



# FAQ CHAYA

Bearings.

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# Bearings.

## **BEARINGS**

Bearings are the heart of skates no matter if we talk about inline or roller skates. The quality of bearings can make the difference in a race between winning or losing or can let you skate with more ease and fun.

## **ABEC**

For quality assessment of bearings, the so-called ABEC-term (Annular Bearing Engineering Committee) has become the most popular one. ABEC is a manufacturing standard of accuracy and manufacturing tolerances of the bearings. The tolerances are based on  $\mu$ -mm! Usually you divide between ABEC 3, 5 or 7 bearings. The higher the ABEC rating, the better the quality and in the end the higher the price.

High quality bearings like for example ceramic bearings or original Swiss made bearings, just to name two examples, renounce to use the ABEC rating. They are simply known for their great quality and performance.

## **BUT**

It should be noted, that the quality of a bearing depends on various factors such as the materials used for the various components of a bearing, the choice of the lubricant etc..It's possible that a poorly greased ABEC 7 bearing shows a worse performance than a well lubricated ABEC 3, bearing from a quality point of view.

## **ILQ**

ILQ is simply a term that is used by Twincam bearings for marketing reasons

ABEC is the term of an industrial standard concerning the tolerances of products



# Bearings.

Twincame has successfully created the ILQ term which obviously is related to the ABEC rating. The higher the ILQ standard the better the quality of the bearing. Twincam does use this term for marketing purposes and not to define quality standards. But Twincam bearings are known for fast spin and high quality. We also know that the ABEC rating is not the one and only factor to separate the good bearings from the bad ones as described above.

Well, make up your own mind and test the different types of bearings to find out which one you like the best.

## **FREESPIN**

The Freespin Technology is used in Wicked ABEC 5, 7 and 9 bearings. We use a special lubricant to offer bearings with a smooth and fast spin. Wicked freespin bearings are an inexpensive alternative to pimp your skates.

## **MATERIALS - INNER AND OUTER RING, BALLS AND RACEWAYS**

A wide variety of materials is used for skate bearings or just components of the bearings. In the following we'll to explain the different materials used in the bearing production.

## **CERAMIC**

Ceramic bearings are said to offer reduced friction, lower weight and improved longevity.

Most ceramic bearings are actually hybrid bearings, which combine a steel inner and outer ring as well as raceway with ceramic balls. Full ceramic bearings are fairly rare simply because of the extremely high price.



# Bearings.

High end ceramic bearings are made of silicon nitride ( $\text{Si}_2\text{N}_4$ ) – they usually have a black color. They are about 30% harder than steel bearings, are rounder with a smoother surface and more uniform size which guarantees a significantly reduction of friction. Furthermore ceramic doesn't rust so less maintenance is required. While full ceramic bearings don't require lubrication hybrid ceramic bearings do so.

White color ceramic bearings are cheaper, using lower quality raw materials and don't perform as well as ceramic bearings made of silicon nitride.

## **STAINLESS STEEL**

Stainless steel are a composition of a higher content of chromium (min. 10,5%) and at the same time reduced content of carbon (max. 1,2%) with the addition of nickel or other elements. Stainless steel is continuously protected by a passive layer of chromium oxide that forms naturally on the surface through the combination of chromium and moisture in the air. If the surface is scratched it regenerates itself. This particularity give stainless steel their corrosion resistance.

Stainless steel bearings are high tech bearings used for skating in wet conditions like for example for off-road skating or inline skate marathon races.

## **CHROME STEEL**

Steel is an alloy of iron and carbon and sometimes other materials. Chrome steel or chrome plated steel is produced by dipping ordinary steel into an electrolyte solution containing chromium and makes use of the electrolysis to create the coating.

The most common material used for the outer and inner ring as well as the balls and race way of precision skate bearings is 52100 chrome steel. Thanks to a special heat treatment and the honed and polished surfaces of all parts chrome steel bearings offer a very hard surface to resist rolling contact fatigue and to run very fast, smooth and silent.



