

How to Lower driving force and friction with hybrid linear bearings

Many customers are interested in using self-lubricating plastic linear bearings, but they are often challenged with getting manual applications to handle heavy loads, and they struggle with drive force configuration. To avoid some of these obstacles, igus® created the drylin® WJRM hybrid linear bearing system. These hybrid linear bearings are a cost-effective solution that are capable of:

1. Reducing bearing friction
2. Reducing required drive force
3. Allowing the system to function without constraints of [the 2:1 rule](#)

Standard [drylin® self-lubricating plastic bearings](#)' low-friction qualities come from a tribologically-optimized plain plastic bearing surface, which slides, rather than rolls, along the shaft. The plain bearing itself offers low friction under low loads. However, for higher loads, or manual operation, lower initial bearing friction may be required. This reduces the drive power that is required to quickly and easily move the system by hand.

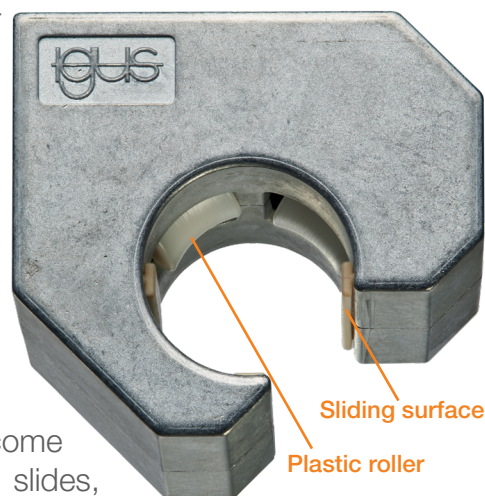
In a hybrid linear bearing system, a combination of plain and roller bearings work together: integrated rollers achieve low drive forces, while the sliding effect of the plain bearings protects against lateral forces. This combination allows for the absorption of aggressive forces, which can be key in manual sliding applications; for example, to manually move a 100 pound door with a sliding linear bearing would require approximately 25 pounds of drive force (estimating a static coefficient of friction of 0.2 - 0.25 and minor misalignment). By integrating a hybrid bearing system, this force requirement could be reduced to only five pounds, making for easier manual operation. In this type of application, we would recommend using two hybrid bearings on the top and two standard drylin® linear bearings below to act as guides.

Options available

drylin® WJRM hybrid linear bearings are a cost-saving alternative to cam roller bearings or linear ball bearings. They also maintain easy linear movement without the need for external lubrication. There are two types of drylin® self-lubricating hybrid linear bearings available: those equipped with one roller bearing ([Types 01](#)) and those equipped with two ([Type 21](#)).

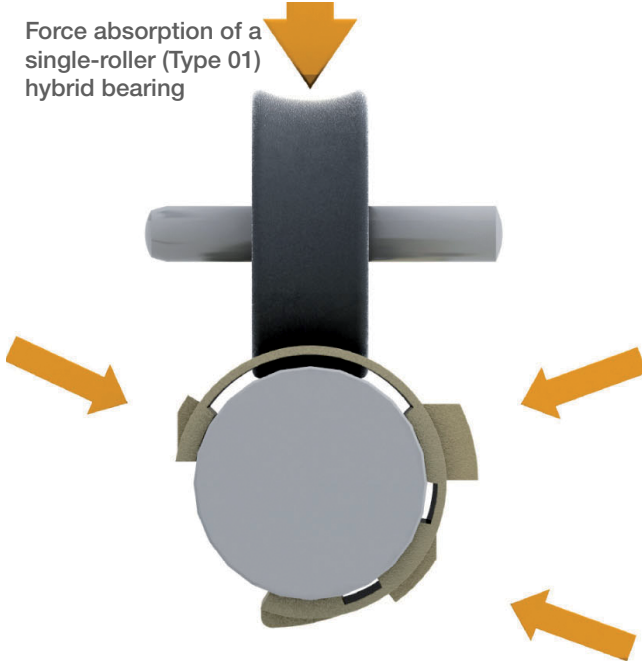
Type 01 hybrid bearings

A single bearing housing paired with a linear plain bearing liner is equipped with an integrated plastic roller. The plastic roller absorbs forces applied by the load, and should be installed so that the bearing load is applied in the rolling direction only. Other load directions are possible with single-roller hybrid bearings, but this may create greater friction forces.



Type 21 double-roller hybrid bearings

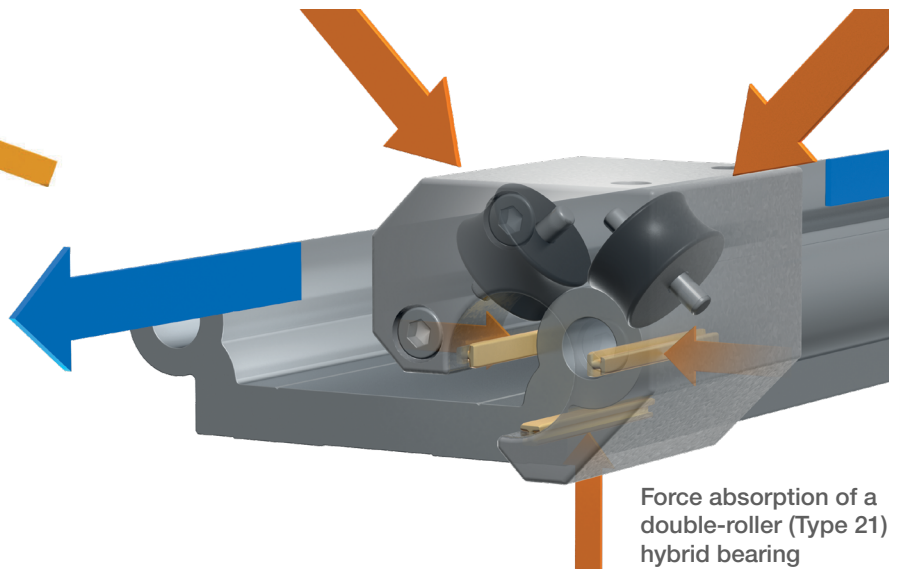
Force absorption of a single-roller (Type 01) hybrid bearing



Double-roller hybrid bearings are composed of two plastic bearing rollers set at an angle of either 70 degrees or 80 degrees. The two rollers offer a higher load capacity than single-roller hybrid bearings, and help to reduce friction forces caused by cantilevered loads. The configuration of the rollers also allows for side-mounted drives and low-profile installation.

Integrating a hybrid bearing system into applications such as machine doors, camera sliders or control panels can even reduce friction forces and ease the operation of applications where the 2:1 rule is not applied.

The 2:1 rule states that if either the drive force (F_a) or applied load force (F_s) are a greater distance than twice the bearing length (w_x), a binding or chattering of the system can occur. When using a hybrid linear bearing, this ratio can be greatly extended, making a 5:1 rule more appropriate.



Force absorption of a double-roller (Type 21) hybrid bearing

To learn more about drylin® linear systems, or for questions about your individual application, contact igus® directly via email at sales@igus.com or by calling 800.521.2747.