

# SKF Explorer spherical roller bearings

Setting the industry standard – again.





The competition is getting tougher.

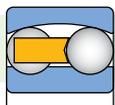
So are SKF spherical roller bearings.

The timeline below illustrates SKF milestones in the development of self-aligning bearings. The legacy, which started with the invention of the self-aligning ball bearing over one hundred years ago, went on to include the invention of spherical roller bearings, spherical roller thrust bearings and CARB toroidal roller bearings.

SKF invents the spherical roller bearing

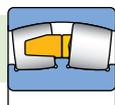
SKF introduces the C design with a guide ring

SKF introduces the CC and CAC designs with self-guiding rollers



1907

SKF invents the self-aligning ball bearing

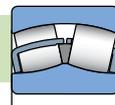


1919

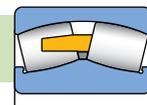


1933

SKF invents the spherical roller thrust bearing

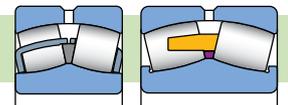


1951



1954

SKF introduces the CA design



1979



To stay ahead of the competition, industrial companies are looking everywhere for ways to improve machine reliability, avoid unplanned downtime and reduce operating costs.

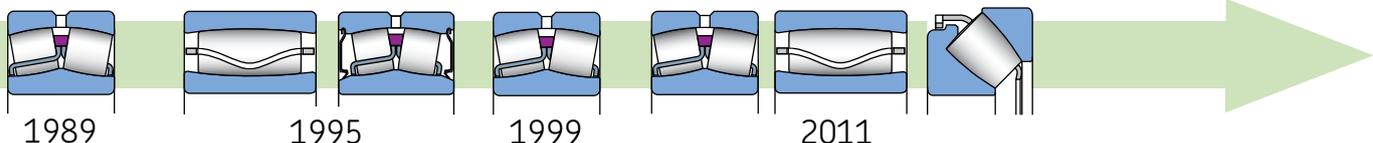
For many, the place to start is the bearing – the heart of the machine. Because when bearings fail, the costs related to downtime and repairs can be significant, even offsetting all the other cost-saving measures that have been taken. That is why it is so important to specify robust bearings for real-life applications.

But what if a bearing was so good that it could last twice as long as the one it replaces? So good that it could reduce energy costs, cut lubricant use, and even allow you to run your machinery faster and cooler? The benefits to your operation – and to your bottom line – would far outweigh the cost of these bearings.

The good news is that there is such a bearing – the upgraded SKF Explorer spherical roller bearing, a product of more than 100 years of SKF knowledge engineering.



SKF introduces the CARB toroidal roller bearing and a standard range of sealed spherical roller bearings

