Deep groove ball bearings

Welcome to the Interactive Course on:

Welcome to this interactive course which will introduce you to the basics of the SKF deep groove ball bearing.

Special Notes for iPad Users

For iPad users, this course plays in the “Articulate mobile player app”, available free from the App store.
The app offers a download option for offline learning, but please note that:

1. An on-line connection is required to use the links on the “resources” tab
2. If you wish to be able to print your course completion certificate then you need to be on-line when you take the end-of-course test

To continue, you can click the Home icon on the screen to return to the Welcome page of the course.

Module 1: Introduction

SKF deep groove ball bearings

The deep groove ball bearing is the most widely used bearing type. In fact, more than a third of all bearings used in the world are deep groove ball bearings. It is suitable for numerous application requirements, such as high speeds, quiet running, low friction and high running accuracy.

In addition, SKF is well known for its wide product range. SKF deep groove ball bearings are found in a large number of sizes, with different cage executions, sealing solutions and grease fills.

After the course you will have a general understanding of SKF deep groove ball bearings in addition to the specific features that take SKF deep groove ball bearings ahead of the competition.

This course doesn't require any special skills or previous knowledge. However, if you are new to bearing solutions, it is recommended that you study the "Bearing Basics" interactive course first.

Course completion certificate

At the end of the course you will be able to take a test, to check your understanding of the topics covered.

If you pass the test on-line, then you will be able to print your own course completion certificate.

Features and benefits

The deep groove ball bearing is the most widely used bearing type on the market. It is used ¡n a wide range of applications, stretching from racing motorcycles to domestic appliances.

SKF Explorer class deep groove ball bearings set a new world standard for endurance and performance. SKF Explorer bearings are manufactured to the highest quality standards possible. The result is a bearing with cleaner steel, optimized geometry and higher ball quality.

SKF is one of the market's leading manufacturers when it comes to quality and range. The worldwide availability of SKF deep groove ball bearings provides a superior service level. Wherever your application needs a new bearing, help is never far away.

Product range and designations

Most SKF deep groove ball bearings can be supplied with different cages, internal clearance, sealing solutions and a selection of lubricants.

The purpose of the cage is to keep the rolling elements in place and to reduce the friction in the system. Steel and polyamide are common cage-materials. In particular cases, brass ¡s used. Each material has its own characteristics.

Seals are used to protect the internal parts from exposure to contaminants that would otherwise decrease bearing service life. Depending on the

speed requirements and surrounding environment, some sealing solutions are more suitable than others.

Grease is necessary to decrease friction of the system. Standard greases are appropriate for standard conditions. Specialty HT and WT greases are developed for more extreme conditions.

Applications

SKF Explorer deep groove ball bearings can prove advantageous in both existing and new machines. The application segment gives examples of how SKF Explorer class bearings provide value to the end-users of electrical motors, agricultural machinery and textile industry machinery as well as lift designers.

Module 2: Features and benefits

Features and benefits of SKF deep groove ball bearings

SKF deep groove ball bearings have features that set the product apart from the competition. In this module, you will learn the features and benefits of SKF deep groove ball bearings, their role in the marketplace and the benefits of choosing SKF.

High power ratings / enable downsizing

Deep groove ball bearings are used in a wide variety of applications.

They are used in gearboxes found in production equipment and hand-held tools. In these applications, SKF deep groove ball bearings provide higher power ratings and enable downsizing.

High speed / low noise / low vibration

Deep groove ball bearings are also used in industrial electrical motors. SKF deep groove ball bearings are already known to handle high speeds with less noise and vibrations than those of most competitors. However, new manufacturing processes enable even tighter tolerances. The result is one of the most quiet-running bearings on the market.

High speed / high accuracy

SKF bearings are widely used in the textile industry, where there is a need for high accuracy and speed. Few competitors meet such high requirements for running accuracy as do SKF deep groove ball bearings.

Uptime

Uptime is valuable to customers who operate large production plants or equipment. Large amounts of money, much greater than the cost of a high quality bearing, can be saved if service intervals can be extended. SKF deep groove ball bearings help customers attain that goal.

An expanding marketplace

The market for deep groove ball bearings is expanding. That, in combination with the fact that deep groove ball bearings are used practically everywhere, makes sure that the demand for aftermarket services will be sustained.

SKF Explorer

With the SKF Explorer deep groove ball bearings, SKF has set the new world standard for endurance and performance. The class represents 90 % of the SKF deep groove ball bearing-range. The SKF Explorer bearings are manufactured to the highest quality standards possible. The result is a bearing with cleaner steel, optimized geometry and higher ball quality.

The SKF Explorer deep groove ball bearing has top rated bearing life. With its help, you can increase the service life of any existing design and thus lower maintenance costs. It further enables productivity increase as a result of a decreased number of planned and un-planned stops.

