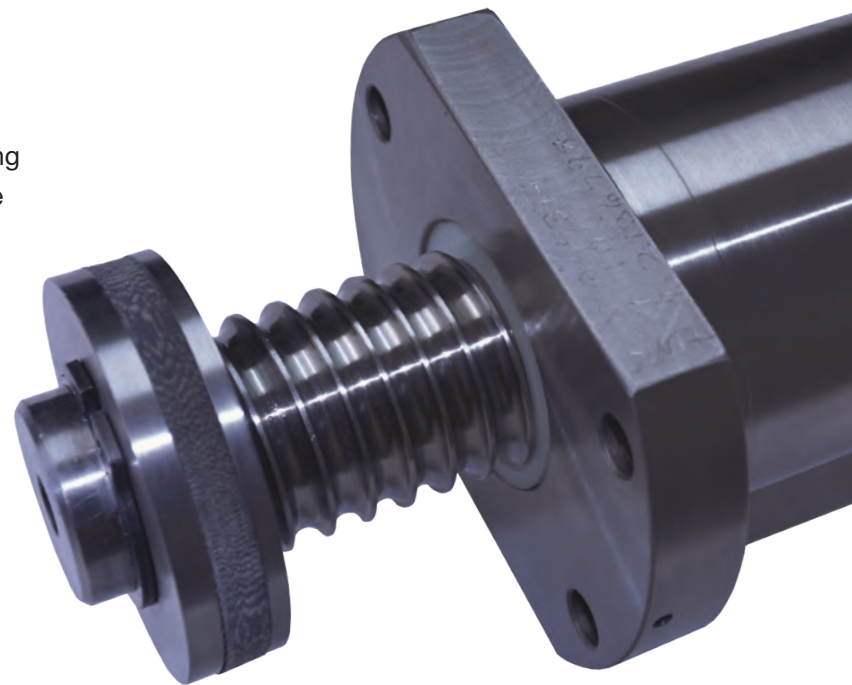


Specialized Elastomer Washers Protect Ball Screws Against Shock Load Damage

Protecting industrial machinery and equipment against shock and vibration is a key requirement for keeping manufacturing operations running smoothly and minimizing downtime. Damping pads are often used to achieve these goals, cushioning equipment and absorbing shock and impact before these forces can have a negative impact on productivity. As an example, PAD plates from Ace Controls are widely specified as shock-absorbing underlayment for industrial presses and large machinery in manufacturing plants, underneath cranes and pipelines as impact plates and in a wide range of other heavy-duty applications.

Because these rugged fiber and elastomer pads offer such high performance in absorbing shock loads, PAD material is now being specified not just as a way to support heavy machines but also as a way to absorb shock within the machine. One example is PAD's recent adoption as an impact-damping washer in a line of robust ball screws from SKF.

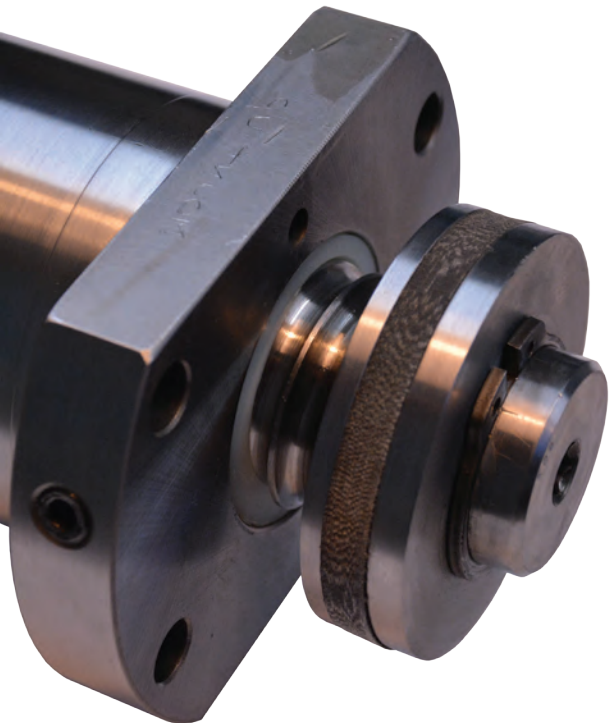
Overtravel protection. In this design, PAD washers are inserted between a pair of steel washers and secured by a snap ring at each end of the ball screw. The elastomer washers act as an additional safety mechanism in the event of a machine malfunction and serve to absorb shock loads that might otherwise cause permanent and costly damage to the ball screw itself. Here's how it works: As the nut travels along the ball thread length, there is a risk that the nut may overtravel either end of the ball screw. No



matter how well the control system is designed, overtravel scenarios are an inevitable and common occurrence in linear motion applications, especially those involving high speeds and dynamic loads. To prevent the nut from overtraveling the ball thread length, the PAD washer that is sandwiched between the two steel washers absorbs the shock of the nut when it makes impact. By absorbing this impact energy, the PAD washer helps to prevent machine damage and avoid costly repairs and downtime. Typical examples of shock-induced ball screw damage include cracked screws, broken encoder mounts and ruined raceways, all of which can be avoided by using a rugged elastomer washer as an additional safety feature.

PAD washers are not a replacement for components such as limit switches and end stops. Instead, they provide an inexpensive method of additional insurance against common and unavoidable over-travel crashes. Like an automobile bumper, PAD washers can permanently deform under excessive shock loads and must be replaced after a significant crash. However, keep in mind that replacing a washer for less than \$100 is much more economical in terms of both time and expense than replacing a high-end ball screw that costs many thousands of dollars. It is far more economical to destroy a simple washer than a sophisticated screw assembly.

Other impact solutions for ball screws include neoprene washers and springs. However, neoprene often suffers from chemical compatibility issues and does not absorb as much force at a given thickness compared to PAD elastomer washers. Springs may also be used as shock absorbers, but they are difficult to specify correctly and require a large footprint, taking up valuable ball screw real estate. PAD washers are much more forgiving than springs in terms of both specification challenges and design constraints.



PAD washer properties. Ace Controls offers its PAD material in several different shapes and sizes, including pads, washers and bushings. Since they're easy to produce in any diameter, all washer styles are customizable to fit a wide range of application needs. Loads range from 0 to 2,000 psi. PAD materials combine isolating elastomer damping with the reinforcing effect of fiber inlays, creating robust cushioning for a wide range of heavy-duty tasks. For example, PAD plates can withstand compressive loads to 10,000 psi (69 N/mm²), depending on their size. The material can also be cut and built up in layers. The PAD material displays superior compression properties and a low creep tendency of roughly 5% when under a continuous static load. With regard to dynamic loads, these can be very high with large, fast-moving ball screws. PAD washers provide reliable protection as they can absorb shock loads as high as each ball screw's static peak load rating.

Due to its superior performance as an additional safety measure on SKF's high-precision ball screws, the company is now offering PAD washers as an option on its entire range of one to six-inch-diameter screw sizes. Customer feedback continues to be encouraging, with documented savings in terms of avoiding costly downtime for equipment repairs. Based on the success of this novel ball screw design, engineers at Ace Controls are now recommending the use of PAD material in applications beyond machine underlayment that require shock and vibration damping in an economical and reliable format.

To learn more, please visit: www.acecontrols.com