

Choosing the Right Grade: Specifying Stainless Bearing Steel

THE QUESTION

I've determined that a stainless steel bearing is the best option for my application. I'm being asked to specify the grade of stainless steel in my product design. I'm not sure which grade to select and specify. Can you help?

Expert Response Provided by Mark Bos, Director of Business Development, National Bearings Company

Custom bearings are often made from stainless steel, especially in applications where corrosion-resistance, non-magnetic properties or frequent sterilization are needed. Many grades of stainless steel are available, and it is important to select the grade that best meets the requirements of the application.

Most standard bearings are made from 52100 alloy bearing steel. This is a chromium steel that can be heat-treated and ground to achieve high load capacity and durability in bearings. 440C stainless steel is the most suitable grade when an application must meet the full load capacity of a standard bearing. It has higher levels of carbon than other grades of stainless steel, in order to achieve the hardness and strength of 52100. The higher level of carbon also means that this steel, while corrosion-resistant, can rust. Passivation can help eliminate this rusting.

300 series stainless steels cannot be heat-treated but have very high corrosion-resistance properties. These stainless steels are also non-magnetic and non-hardenable. Bearings that have lighter load requirements, such as thrust retainers or window roller bearings, are commonly made from this type of stainless. Typically, a bearing made from 300 series stainless steel has about half the capacity of a standard bearing.

For applications that require moderate load carrying capability and high corrosion-resistance, precipitation hardenable stainless steels are an option. Grades such as 17-4 or 17-7 are specialty grades that can achieve strength greater than 300 series stainless, without the carbon content of the 400 series grades.

Many more grades of stainless can be used in bearing manufacturing in order to customize a bearing to precisely meet the requirements of an

application. When designing a custom bearing made from stainless, it is not uncommon to use more than one type of stainless steel. The bearing races and balls may be made from 440C, while the ball cages and bearing shields may be made from 302 grade stainless steel.

In conclusion, while designing for the environmental conditions that the bearing may encounter in application, it is important to consider the loads that the bearings will need to carry. The heavier the load is, the more likely that a hardenable stainless steel will need to be selected.

One note of caution: it is very important to match the material and hardness of both the bearing races and balls or needles. The harder component will wear into the other, causing premature failure. **PTE**

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Stainless Steel Bearings - What Grade Works Best?			
52100	400 Series	300 Series	17-4 17-7
Chromium Steel. Can be heat-treated, ground to achieve high load capacity, and highly durable.	Most suitable grade to meet full load capacity of a standard bearing. Higher levels of carbon and corrosion-resistant but can rust. Passivation can help eliminate rust.	Can not be heat-treated but has a very high corrosion resistance. Non-magnetic and non-hardenable. For lighter loads - about half the capacity of a standard bearing.	Precipitation hardenable stainless steels. Moderate load carrying capabilities and highly corrosion-resistant. Strengths greater than 300 series without the carbon of 400 series.

Mark Bos is a manufacturing professional with extensive experience in custom bearing and assembly design and manufacturing. In his current position with National Bearings, Bos serves as VP of Business Development, and is actively involved in product development, engineering, marketing and sales management. Bos has specialized in bearings and bearing component design and manufacturing for the past 17 years.

