



The Difference Between Bumpers and Cushions for Pneumatic Actuators

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Actuators are used in a wide variety of equipment and in a broad number of industries. During repeated operation, multiple actuators can easily ramp up the noise level in your factory, which can cause employee discomfort as well as stress due to working in a noisy environment.

Further concerns might be actuator life cycles, and the costs related to repair, replace, and downtime due to failures. Bumpers are best for applications where multiple actuators are constantly running in a plant to significantly reduce the noise.

When actuators travel a full stroke the internal piston contacts the cylinder's end cap. For high-speed or high-load applications, that can mean a loud and sudden impact, which leads to a loud noise as well as premature actuator wear. Cylinders that incorporate bumpers are quieter and last longer.

Bumpers (Fig. 1) are made out of a thin pad of material, typically a type of urethane or something with similar material characteristics that equally reduces metallic noise at the end of the stroke. This produces a cylinder with quieter operation, which is a big benefit for employees who work near such loud equipment, especially when multiple actuators are operating. These thin pads can be attached directly to the piston or retained in the end caps. The overall effect of adding bumpers is mostly related to dampening the sound of the piston hitting the end cap. They provide minimal to no reduction of kinetic energy at the end of travel. Changing the thickness or durometer of the material can enhance the effectiveness of the bumper.

Check with your manufacturer, because bumpers may or may not be available on certain series of product, while some actuator series come with them as standard. Because bumpers are designed so thin—only to reduce noise—they are not designed to dissipate large amounts of kinetic energy. Over long periods of operation, this can cause damage to the bumper as well as the actuator if allowed to go on too long.

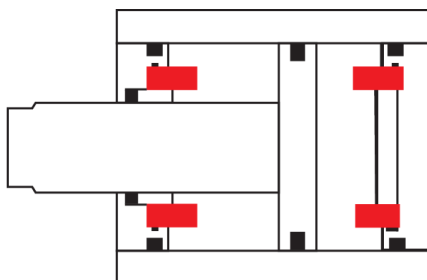


Fig 1: Bumpers are used to decrease noise created when a piston contacts the cylinder's end cap.

Adjustable Air Cushion Technology

Adjustable air cushions (Fig. 2) decelerate loads near the end of the stroke to reduce noise, similar to bumpers, but also reduce the high impact that bumpers are not designed to handle. In an adjustable air cushion design, the speed of an air cylinder is controlled by the flow of air in and out of the cylinder. Restrict the flow of air and lower the speed.

The operation of an adjustable air cushion relies on a part that is attached to the piston/rod assembly, called a spud, that takes up a certain length and is located next to the piston. This spud can be located on the front end, back end, or both ends

of the cylinder depending on where the customer requires the cushion effect to take place. When the piston nears the end cap, the cushion spud engages with special seals so that the cushion of air slows down the piston. The cushion spud passes through the seal and eventually closes off the direct path of air out of the port. This causes the rod to slow down just before the end of the stroke.

The air is then re-directed through an orifice before it exits the cylinder. The size of the orifice can be adjusted by a screw that is accessible on the outside of the end cap. Essentially, this is operating as a built-in needle valve at the end of travel. If the orifice is reduced in size, the cushion effect is greater and the cylinder will move slower at the end of travel. If the orifice is opened up, or if the seal is removed, the cylinder will move faster at the end of stroke. Customers can adjust the screw manually to get more or less cushion effect depending on the load and speed of their application, and to ensure the piston does not slam into the end cap at the end of travel.

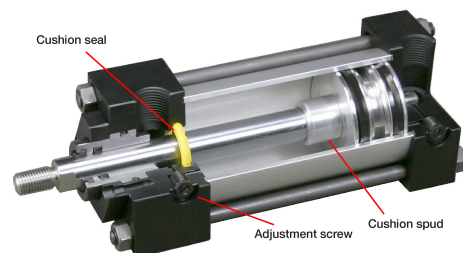


Fig 2: Cushions slow the piston down prior to hitting the end cap of the cylinder using a volume of air.

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Most actuators of this type offer a wide variety of cushion options across multiple cylinder lines. Flexibility of design is available, allowing engineers to specify cushions on the rod end, the cap end, or both ends of the cylinder depending on the specific needs of their application. Models are also available with cushions of multiple lengths. For example, longer cushion lengths can be used for applications having heavier loads, while shorter cushions are for applications that carry lighter loads.

Cushions are best used for high-cycle applications that have a load on the cylinder. High speed and loads can create significant kinetic energy. If the cylinder is constantly traveling the entire stroke length and hitting the end cap, it can cause significant wear on the cylinder over time. Cushions will slow the stroke down so it does not slam into the end cap, extending the life of the cylinder.

Auto-Cushion Technology

An auto-cushion technology is also available. This is a newer and innovative method that works similarly to the adjustable cushion mentioned above. However, in this design, the cushion spud also incorporates tapered grooves, which allow the cushion effect to automatically adjust to any load and speed, which then brings the piston to a controlled stop. Only in extreme applications would the customer need to manually adjust the cushion screw when using this technology.

Getting the auto-cushion option (which is currently only available on a select number of cylinder styles) eliminates the need for the customer to spend valuable time manually adjusting the cushion for each actuator, every time a new cylinder is installed, or whenever a product change over occurs.

In conclusion, depending on your application, there are different ways to manage your actuators and their potential noise levels and operational capabilities. Understanding who will be nearby, what loads are required, and how dynamic the application can all help you make the right selection.

Finally, contacting the company you are purchasing from and talking with their engineers can help you better understand their offerings as well as what might be the best fit for your needs.

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