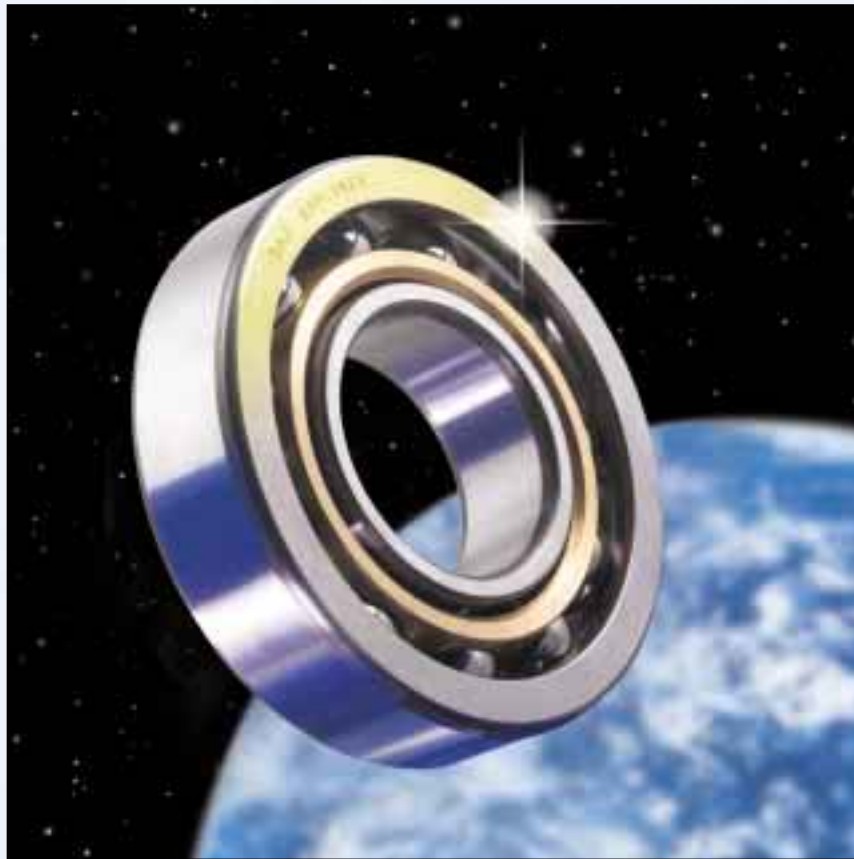


SKF

# EXPLORER

*Angular Contact Ball Bearings  
for Compressor Manufacturers*



*The new world standard  
for endurance and performance  
in angular contact ball bearings*

# Compressors: The benchmark fo

The bearings in a compressor must provide accurate radial and axial positioning of the rotors while supporting the load on the rotors. In addition, they should generate a minimum amount of friction, noise and heat. The bearings should also be able to accommodate high thrust loads and provide superior performance even under poor lubrication conditions.

Lubrication is particularly important in refrigerant compressors. When used with compatible oils, refrigerants are dissolved, which dilutes the viscosity of the oil. This diminishes the oil's capability to separate the balls from the raceway and reduce friction.

SKF has responded with a new generation of angular contact ball bearings. These bearings have optimized surface finishes and low sliding contact for maximum bearing service life. In addition, these bearings provide the following benefits:

- **Reduced heat generation**
- **Improved service life even under marginal lubrication conditions**
- **Stiffer bearing arrangement**
- **Improved running accuracy**
- **Universal matching**



### ***Demanding conditions***

*In refrigerant compressors, the mixture of lubricating oil and refrigerant is critical. Using SKF technology, that delicate balance between refrigerant and oil has been minimized. With SKF Explorer angular contact ball bearings, the compressor's bearing arrangement will continue to operate satisfactorily even under marginal lubrication conditions.*



# r severe operating conditions

## New generation angular contact ball bearings extend compressor service life

Imagine an angular contact ball bearing that could accommodate higher loads and higher speeds, last longer under poor lubrication or contaminated conditions, and still last at least three times longer than the angular contact bearing you're currently using. Imagine the value it would add to your compressor. Then imagine your customer's reaction when your compressor performs better than previous designs.

