

BEST PRACTICES 2.0

Enhance Machine Safety with Locking Cylinders

Stopping a pneumatic cylinder in emergency situations or during regular operations is essential to machine safety. Although there are many ways to solve this challenging application, stopping the flow of compressed air using an air circuit combined with a mechanical locking cylinder will be the most enhanced level of safety.

The energy in compressed air can be controlled and directed by solenoid valves to produce cylinder motion, but it can also be harnessed to abruptly stop cylinder motion.

The common way to stop cylinder motion is to direct the compressed air through a 3-position, spring return, center closed solenoid valve to trap the pressurized air on both sides of a cylinder in an e-stop situation. When electrical power is interrupted purposefully (e-stop) or accidentally, the spring return function will position the valve back to the center, trapping the pressurized air, thus halting all pneumatic motion.

Although stopping a cylinder with a pneumatic circuit can be highly effective, this method alone is not recommended for maintaining the cylinder in its stopped position, especially when it is bearing a heavy vertical load.

The primary reasons for not solely relying on a 3-position, center closed valve for holding cylinder position:

- Risk of air leaking from the seals of the valve's outlet ports
- Risk of air leaking from the seals of the valve's spools
- Risk on the spring force holding the valve in the center closed position
- Risk of cylinder drift caused by the area differential on the piston extend side vs. the retract side
- Risk of air leaks from the overall system (fittings, tubing etc.)

All of these risks can be mitigated by adding a mechanical rod lock to the cylinder.

Locking cylinders come in two types, locking type or end lock of the rod at extension or retraction, and a braking type or fine lock, where the piston rod can stop and maintain a position at mid stroke. Both types of locking mechanisms can be activated by either when air pressure is lost or when air is pressurized.

Some common applications for locking or braking cylinders are:

- Press, clamping or holding a cylinder position for welding, drilling etc.
- Stopping a cylinder to maintain a safety zone during repairs
- Holding a static load
- Drop prevention
- Emergency stop

Note: Installing a pressure regulator and flow controls to balance the air pressure for the circuit to adjust for piston area differential is also recommended when using an end lock or fine lock cylinder. For more on locking cylinders, visit www.smcusa.com.