igus®

tech talk

3 Tips For Selecting a Linear Slide Table

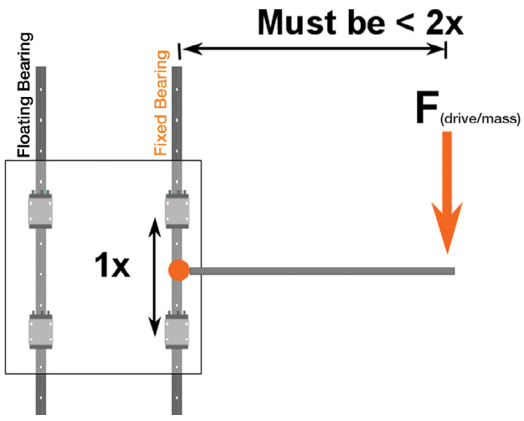
Whether you are looking to design your own linear slide table assembly, or purchase a ready-made, off-the-shelf system, there are a huge number of options available on the market today. Component choices, such as plastic or bronze lead screw nuts, ball screws, and belt-drives can make selecting the best slide table system difficult.

In this brief tech talk, review 3 quick tips to help make your selection process easier.

Tip #1 - Plastic or metal linear bearings?

Tribologically optimized plastic materials can be used in a wide range of applications, often outperforming metal, while offering lower purchasing costs, lower weights, and reducing the need for maintenance.

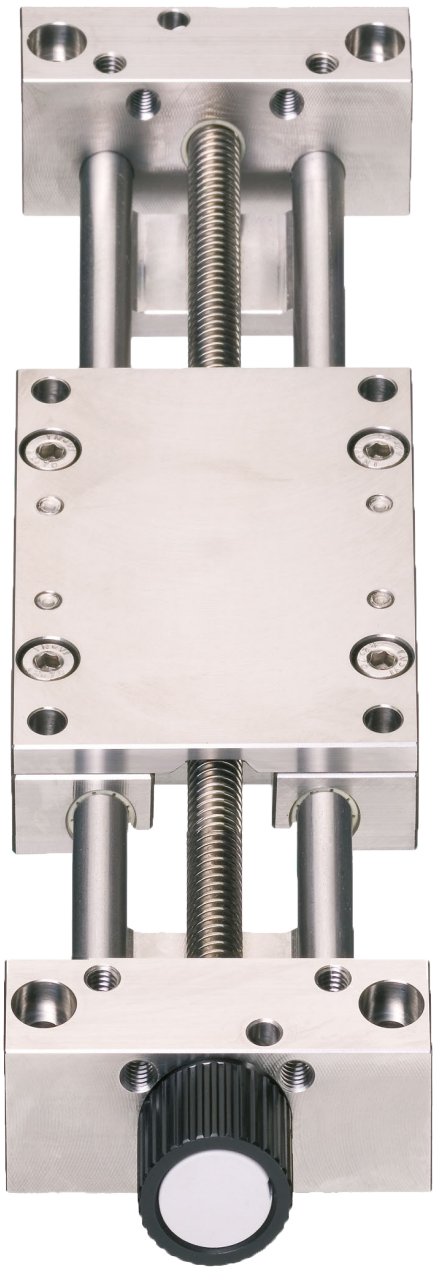
Plastic options are excellent in dirty applications, as well as laboratory settings, as their ability to self-lubricate reduces the risk of contamination in clean environments, lowers the risk of bearing seizure due to dirt and dust build-up. Ball bearing linear guides, while typically more expensive and requiring lubrication, may be required for applications needing micron-level precision.



When using plastic bearings in linear applications, it is important to use proper spacing between bearings along the axis of travel. The typical rule of thumb is what we call the "2-to-1 Rule" (visualized left), which states that the load's center of gravity and the drive-force must be ≤ 2x the distance between the bearings. If this rule is not followed, your system is likely to chatter or bind, which is especially true with belt-driven systems which often have high speeds and accelerations, as this principle is a result of friction and inertia. To be sure you're abiding by this rule, you can implement a longer plate or an extra carriage into your linear slide table. If your application is slower-moving, or handling static loads, this 2-to-1 rule is not as crucial. You may need to use ball bearings or lubricated bearings in applications with very high cantilevers, or when the linear positioning tolerance needs to be less than ±0.008 inches (0.2 mm).

Tip #2 - Lead screw or belt drive?

Typically, actuators using lead screws are more ideal for lower cycle, or positioning applications. For longer strokes belt-driven systems are more ideal. Lead screw systems also can generate higher forces than other types of actuators, so moving heavy loads at low speeds is possible. There are two types of lead screw tables offered by igus® to handle axial forces: ones that use plain bearings, and ones using ball bearings. The plain bearing versions are limited to applications that are under 100rpm, making them better suited for applications that use a hand wheel or thumbscrew to position the system. Actuators using ball bearings can run up to 1500 rpm, making them ideal for



motorized applications. Another consideration of a lead screw actuator is lead screw length – the longer the screw and the higher the rpm the more likely resonance can occur between the plastic lead screw nut and screw. For example, a table using a 14 diameter x 4 mm lead screw, with a stroke length of 100 mm can achieve 1500 rpm, while the same lead screw with a 500 mm stroke is limited to 400 rpm. Higher helix lead screws can be used to increase speed, but there is a loss of torque generated by the system's decreasing load capacity. Lead screw systems are available in multiple materials including all-stainless systems for wash-down or harsh environments, as well as low weight and non-magnetic carbon fiber materials. Lead screw nut systems are capable of +/- 0.1 mm (0.004") linear positioning tolerance, but this can be reduced considerably by using preloaded lead screw nut systems.

Belt-driven systems, sometimes referred to as toothed-belt or timing belt systems, are generally a better choice for higher speed and longer stroke applications. DryLin® ZLW belt drive systems are capable of speeds up to 5 m/s (16.4 feet/sec). Typical belt-drive systems are limited to lower loads, however higher load options exist such as the ZLW-1660 and the new ZLW-20-120. Generally speaking, systems that use polyurethane belts with steel reinforcements work better for higher loads, while those using glass-reinforced neoprene belts offer lower cost solutions. Belt-driven stages are typically less accurate than lead screw systems. The usual linear positioning tolerance is between +/-0.2 mm (0.008") to +/-0.35 mm (0.014"). For ultra lightweight designs, these systems are also available using carbon fiber guide rails.

Tip #3. Off-the-shelf or in-house assembly?

The standard choice for created an assembled system was to set aside the time required to design, draw, purchase, and assemble the system, select and purchase all necessary components, and test the assembled system for quality control.

When adding up all these associated costs, a pre-assembled system may be a more cost-effective approach, so long as offered systems are available to fit your application's requirements. A number of off-the-shelf solutions are available through the DryLin® linear slide product family, including belt or screw driven options, a range of material choices, and even fully motorized slide table systems.

To make your selection process even easier, a number of online tools are availble for DryLin® linear systems, including a slide table configurator. Simply input your application's parameters, and select and order from suitable DryLin® options.

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.