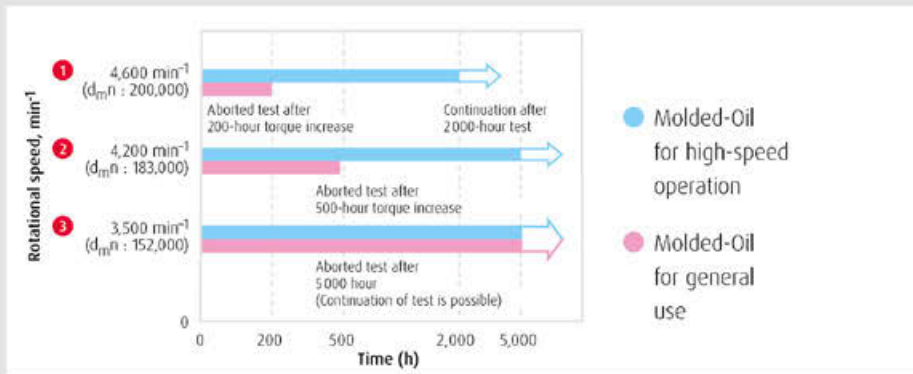


**Durability performance test**

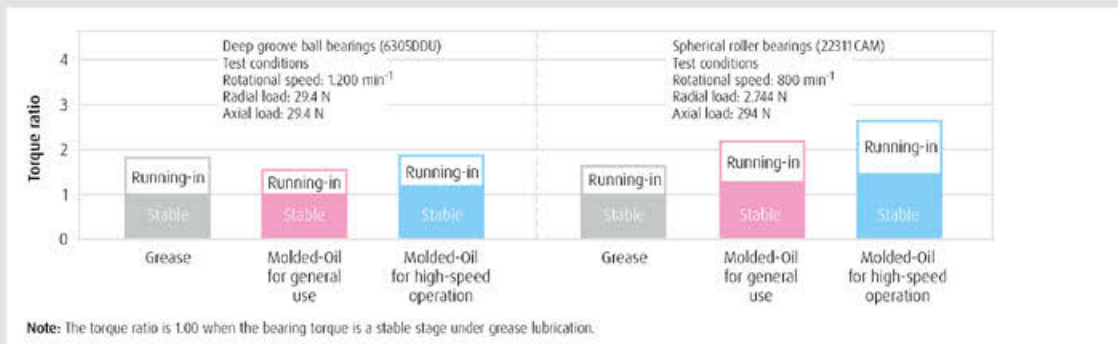
Slow seeping of the lubricant from Molded-Oil provides excellent lubrication performance for extended periods. Molded-Oil Bearings for general use cannot be used under conditions of high-speed rotation, but Molded-Oil Bearings for high-speed operation perform with excellent durability under such conditions.

Durability performance test			
Test conditions	Test bearings	6305DDU	
	Radial load	98 N	
	Axial load	245 N	
	Rotational speed	1	3,500 min <sup>-1</sup> (d <sub>m</sub> n : 152,000)
		2	4,200 min <sup>-1</sup> (d <sub>m</sub> n : 183,000)
3		4,600 min <sup>-1</sup> (d <sub>m</sub> n : 200,000)	

**Fig. 4 Durability test results of deep groove ball bearings**



**Fig. 5 Bearing torque comparison of grease-lubricated and Molded-Oil bearings**



Note: The torque ratio is 1.00 when the bearing torque is a stable stage under grease lubrication.



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