# Bearings.

Chrome steel is used for mid to high end bearings. Contact with water should be avoided so that the material does not rust and the bearings loose performance.

## **CARBON STEEL**

Carbon is known as a high-tech material which is used for airplanes as well as in formula 1 race cars or in a wide variety of sport equipment. But the name misleads in terms of bearings. Bearings made of carbon steel can't carry high loads or operate at high speeds and they don't have corrosion resistance. The higher friction between the balls and raceway results in a significantly slower speed and performance. They are usually low costs bearing which are built into entry level and budget skates.

## **MATERIAL - THE BEARING RETAINER AKA CAGE**

Retainer keep the balls evenly spaced around the raceway to prevent ball to ball contact and allow higher speed. They also help to retain grease around the balls and raceways. For greater accuracy and to prevent additional friction, it's important that the retainer is not allowed too much radial movement. To achieve this, the retainer is guided by either the balls or one of the rings.

## **STEEL RETAINER**

Steel retainers are widely used in bearings. They usually have a "crown" shape and are guided by the inner ring. We talked about different types of steel already before and don't want to repeat all again. Please refer to the topic: Materials – Inner and Outer Ring, Balls and Raceways for more information.

Due to the properties of steel retainers made of steel have a few disadvantages:

- Higher weight
- Impacts may deform the cage
- May start to rust if carbon steel is used
- More noise during operation



# Bearings.

## **PLASTIC RETAINER**

Composite retainers are often made of injected reinforced nylon, but injected acetal (POM) can also be found. Other polymers like polyethylene (PE) is used in stainless steel bearings while PEEK (PK) is mainly used in ceramic bearings. Plastic crown shaped cages are ball-guided. They have better sliding characteristics than a steel cage and produce fewer fluctuations in running torque. It can increase max. speed up to 60% so is generally used in high speed applications and has good low noise properties.

The disadvantages that were mentioned in the steel cages are the advantages of the composite cages.

## **MATERIAL - SHIELDS AND SEALS**

Bearings are available with different types of shields and seals. They can extend the bearing life by preventing contaminants from reaching the critical surfaces inside the bearing, and they help retain the lubricant in the bearing.

### **ZZ**

These are bearings covered on both sides by non-removable, non-contact metal shields retained in the outer ring via crimping or pressing. This type can NOT be removed once assembled. This also means that you can't maintain the bearing, just clean the outside surface and dry the bearings after skating in the wet to avoid rust and corrosion on the outside surface.

This type of bearing is often used in low end skates

### **ZZS / ZS**

These are bearings covered on both sides by removable non-contact metal shields retained in the outer ring with a snap wire aka C-ring. Since there is no contact made with the inner ring there is no appreciable impact on torque or speed. The code for a single shield bearing is ZS.



# Bearings.

Advantages of C-ring shields:

Non-contact shields

No additional friction

No additional increase in temperature

Up to the speed limit applicable

Good seal against leakage of lubricants (ZZS version)

Long term maintenance-free

Disadvantages:

Limited protection against contamination of dust and water (especially Z2 version)

## **2RS / RS**

These are molded non-contact rubber seals. This is a nitrile rubber (NBR) bonded to a steel insert. The seal is fixed into a groove in the outer ring. This type of seal can be removed but care must be used to not bend or cut the seal lip. Rubber coated seals have contact with the inner ring thus offer a better protection against contamination of dust and water than a metal shield. On the downside it results in a higher torque and reduces the max. speed capability of a bearing. Certain lubricants and chemicals react with rubber so you better watch out which cleaning supplies and lubricants you use. The code for a single rubber coated bearing is RS.

## **LABYRINTH SHIELDS**

These bearings are sealed from both sides by rubber coated steel shields. They have a groove on the inner ring as well where the seal lip makes contact. This creates a more effective seal against the contamination of dust and water and reduces the maintenance frequency without increasing the torque. Labyrinth shields are often used in combination with rustproof stainless steel bearings. They are used for skating in wet conditions. Certain lubricants and chemicals react with rubber so you better watch out which cleaning supplies and lubricants you use.