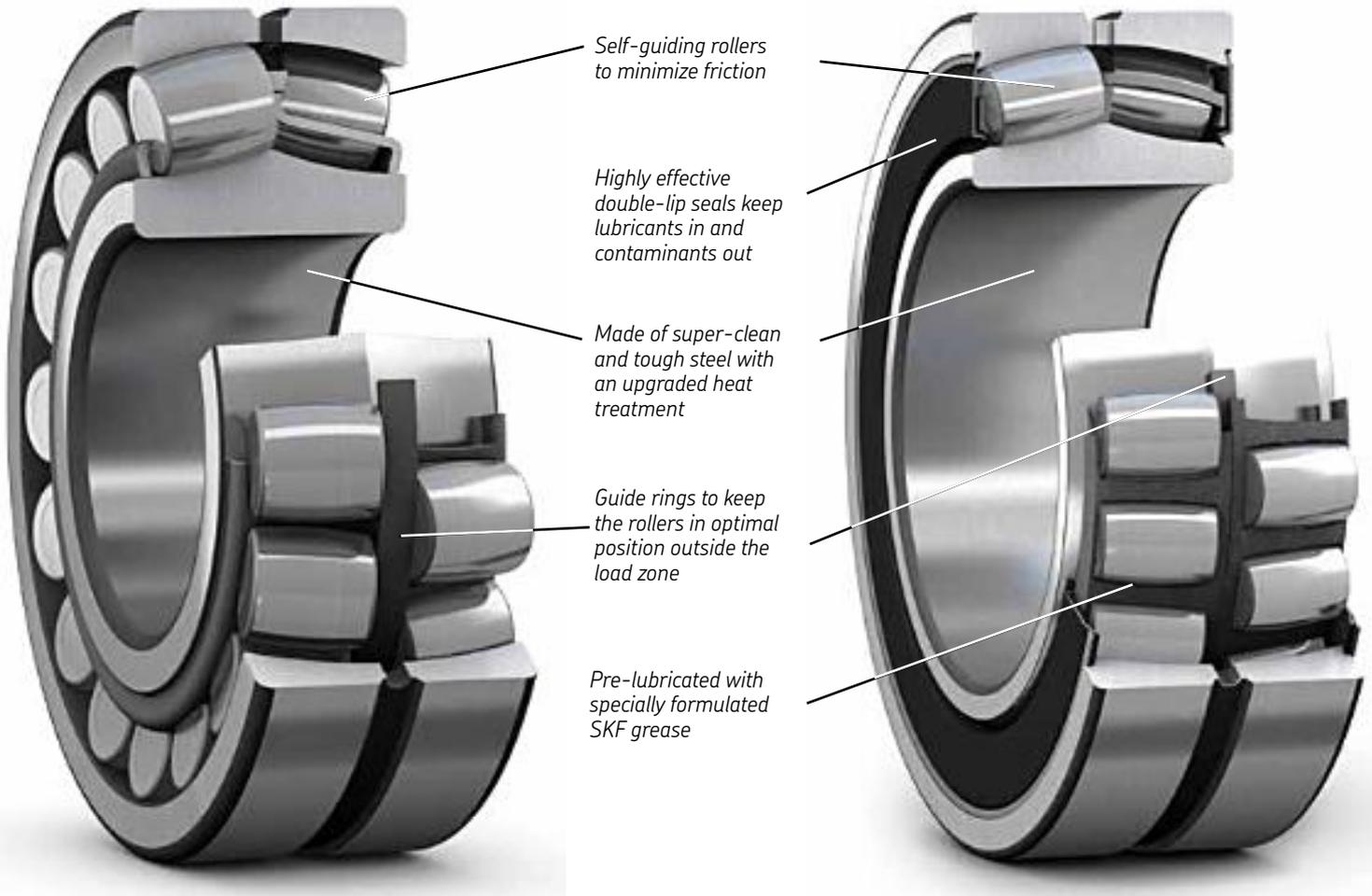


SKF introduces the E design, with increased load carrying capacity

SKF introduces SKF Explorer spherical roller bearings

SKF introduces upgraded SKF Explorer bearings featuring a new heat treatment to extend service life

