



Choices can be confusing. Do you need chrome steel? Stainless steel? Low carbon steel? Or something else? Ball bearings are manufactured from a variety of materials, each designed to maximize performance and life. Below is a roundup of the various options and their uses:

Chrome Steel – SAE 52100

The most common material for precision ball bearings, roller bearings, and tapered roller bearings is 52100 chrome steel, which is comprised of high carbon content and 1.5% chromium. It is an excellent general-purpose bearing steel, which features good fatigue life in rolling element bearings. To minimize corrosion, the bearing surfaces must be protected with a rust inhibitor or oil.

Extra clean 52100 chrome steel bearings

For high precision miniature bearings, “extra clean” 52100 chrome steel is available. This material is a consumable electrode vacuum melted and is premium quality with very low impurity levels. After superfinishing, this material exhibits an improved raceway finish that results in lower noise and torque levels.

Stainless Steel

With their higher chromium content (18%) than chrome steel bearings, stainless steel bearings are resistant to surface corrosion. They are available in martensitic and austenitic varieties (a reference to their crystalline structures), but AISI 440C is the preferred alloy offering the best combination of corrosion resistance and mechanical properties. Typically, after heat treatment, stainless steel is slightly “softer” than the more common chrome steel. This results in slightly lower load ratings.

Carbon Alloy Steel

Carbon steel, such as 12L14 or 1020, is used to produce lower precision, non-ABEC or RBEC rated bearings. These steels are easy to machine and can be case-carburized. This heat treatment process produces a surface hardness that is appropriate for rolling element bearings. The raceways are unground and often burnished to improve the surface finish. These bearings can be plated to improve corrosion resistance. The primary consideration for these types of bearings produced from these alloys is low cost. They are not suitable for high load or high-speed applications.

Low carbon steel is also used to produce bearing components used in chrome steel bearings such as cages, metal shields, and metal washers.

Ceramics

The most common use is producing the rolling elements- the balls, from a ceramic material with the inner and outer rings made from traditional, heat-treated, chrome or stainless steel. These bearings are commonly referred to as Hybrid Bearings. With improvements in manufacturing technology, Full Ceramic Bearings are also readily available. These bearings have both the inner and outer rings in addition to the rolling elements manufactured from ceramic material. While hybrid and full ceramic bearings demand a premium price, they are often the most economical solution when considering the cost of a failure and the total cost of ownership for the end-user.

Plastics and Non-Metallic Materials

Engineered plastics or phenolic resins are often used to produce the cages, or ball separators, in miniature and instrument series bearings. These are lightweight and strong and typically specified in noise or torque-sensitive applications. Some are porous and can be impregnated with oil for very low torque applications.

Seals are most commonly made of nitrile or Buna rubber, which are inexpensive and can be used across a wide temperature range. Viton and Teflon materials are available and offer good chemical resistance and can withstand higher operating temperatures.

For more information, read, “[Bearing Materials – Ceramics, Chrome Steels, Stainless Steels and Plastics](#),” written by AST Bearings engineers.

Let our team of experts help with your bearing needs. [Contact them here](#) or learn more about our [custom solutions](#).

Additional resources and information

- AST Bearings is proudly presenting our new certificates for both the NJ and CA locations: [AST Bearings’ ISO 9001:2015 Certificates](#)
- To learn more about ISO 9001 standard and how AST verifies customer satisfaction: [Learn About AST Bearings’ certification to ISO 9001:2015](#)

