

Four considerations for selecting a shaft to use with iglide® bearings

It is critical to use shaft and bearing materials that work well together. A whole range of problems can arise if the wrong shaft material is used with a particular bearing.

1. Shaft Material: Many different shafting materials are available on the market, serving a wide variety of applications and requirements. There are a few different factors to consider when choosing a specific shaft material to be used in combination with a plastic bearing.

- **Weight:** Plastic bearings are lighter in weight than their metal counterparts. If you are also looking for a lightweight shaft, aluminum, carbon fiber or plastic may be the best options. However, these lightweight shaft materials could present issues for certain bearing materials, such as bronze or fiber-wound bearings that typically work best on a hardened steel shaft. Plastic bearings tend to be very shaft-friendly, so there are a variety of options when selecting a shaft material to be used with them.

- **Corrosion resistance:** If the shaft will be used in an environment where chemicals or liquid media are present, then the corrosion resistance of the shaft must be taken into account. iglide® bearings work well on shafts that are corrosion resistant, such as hard-anodized aluminum shafts, chrome plated shafts or shafts with a number of different surface treatments, such as salt bath and gas nitride finishes.

- **Strength:** The shafting in an application must be able to withstand the stressors of the application at hand. For some high-load applications, certain lightweight shafts may be exposed to deflection.

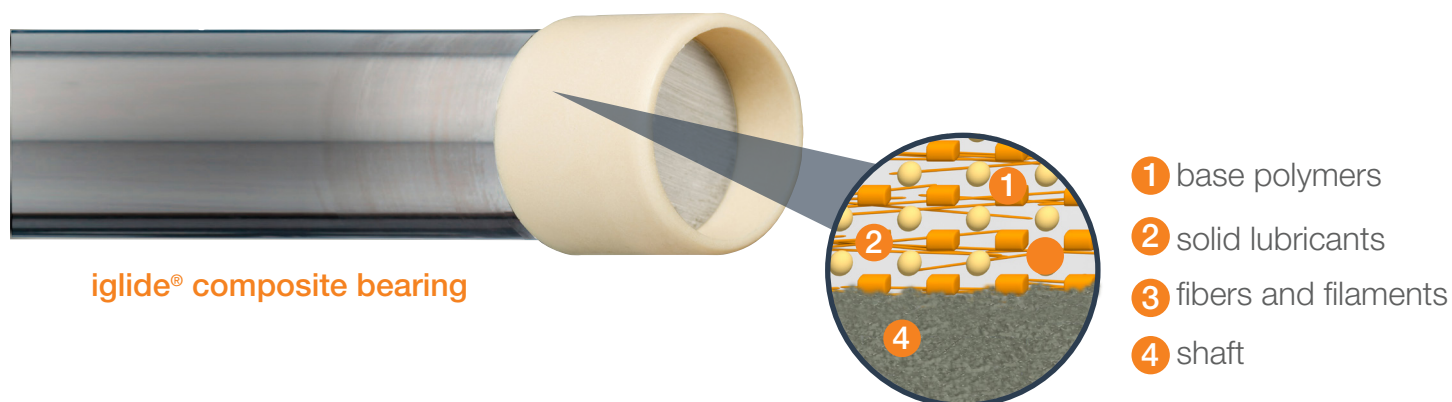
- **Magnetism:** Many igus® customers, especially those in the medical technology industry, have applications that require non-magnetic components. iglide® bearings themselves are non-magnetic, but to suit these types of applications, it is usually important that the shaft also be non-magnetic. iglide® bearings work well with non magnetic materials, including fully plastic shafts.

- **Cost:** Price is almost always a factor in determining what type of shaft can be used. Some applications require more expensive materials, such as stainless steel shafts, hardened shafts or carbon fiber shafts, while other applications can take advantage of a less expensive option.



2. Roughness: The roughness of a particular shaft material is especially important when using a self-lubricating plastic bearing.

- A shaft that is too rough acts like a file and separates small particles from the bearing surface during movement. A shaft that is too smooth can cause high wear rates, resulting in an increase in friction due to adhesion.
- Generally speaking, an iglide® bearing should be used on a shaft with a roughness of 8-64 RMS. For linear applications, the best performance is seen with a shaft roughness of 8-16 RMS, and 16-64 RMS for oscillating or rotating applications. This may vary depending on the particular bearing material or shaft selected.
- Some bearing materials require an expensive, polished shaft. However, a composite plastic that has been homogeneously blended reacts better with a rougher shaft. When an iglide® bearing moves along the shaft, a certain amount of roughness will allow the solid lubricant in the bearing to fill the valleys of the shaft and act as an optimal gliding surface (see image below).



3. Hardness: The hardness of a particular shaft material should be considered in a bearing application, for the following reasons:

- Both the shaft and the bearing must be able to withstand the load of an application in order to run properly and have long service lives. Load capacity and service life are dependent on shaft hardness.
- Some bearing materials, such as composite plastics, occasionally contain certain fibers that can cause physical damage to a softer shaft. When shafts are soft, they become smooth during the break-in phase. Abrasive points are then worn off and the surface is rebuilt. Some shaft materials, however, can cause the wear resistance of the plastic bearing to increase. Therefore, it is very important to look at not only the individual shaft and bearing materials, but how they interact. Hardness recommendations for shafting to be used with iglide® bearings are available depending on application details.

4. Shaft and Bearing Combination:

- iglide® bearings work well with a variety of different shaft materials. This allows for a high degree of design freedom, making it possible to select various shaft materials that suit your needs.
- If the shaft has already been selected when you are choosing a bearing material, the most important things to take into account are the application's load, speed, motion, shaft roughness and environmental conditions.
- The thermal conductivity of the bearing and shaft can create problems if the system's PV Value gets too high. The thermal conductivity of each material in the system will help to predict the lifetime that can be expected from the application.



- igus® has conducted extensive tests on bearing and shaft combinations under real-world conditions, which has resulted in the development of a database called the Expert System 2.0. The Expert System includes a lifetime calculator, allowing customers to enter application details and receive an expected bearing lifetime. If you have design freedom with the shaft, the Expert System can also tell you the percentage of increase or decrease in lifetime based on changes to shaft material. This tool is available for use by anyone and is found at [igus.com/iglidurConf](https://www.igus.com/iglidurConf).

Wear of iglide® Bearings (G300, J, M250, T500) with Different Shaft Materials