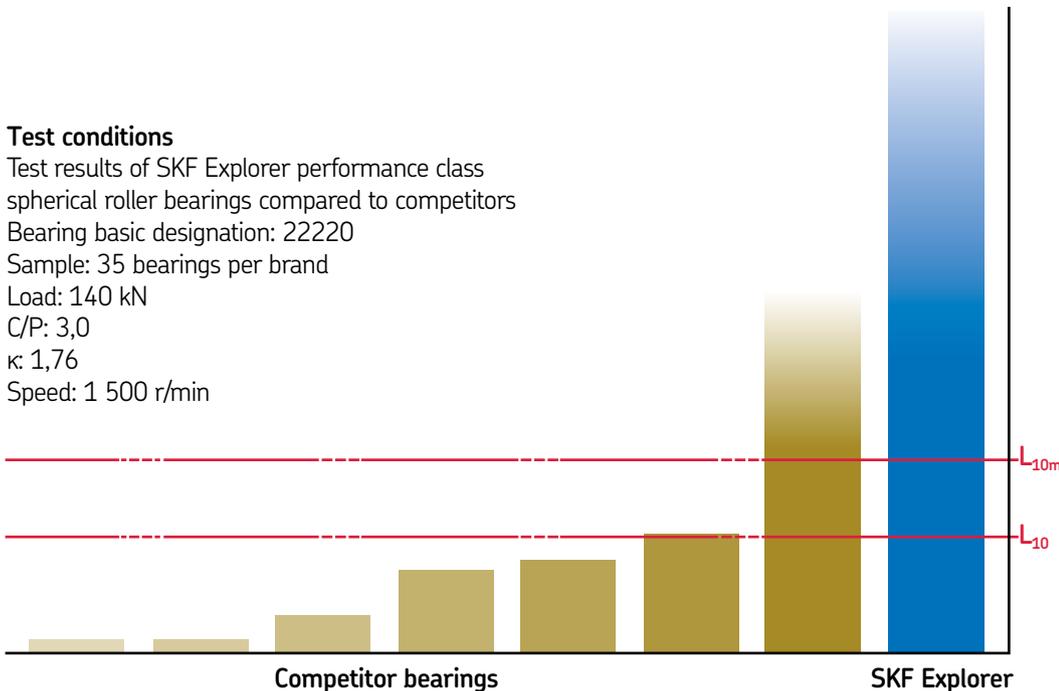
# Excellence in design and performance



### Test conditions

Test results of SKF Explorer performance class spherical roller bearings compared to competitors  
 Bearing basic designation: 22220  
 Sample: 35 bearings per brand  
 Load: 140 kN  
 C/P: 3,0  
 $\kappa$ : 1,76  
 Speed: 1 500 r/min

Bearing life



Bearing life tests conducted at SKF Engineering & Research centre confirm the outstanding performance of SKF Explorer performance class spherical roller bearings when compared to competitor bearings.

## A commitment to innovation and improved bearing performance

From the very start, SKF has taken the lead in the development of self-aligning bearings. We introduced spherical roller bearings in 1919 and have been consistently improving them. Along the way, we also invented the spherical roller thrust bearings and CARB toroidal roller bearings.

In 1999, we introduced the SKF Explorer performance class with improvements in bearing geometry, materials and manufacturing methods. SKF Explorer bearings gave design and maintenance engineers a whole new set of options. Machinery could be downsized with no loss of capacity, or run faster, longer, cooler or quieter.

Today, they are even better.

## Upgraded SKF Explorer spherical roller bearings

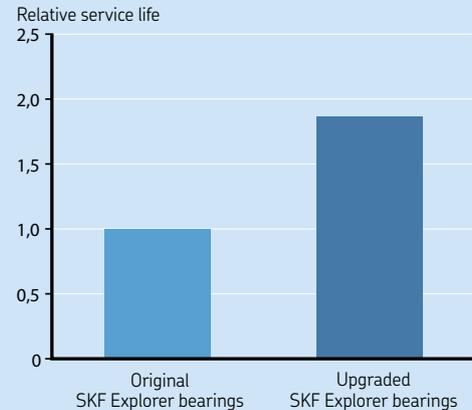
Tests conducted in SKF laboratories show that upgraded SKF Explorer spherical roller bearings can last up to twice as long as previous bearings under contaminated or poor lubrication conditions.

Today, all spherical roller bearings are in the SKF Explorer performance class and have been upgraded, featuring a combination of high-quality steel and an improved heat treat process. Upgraded SKF Explorer spherical roller bearings are marked with “WR” on the package and the bearing outer ring.

### Test conditions

Bearings: 22220 E  
The bearings were run-in under contaminated conditions.  
 $\eta_c = 0,2$

Operating conditions after cleaning  
Load: 140 kN  
C/P: 3,0  
Speed: 1 500 r/min  
Lubricant: Turbo T 68 mineral oil

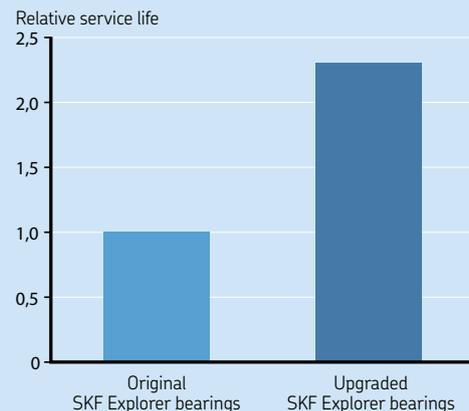


*The SKF Engineering & Research centre performed endurance tests under specific contaminated conditions to verify performance improvements of the upgraded SKF Explorer bearings. These test results show that upgraded SKF Explorer bearings provide up to twice the service life under contaminated operating conditions.*

### Test conditions

Bearings: 22220 E  
Load: 140 kN  
Speed: 1 500 r/min

Lubricant: Turbo T 9 mineral oil  
 $\kappa: 0,45$   
Operating temperature = 75 °C



*Tests were also conducted to verify the service life of upgraded SKF Explorer bearings under poor lubrication conditions. The results show conclusively that upgraded SKF Explorer bearings last twice as long under poor lubrication conditions.*

# Sealed bearings for superior protection against contaminants

Sealed SKF Explorer spherical roller bearings can significantly increase bearing service life in contaminated environments.