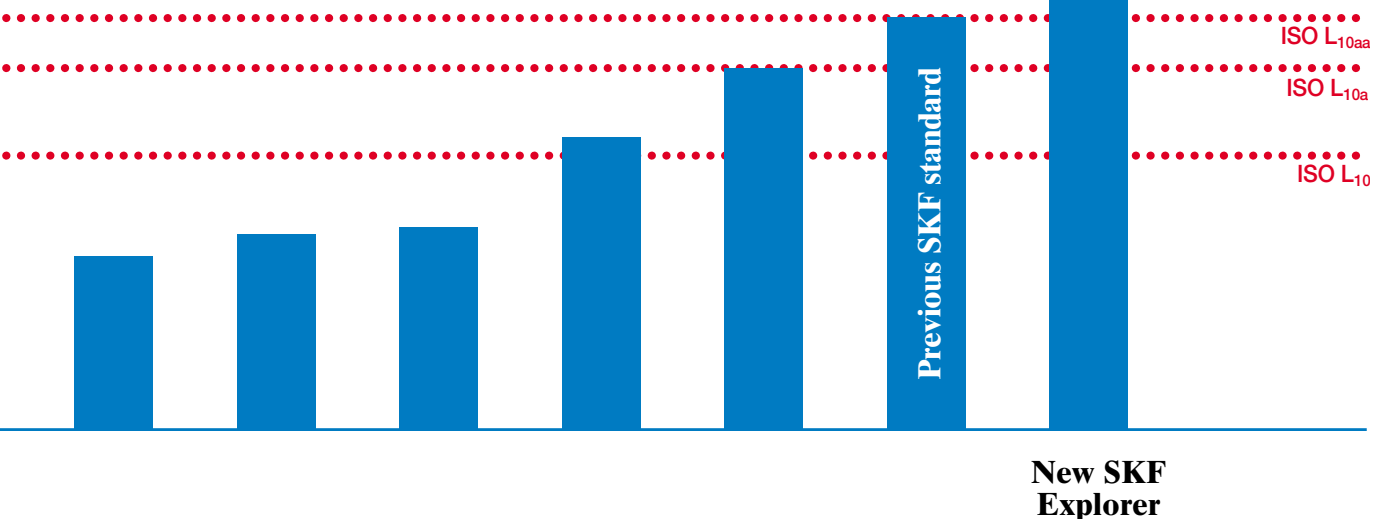
### SKF engineers did

And the result is a new generation of angular contact ball bearings that seem custom made for the harsh operating environment of a compressor. To find out how you can benefit from the superior endurance and unmatched performance characteristics of this new generation bearing, read on.

### *There's no comparison*

*Re-engineered to maximize the effects of lubrication and minimize the effects of friction, wear, and contamination.*

*Explorer angular contact ball bearings will last at least three times longer than conventional bearings depending on the operating conditions.*



# For design engineers, new option

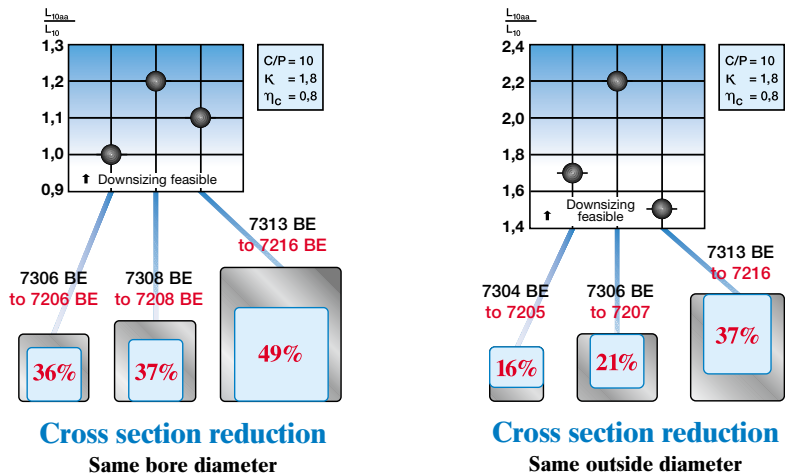
Over the years, manufacturing and materials research and process improvements have enabled machine components to get smaller without decreasing power output. With each developmental milestone, engineers were given a choice: Either downsize the application or increase power output.

The new generation of Explorer angular contact ball bearings represents the next significant improvement in performance. But this is not just a short step up to the next level. This is a quantum leap in bearing performance. Tests have shown that these angular contact ball bearings *can last up to three times longer than the bearing you're currently using.*

## OE options

These graphs illustrate various design options made possible by Explorer bearings' superior capabilities. As seen, cross section reductions can be achieved when retaining either the bore diameter (left) or the outer diameter (right).

## Advantage Explorer



## Downsizing with no downside

Because Explorer bearings have a higher load rating than conventional bearings of similar size, engineers may use a smaller Explorer bearing to do the same job. This opens the door to new designs that are lighter and more energy-efficient. For example, changing from a conventional 7308 BE to a 7208 BE Explorer bearing will give a mass reduction of 42 %!

# s for powering up or sizing down

The longer bearing service life of Explorer angular contact ball bearings opens up a new world of possibilities. If you size-down with an Explorer bearing, not only will you be able to reduce noise, vibration and warranty costs, but you'll also be able to build value into each component by increasing speed, improving service intervals, reducing heat

and power consumption and controlling your customer's maintenance costs.

Power-up or size-down – the option you choose will depend on whether you're developing a new design or making improvements within existing parameters.

