

Product Name: Temperature Compensation (TCM)

Product Description:

Temperature plays a big part with gas springs. Output force will increase as the temperature rises and decrease as it drops. Gas springs function by utilizing compressed nitrogen gas to provide the force to extend the shaft via a differential in surface area of the piston. It is these gases that are affected by the temperature changes. In all applications, one must use a gas spring with enough force at the low end of the temperature range. In some applications when designing a gas spring to operate at say -20C and allowing for 1% to 2% force loss per year the result is a gas spring that has unacceptably high forces when hot – this is when a TCM can provide assistance. There are a few main advantages to using an AVM Gas Spring with a TCM (Temperature Compensation Module):

1. Increases extended position spring force (P3) over similar standard gas spring design at cold temperatures (below freezing).
2. Then gas spring is below -5°C, the TCM (Temperature Compensation Module) valve is open.
3. Provides the lowest possible closing efforts while maintaining safe cold hold – open force.

There are some design requirements for a gas spring with TCM that need to be reviewed with engineering to ensure proper functionality. Please contact your local AVM representative who will be able to assist you.

How A TCM Functions

During the pressurization of gas into the front chamber, the bi-metallic valve in the TCM is forced open by the rising gas pressure, allowing pressurization of the rear chamber. This valve does not close until the pressure is stabilized during crimping of the tube over the front bushing. The pressure in the front

chamber is only slightly higher than the pressure in the rear chamber. This relative pressure setting will remain until the first complete compression stroke.

First Compression Stroke

As the gas spring is compressed, the pressure rises due to the reduction in volume of the front chamber caused by the intrusion of the rod. During the first compression stroke the bi-metallic check valve is opened by the increasing pressure, thus equalizing the pressure in both chambers. Once the pressure has equalized the TCM valve will close. This process is referred to as “setting the TCM.” At temperatures above 40°F, a gas spring with a “set” TCM operates using the volume of gas in the front chamber only, as if the rear chamber did not exist.

Extension After Compression

After the TCM has been “set”, the pressure in the front chamber will lower relative to the rear chamber as the gas spring extends. This lowering of the gas pressure in the front chamber is what allows lower handle loads to be achieved at temperatures above 40°F. During temperature changes that stay above 40°F the percent difference between the front and rear chambers remains constant. Because the pressure difference stays constant the TCM will not be forced open during operation at temperatures above 40°F.

Cold Operation

When the temperature falls below 40°F and the spring is in the compressed position, the bi-metallic valve in the TCM will open. By opening the valve the operating volume of the gas spring becomes that of both the front and rear chamber. The slight pressure difference that existed before the TCM valve opened stabilizes into one pressure. The gas spring at this point exerts about the same output force as before the TCM opened. However, as the gas spring extends the rate of decompression is less than when the TCM was closed. This occurs because the shaft now occupies a smaller percentage of the internal gas spring volume. Since the rate of decompression is lower the output force

of the spring decreases less over the stroke of the gas spring, resulting in a higher output force at the extended position.