These bearings are pre-lubricated with a specially formulated bearing grease and sealed with highly effective contact seals. The seals protect the bearing and lubricant from contaminants that might otherwise cause premature bearing failure.

## Benefits include:

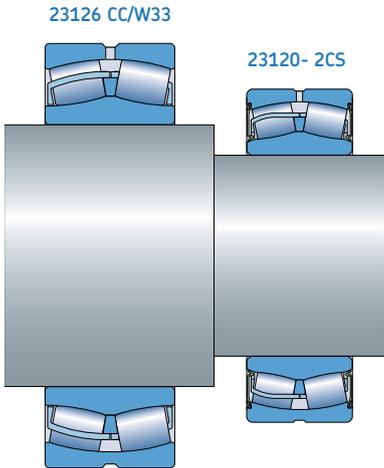
- **Significantly reduced need for maintenance**
- **Minimized grease consumption and environmental impact**
- **Substantially increased uptime**

## Potential for downsizing

When compared to an open bearing, the higher level of cleanliness inside a sealed spherical roller bearing makes it possible to down-size the bearing arrangement without negatively affecting the service life or performance of the application.

In many applications, these bearings can be considered lubricated for the life of the bearing. By eliminating or extending relubrication intervals, these bearings can significantly reduce the cost to purchase, apply and dispose of grease. Reduced maintenance costs can, in many cases, substantially reduce the total cost of ownership of an application.





**Operating conditions:**  
 Load: 90 kN  
 Speed: 500 r/min  
 Typically contaminated environment  
 Lubrication: Standard SKF bearing grease

These two bearings provide the same rating life when used in a typically contaminated environment.

SKF sealed spherical roller bearing range

Bore [mm]	Series									Size
	213	222	223	230	231	232	239	240	241	
25	↔									05
30	↔									06
35	↔									07
40	↔	↔								08
45	↔	↔								09
50	↔	↔								10
55	↔	↔								11
60	↔	↔								12
65	↔	↔								13
70	↔	↔								14
75	↔	↔								15
80	↔	↔								16
85	↔									17
90	↔	↔								18
95	↔									19
100	↔									20
110	↔									22
120	↔									24
130	↔									26
140										28
150										30
160										32
170										34
180										36
190										38
200										40
220										44
240										48
260										52
280										56
300										60
320										64
340										68
360										72
380										76
400										80

= Spherical roller bearings assortment (d<400 mm)  
 = Sealed spherical roller bearings  
↔ = Sealed spherical roller bearings slightly wider than standard bearing

The SKF range of sealed spherical roller bearings is by far the widest among all manufacturers.



# Bearings for specific applications

## SKF spherical roller bearings for vibratory applications

SKF offers spherical roller bearings specifically designed to withstand high acceleration levels. The bearings are equipped with a special, hardened cage and a hardened guide ring, which enable them to withstand higher acceleration forces while operating at cooler temperatures. These bearings have been used with great success in vibratory applications such as vibrating screens and road rollers.

*SKF Explorer bearings for vibratory applications are also available with a PTFE coated bore to virtually eliminate fretting corrosion at the non-locating bearing position. Available sizes: 22308-22348*



## SKF Energy Efficient (E2) spherical roller bearings

With optimized internal geometry, a new cage design and a special low friction grease, spherical roller bearings within this performance class are characterized by a frictional moment in the bearing that is at least 30% lower than a same sized SKF Explorer bearing. The friction reduction results in up to 40% higher reference speeds and extended grease life. In light- to medium-load applications, the bearings can improve machine efficiency and save energy.