Moreover, SKF Explorer deep groove ball bearings feature extremely low friction. As a result, deep groove ball bearings from SKF can be operated at higher speeds without an ensuing temperature increase. Low friction also leads to lower operating costs due to energy consumption savings.

Greased for life when shielded or sealed

SKF deep groove ball bearings are also greased for life when sealed or shielded. This makes the bearing virtually maintenance free. Its users will therefore enjoy trouble -free operation.

Bearing service life ¡s highly dependent on the environment in which the bearing operates. SKF Explorer deep groove ball bearings feature highly efficient sealing solutions that protect the internal parts from contaminants and help retain grease. Bearing service life is thereby greatly extended.

Increased machine reliability

Perfection ¡n your manufacturing process implies high dimensional accuracy of components. SKF offers precision to the users of its products. SKF deep groove ball bearings significantly ¡ncrease machine reliability.

Explore the features

An SKF Explorer deep groove ball bearing is full of features that have continually been improved to bring the product where it is today: the worldwide leader in quality and accuracy. Click on the active areas on the bearing to learn more about the improvements and associated benefits.

Summary

The deep groove ball bearing ¡s the most commonly used bearing type. The SKF high quality production process and clean steel result in one of the longest lasting bearings on the market. With an unbeatable range and worldwide presence, SKF becomes the first choice for many bearing users around the world.

Module 3: Product Range

Product range and designations of SKF deep groove ball bearings

There is a wide variety of SKF deep groove ball bearing configurations — each fulfilling a specific customer need. This module will highlight the most common executions.

Deep groove ball bearing designations

This illustration shows the different SKF single row deep groove ball bearing series.

Most deep groove ball bearings can be supplied with a choice of sealing solutions, cages, clearance classes, selection of lubricants and other features. We will now explore the basics of the most common configurations.

Sealing solutions

Basic design SKF deep groove ball bearings are unsealed, or in other words open. Since bearings are very sensitive to exposure to contaminants, the most popular sizes of deep groove ball bearings are available in sealed versions.

Click on the various seals on the right of this page for more information about each one, and to view it's designation suffix.

Metallic shields provide fair dust exclusion and grease retention abilities. Since there is no contact between the shield and the inner ring, the sealing solution is recommended for applications with high speed and low friction requirements. However, a shield cannot prevent water from entering the bearing. Shields on both sides are indicated by the designation suffix 2Z.

Non-contact seals have, in comparison to shields, improved performance regarding both grease retention and dust exclusion abilities. Standard non-contact seals on both sides are indicated by the designation suffix 2RZ.

However, for small deep groove ball bearings, an improved seal has replaced the RZ-seal, where the retention and exclusion performance have been significantly improved — without affecting its speed abilities. Low-friction seals on both sides are indicated by the designation suffix 2RSL.

When the seal is required to withstand heavy contamination, and perhaps even water or moisture, ¡t is necessary to use a contact seal. Contact seals are used only when low friction and high speeds are not required. Contact seals on both sides are indicated by the designation suffix 2RS1.

For small deep groove ball bearings, an enhanced contact seal has replaced the RS1-seal, where the grease retention, water and contaminant exclusion performance have been significantly improved. This enhanced contact seal can even withstand high pressure cleaning. Seals on both sides are indicated by the designation suffix 2RSH.

What type of seal ¡s suitable, and when? In practice, several factors must be taken into consideration when making recommendations. However the following guidelines may give you an idea:

Firstly, assess the speed of the shaft. While all sealing types can withstand lower speeds, only a shield, or a low-friction seal might be appropriate.

Secondly, consider contaminants. In presence of water, only contact seals should be used. However, ¡t is recommended to contact SKF. As to dust exclusion, service life is greatly increased ¡f contact seals are used to protect the application.

Finally, operating temperatures strongly affect the sealing requirements. For normal operating temperatures, any sealing will work. However, as temperatures increase the rubber is affected. It is then recommended to use Z shields or to contact SKF.

Cages

The purpose of the cage is to keep the rolling elements in place and to further reduce the friction in the system. Depending on the application, different cage materials are more suitable than others.

Click on the cage types shown on the right of this page for more information about each one, and to view it's designation suffix.

Made out of continuously hot-rolled low carbon sheet steel, the steel cage is the standard in SKF deep groove ball bearings. It is a lightweight solution featuring retained high strength. Being the standard cage, it has no designation suffix.

It is also possible to use synthetic materials for constructing cages. An injection -moulded cage of glass fibre reinforced polyamide 6,6 is a common alternative. The material has a favourable combination of strength and elasticity. Polyamide 6,6 cages are indicated by the designation suffix TN9.

Since polyamide 6,6 is sensitive to high temperatures, the cages can be used ¡n operating temperatures below 120 degrees Celsius, or 250 degrees Fahrenheit.

A special type of cage ¡s made out of brass. Machined brass cages are unaffected by most common bearing lubricants and can be cleaned using normal solvents. Machined brass cages are ¡ndicated by the designation suffix M.