## *Increase service life of existing designs*

Don't need to increase power output?  
Use an Explorer bearing of equal size to:

- Increase safety factor
- Reduce vibration
- Reduce heat generation
- Increase service intervals
- Increase machine uptime

## *Maintain power output of new designs*

Use a smaller Explorer bearing to:

- Reduce overall dimensions to save on material costs and weight
- Reduce heat generation
- Increase speeds

## *Increase power output of existing designs*

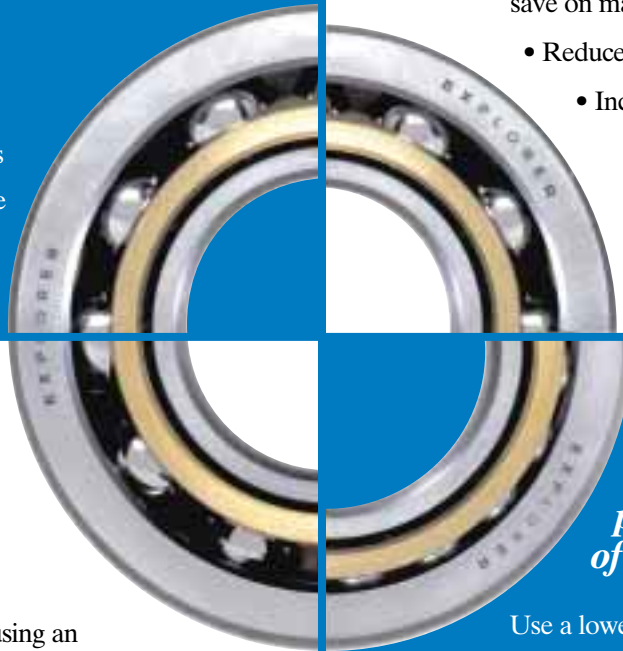
Avoid costly redesign by using an Explorer bearing of equal size to:

- Increase power density (output)
- Increase speeds
- Increase loads

## *Increase power density of new designs*

Use a lower profile Explorer bearing with the same outside diameter to:

- Increase shaft size
- Achieve a stiffer design
- Operate at the same or higher speeds



# Build more value into your com

## **Single row angular contact ball bearings – engineered for combined loads, high speeds, poor lubrication and contamination**

SKF Explorer single row angular contact ball bearings are typically used in compressors where there are moderate to high speeds, high axial and radial loads and a need for operational reliability. These bearings usually operate with a light preload to accurately locate the shaft.

To meet these demands, Explorer angular contact ball bearings are manufactured to P5 running accuracy and P6 dimensional accuracy. P5 means that these bearings are running smoother and cooler with less vibration. P6 provides greater control of mounted clearance or preload, which promotes better load sharing. Uneven load sharing is the most common cause of ball skidding.

These new generation bearings also feature cleaner steel with fewer impurities and a unique SKF heat treat process to provide temperature stabilization up to 150 °C (302 °F). This unique process also provides more durable raceways that are less sensitive to spalling, and the damage caused by contamination. The surface finish on the contact surfaces of the raceways and cage have been optimized to provide a superior oil film even in applications where there is inadequate lubrication.



# compressors with SKF

## Hybrid single row angular contact ball bearings – designed for optimum performance, reliability and service life under difficult operating conditions

SKF hybrid bearings use balls made of a ceramic material called silicon nitride. Silicon nitride,  $\text{Si}_3\text{N}_4$ , has specific unique characteristics that can make it an excellent choice for compressor applications requiring high speed, high stiffness, high hardness and lower noise. The smooth surface finish and high hardness of the ceramic rolling elements make them suitable for use in poor lubrication conditions, e.g. very high concentrations of refrigerant.

SKF is a pioneer in the research and development of alternative materials for precision balls and silicon nitride is one of the newest materials. Balls made of silicon nitride signify a major breakthrough in precision ball technology and bring new potential to many rolling bearing applications.

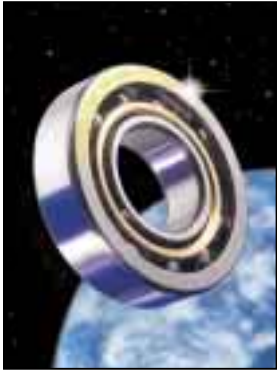
$\text{Si}_3\text{N}_4$  balls in rolling bearings have a number of inherent features including: low density, low thermal expansion, higher modulus of surface elasticity, less stringent lubrication requirements, and very smooth surface finish. These features open up a wide range of possibilities for the angular contact ball bearings used in compressors.



*SKF has a full line of hybrid single row and double row angular contact ball bearings available.*

## User benefits

- Lower density. Silicon nitride balls have a density of only 40 % of similar steel balls. This means higher speeds, less weight, lower inertia, more rapid starts and stops.
- Low friction. Silicon nitride's low coefficient of friction enhances wear resistance enabling bearings to run cooler even when they are poorly lubricated. This means better lubrication, less noise, lower operating temperatures.
- Higher modulus of elasticity. Ceramic balls have a 50 % higher modulus of elasticity than steel. This means increased bearing stiffness.
- Lower coefficient of thermal expansion. Ceramic balls have a thermal expansion only 29 % of similar steel balls. This means less sensitivity to temperature gradients for more accurate preload control.



SKF Explorer  
Angular Contact  
Ball Bearings

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