Maxum Hardware

Gas Spring – Frequently Asked Questions

What is a Gas Spring? Ameritool Gas Springs are self-contained, pneumatic devices capable of producing very large forces (5 - 1,200 lbs.) from a compacted piece. A gas spring consists of a piston attached to a shaft moving within a sealed cylinder charged with nitrogen. The piston has an orifice which allows gas pressure to pass through and act equally on both sides. It is the pressure acting on the shaft cross-sectional area which provides the spring its force.

The output forces are the result of the differential between the pressure in the cylinder and the atmospheric pressure outside the cylinder acting on the cross section of the piston/shaft. As the piston/shaft is compressed into the cylinder the internal pressure increases according to the volume of gas displaced by the rod. This increase in force is called the K-Factor. Because they operate on simple pressure differentials, gas springs will perform as well in the vacuum of space as they do on land.

What is K-Factor? K-factor is the ratio of the compressed force (P2) and the extended force (P1). As governed by Boyle's Law, P2 force is always greater than the P1 force. During compression, the volume of the piston/shaft introduced in the cylinder displaces an equal volume of gas, increasing the pressure in the cylinder which increase the force of the spring.

What is Gas Spring Force? Gas spring force is often designated as P1 which is the force measured 1 inch from full extension. Force is a function of the charge pressure in the cylinder acting on the cross section of the rod. The smaller the diameter of the piston/rod the lower the force at the same pressure. For example, a gas spring with a 9/16 (14mm) rod charged to 1000 psi will have a P1 force of 200 pounds while a spring with a 5/16 (8mm) rod charged to the same pressure will have a P1 force of 65 pounds.

How does Temperature affect the Life and Performance of Gas Springs? Temperature affects gas springs in two ways. As the temperature of the gas spring changes, the internal pressure also changes. As internal pressure changes, so does the output force.

Very high or very low temperatures can adversely affect the gas spring's ability to retain its gas charge. At very high temperatures, the permeability of the seal increases and gas molecules may diffuse through the seal more quickly. Gas Springs can support and perform reliably at temperatures ranging from -40°F to 300°F (-40°C to 148°C).

How does Temperature affect Gas Spring Force? The force produced by a gas spring varies linearly by .19% for each degree F change from ambient temperature of 70 degree F. For example, a 30 degree change in temperature results in a 5.7% change in spring force (30 x .19% =5.7%).

What is the preferred Mounting Orientation of a Gas Spring? The type of damping designed into the unit determines the mounting orientation of a damper. Extension and compression dampers require specific orientations.

How does a Tension Spring Work? Tension gas springs work by keeping the piston rod in the closed position, operating in the opposite direction of other gas springs. Since a tension gas spring is compressed in its relaxed state, it always returns to its relaxed state once extension is stopped. Extension dampers should be mounted shaft down to provide consistent damping for the full stroke. If mounted with the shaft pointing up, the unit may experience inconsistent damping or no damping at all.

Compression dampers should be mounted shaft up to provide consistent damping for the full stroke. If mounted with the shaft pointing down, the unit may experience inconsistent damping or no damping at all. Lubrication of the seal is not a problem due to the high volume of oil contained in a damper.

What is the expected Life of a Gas Spring? When calculating the approximate life of a gas spring, one must first determine how much force the support can lose before the user considers the support too weak in the application. The time it takes to lose this amount of force is considered to be the life of the gas spring.

All gas springs lose output force over time. The rate at which force loss occurs varies greatly by application. Factors which affect the rate of force loss include size of the support, orientation, number of cycles, ambient temperature, vibration and the geometry of the application. Considering all of the variables, it is very difficult to estimate life accurately without actual testing of the application.