*Identified by the prefix E2, SKF E2 bearings are part of the SKF BeyondZero product portfolio, comprised of products that help reduce CO<sub>2</sub> emissions and environmental impact. Available sizes: 22209-22213*



## SKF DryLube bearings

SKF DryLube bearings are designed to operate without any need for relubrication in low speed applications at temperatures up to 250 °C (380 °F). SKF DryLube bearings are filled with a dry lubricant based on graphite. The dry lubricant is injected into the free space of the bearing and cured until it solidifies. A thin film of dry lubricant is maintained on the raceways and rolling elements to avoid metal-to-metal contact.

*Virtually any SKF spherical roller bearing can be supplied as an SKF DryLube bearing.*



## Solid Oil bearings

In most applications, standard greases and oils provide an adequate amount of lubricant to a bearing. However, in cases where accessibility to the bearing for relubrication purposes is impractical or impossible, Solid Oil is an excellent solution.

Solid Oil is an oil-saturated, polymer matrix that fills the entire free space in the bearing, encapsulating and protecting both the rolling elements and cage(s). For severely contaminated environments, sealed spherical roller bearings can be supplied with Solid Oil. Solid Oil bearings may operate in temperatures of up to 85 °C (185 °F) and at low speeds.

*Virtually any SKF spherical roller bearing can be supplied on request as a Solid Oil bearing.*



# The SKF self-aligning bearing system

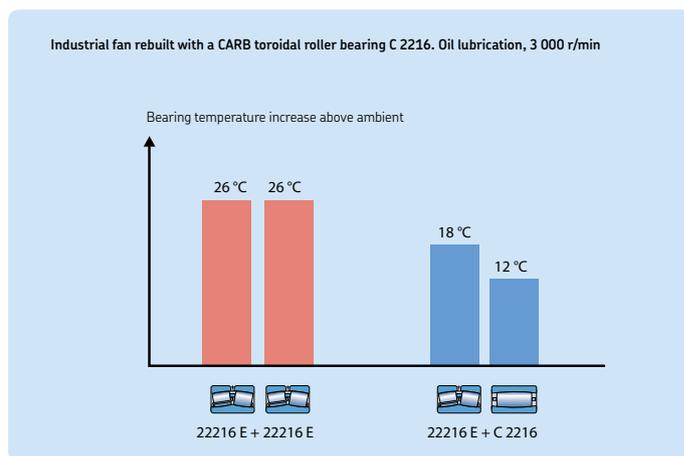
In the past, applications that had to contend with misalignment and thermal elongation of the shaft used a locating/non-locating bearing system with two spherical roller bearings. The non-locating bearing would have a loose outer ring fit, enabling it to slide on its seat in the housing. This arrangement typically caused a stick-slip condition which induced vibrations, additional axial loads on the bearings and heat - all of which can significantly reduce bearing service life.

The SKF self-aligning bearing system, which uses a spherical roller bearing at the locating position and a CARB toroidal roller bearing in the non-locating position, virtually eliminates those problems.

The CARB bearing, invented by SKF, is a revolutionary bearing that is self-aligning like a spherical roller bearing, and axially free like a cylindrical roller or needle roller bearing. This enables the bearing to accommodate thermal elongation and contraction of the shaft or structure caused by temperature variations, without inducing internal axial loads.

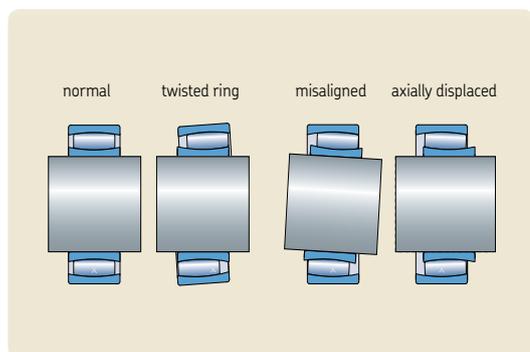
Because both the inner and outer rings of a CARB bearing can be mounted with an interference fit, problems associated with a loose outer ring, such as fretting corrosion, are avoided.

CARB bearings are dimensionally interchangeable with spherical roller bearings.