# Bearings.

## **CLOSED AND SEMI CLOSED BEARINGS**

Closed bearings are obviously covered from both sides while semi closed bearings are just covered by one shield leaving the other side open. The open side of the bearing should be always point towards the inside of the wheel to protect it from dust and water.

Advantage of a (semi-) open bearing:

- Easier maintenance
- Slightly lower weight

Disadvantages of a (semi-) open bearing:

- Contamination from dirt and water
- Lubricant evaporates quickly
- Shorter intervals for maintenance

## **LUBRICANTS**

Lubrication provides a thin film between the contact areas in a bearing to reduce friction, dissipate heat and inhibit corrosion of balls and raceways. The lubricant will affect the maximum running speed and temperature, torque level, noise level and, ultimately, bearing life.

## **MINERAL OR SYNTHETIC BASED LUBRICANTS**

They are the most commonly used lubricants for bearings designed for high speed use. Many types of synthetic oils can be found in the market. Each top speedskater has his own "secret agents" and reveals not know what "secret weapon" he uses to make its bearings as quickly as possible. Some athletes race even without the use of any lubricants.

mineral or synthetic lubricants can differ in their viscosity. The higher the viscosity the more liquid the lubricant.

In general you can say:

High viscosy lubricant:

- is easer to spread in the bearing
- creates less friction (bearing runs faster)
- evaporates faster – results in more frequent intervals of maintenance





# Bearings.

## **SILICON LUBRICANTS**

They have a wide temperature range and change viscosity less with temperature. They have good water-resistance properties. They are not suitable for high speeds, but great for use in wet conditions.

## **GREASES**

Greases are simply oil mixed with a thickener to keep them stay longer inside the bearing. They have their advantage of giving constant lubrication over a longer period without maintenance.

Too much grease has a negative affect on the bearing performance. A high grease fill results in higher rolling resistance (higher torque). The space in a bearing is important in allowing the heat to radiate away from contact area between balls and raceway. Too much grease is counter productive in this case.

## **TEFLON**

Teflon is mixed in part as a lubricant additive is a rust and corrosion inhibitor and. It improves the operating characteristics of standard grease lubricants.

## **608 STANDARD**

The mark 608 on the bearings stands for standardization of a manufacturing process. The number 60 represents the production series and the number 8 stands for the inner diameter of the bearing. Inline skates and roller skates are usually equipped with 608 bearings. 608 bearings maintain high speed easily for long periods of time and are easy to maintain.



# Bearings.

## **MAINTENANCE OF BEARINGS**

The first signs to maintain a bearing are noises or heavy spin of bearings. To save some money you should maintain your bearings regularly.

Please follow the advice below:

- Disassemble the wheels from the plate
- Open the shields (if possible) with a needle
- Place the open bearings in a small container (e.g. Wicked ) that is filled with citrus cleaner or other cleaning liquids.
- Clean bearings carefully with a toothbrush
- Dry the cleaned bearings on a towel
- Grease the dry bearings with synthetic oil or other lubricants
- Close the bearings again and assemble the bearings into the wheels.

## **HOW OFTEN DO I HAVE TO MAINTAIN MY BEARINGS?**

There is no general advise how often you should clean your bearings like there is no information how often you should wash your car. Every skater is different. Some maintain their skates and bearings almost every day, some wait until they loose performance and some just exchange parts.

Dust, water and dirt can damage the honed and polished raceways and balls of a bearing and has influence on the performance of the bearing and in the end on the speed of your skates. You can extend the lifetime of your bearings through regular maintainance. Nice side effect – you safe maney. It really depends on many factors how often you should clean your bearings as you can see.

But please note that also rustproof bearings need to be maintained. Dust and dirt also damage the raceways and balls of the bearing. The bearing just does not rust.

## **PLEASE NOTE:**

**Always maintain your bearings immediately after skating in wet conditions to avoid them getting rusty!!!**

**Even rustproof bearings should be at least disassembled and dried with a towel**