Unfortunately, it is difficult to provide simplified guidelines for cage recommendations. However, SKF’s application engineers are more than happy to provide qualified assistance.

Clearance

Clearance is the total distance through which one bearing ring can be moved relative to the other. Standard executions have Normal clearance, which is indicated by the designation suffix CN. However, this suffix is not normally included in the designation of the bearing.

The operating temperature affects the steel. In fact, as the operating temperature rises, the dimensions of the ¡nner and outer ring are affected and internal clearance is thereby reduced. However, the change ¡s undetectable to the naked eye, but strongly influences the performance of the bearing.

SKF deep groove ball bearings should have an operational clearance of virtually zero to operate satisfactorily. In applications where the bearing grows hot during operation select a bearing that leaves room for expansion. A rule of thumb is therefore to select bearings with a clearance greater than Normal for high-speed applications. C3 is the designation suffix for a bearing with clearance greater than Normal.

Lubricants

Grease is necessary to decrease system friction. There is a set of standard greases as well as special greases. Standard greases are appropriate for general conditions.

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There are two common types of specialty greases. One is developed to handle high temperatures and given the designation suffix HT. The other, is suitable for wide operating temperature ranges and is referred to as WT grease.

Selecting the right grease is crucial for optimal bearing life expectancy. The SKF application engineers will gladly assist you. As a rule of thumb, the standard grease works for several applications under general conditions. For slightly elevated temperatures, below 140 degrees Celsius, use the HT high temperature grease.

For wide temperature ranges, or temperatures up to 160 degrees Celsius, the WT grease ¡s the preferred choice. It is also worth mentioning that the service life increases significantly if specialty greases are applied - especially with WT-type greases.

Deep groove ball bearing designations

Note that the flowcharts presented in this e-learning do not provide sufficient information to use for making product recommendations.

Contact your SKF representative for a full analysis of your requirements and to receive application-specific recommendations. To find more information about the deep groove ball bearing designations and variants, use the SKF General Catalogue, contact your SKF representative, or explore the www.skf.com website.

Summary

There are several variants of SKF deep groove ball bearings. In this module, you have been given an introduction to the most common seals, cages and greases. In the next module, we will look at how SKF deep groove ball bearings have been used in practice.

Module 4: Applications

Applications of SKF deep groove ball bearings

In this module we will take a look at applications with SKF deep groove ball bearings. Specifically, we will highlight situations where SKF Explorer deep groove ball bearings were used to raise the performance of existing machines and how they were used building new ones.

Applications

SKF Explorer deep groove ball bearings can prove advantageous in both existing and new machines. In existing machines, the SKF Explorer class bearings reduce noise and vibration levels, increase service life and power output. In new machines, SKF Explorer deep groove ball bearings provide higher speed and increased power density.

Air conditioning fans

Smooth and quiet running behaviour ¡s a critical parameter for the electrical motor powering air conditioner units. Bearing rotation may excite the surrounding structure and cause noise.

Nonetheless, noise and vibration decrease when higher quality bearings are used in the applications. By using SKF Explorer deep groove ball bearings, the noise and vibration levels are significantly reduced. The result

is a high-end product for which manufacturers are able to charge a premium price.

Agricultural equipment

Running a farm is hard work. Income heavily depends on a farmer's ability to harvest the crops at the right time. At that time, ¡t ¡s crucial that his equipment is reliable and breakdowns are avoided at all costs. Long service life is greatly appreciated.

SKF deep groove ball bearings in agricultural equipment most often operate under severely muddy and wet conditions. Failure is often caused by contamination ingress. In many cases, service life would have been significantly extended had the bearings been equipped with an RSH or RS1 contact seal.

Lifts / elevators

Lift manufacturers must consider several factors in their product designs. However, safety is one of the most important ones. Manufacturers are constantly seeking cost efficient ways to raise the safety factor. For this application, high quality SKF Explorer bearings are just right.

SKF Explorer deep groove ball bearings can withstand heavier loads without the need to change machine arrangement or affecting service life. Equipped with SKF Explorer bearings, the lift is made even more robust and can accommodate greater unexpected load increases.

Spinning machines

The textile industry operates thousands of spinning machines and other equipment that run at very high speeds. High speeds are a requirement for producing sufficient volumes to compete on the global market. Normally, to cope with these operating conditions, bearings must be specially made to a greater quality standard.

The SKF Explorer deep groove ball bearings are already manufactured to the highest standard. For example, the 6205 bearing ¡s manufactured to P5 running accuracy. It thereby accommodates speeds up to 18 000 rpm. In

return, it provides greater production volumes and sustained profitability to its users.

Summary

This module has discussed only a few of the many applications where SKF deep groove ball bearings have been successfully applied. We hope that you have found the module interesting.

If you feel ready then you can now move on to the end of course test.

End of course test

Now it’s time to see what you learned.

If you pass the test on-line then you’ll be able to print your course completion certificate.