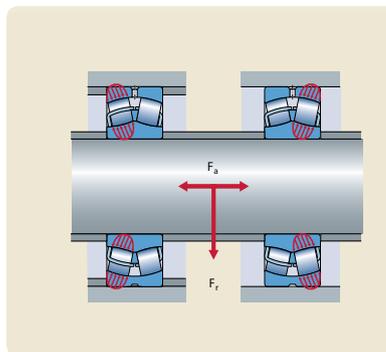


## Rebuilding an industrial fan with CARB bearings

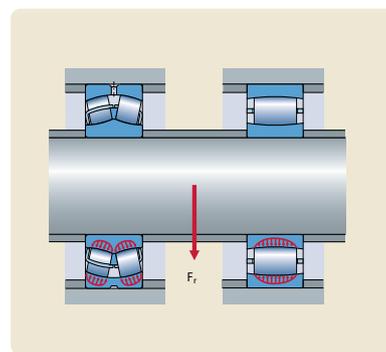
The temperature of the bearings was significantly reduced by the SKF self-aligning system, which includes an SKF spherical roller bearing and a CARB bearing. Reducing the operating temperature extends the relubrication interval.



The rollers in a CARB toroidal roller bearing adjust automatically so that the load is distributed evenly along their entire length.



Heavy axial loads and stresses are induced in the bearings system if the non-locating bearing experiences "stick-slip" or is restricted from moving axially.



By virtually eliminating induced axial loads, both bearings can share existing loads equally.

# Proven in real-world applications



**Customer: Benzlers**

*“Our customers require 80 000 hours of service life. I need to have bearings with performance that I can trust.”*

*Wolfgang Böhm  
Application engineering manager*

## Common applications

- Gearboxes
- Wind turbines
- Pumps
- Fans and blowers
- Mining and construction equipment
- Pulp and paper processing equipment
- Marine and offshore machinery
- Metal industry equipment
- Railway axle boxes





“We manufacture big machines with an expected service life of 15 years. We need to be able to predict the life of all components, especially the bearings that withstand high loads and vibration levels in this harsh environment.”

*Customer manufacturing industrial gearboxes*



“Our machines are operating in contaminated areas such as foundries and dump plants. The bearings must be able to cope with this – or we will be out of this business.”

*Customer manufacturing equipment for the metals industry*



“The application conditions are tough, but the SKF bearings are capable of handling them.”

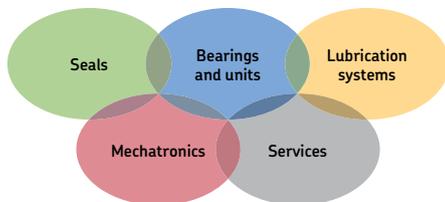
*Customer manufacturing large size conveyors*



“The SKF VA405 bearings make it possible to run the screens even harder, to make our screens better than those of the competitors.”

*Customer manufacturing vibratory screens*

For more information about SKF spherical roller bearings, see your SKF representative or visit [skf.com/srb](http://skf.com/srb).



### The Power of Knowledge Engineering

Combining products, people, and application-specific knowledge, SKF delivers innovative solutions to equipment manufacturers and production facilities in every major industry worldwide. Having expertise in multiple competence areas supports SKF Life Cycle Management, a proven approach to improving equipment reliability, optimizing operational and energy efficiency and reducing total cost of ownership.

These competence areas include bearings and units, seals, lubrication systems, mechatronics, and a wide range of services, from 3-D computer modelling to cloud-based condition monitoring and asset management services.

SKF's global footprint provides SKF customers with uniform quality standards and worldwide product availability. Our local presence provides direct access to the experience, knowledge and ingenuity of SKF people.



SKF BeyondZero is more than our climate strategy for a sustainable environment: it is our mantra; a way of thinking, innovating and acting.

For us, SKF BeyondZero means that we will reduce the negative environmental impact from our own operations and at the same time, increase the positive environmental contribution by offering

our customers the SKF BeyondZero portfolio of products and services with enhanced environmental performance characteristics.

For inclusion in the SKF BeyondZero portfolio, a product, service or solution must deliver significant environmental benefits without serious environmental trade-offs.

The Energy Efficient spherical roller bearings are included in the SKF BeyondZero portfolio because the bearing frictional moment is reduced by at least 30%.

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