



## Something Old, Something New

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Although the control features provided by an LRT are not new, their marriage to cost-effective pneumatic cylinders is. As a result, designers can now take advantage of the flexibility of an LRT but continue to work with the cost effectiveness of pneumatics to power machine elements.

**Fact:** Pneumatic cylinders have long been used for the positioning of machine elements in manual and automatic equipment.

**Fact:** Designers often incorporate switching devices into machines in order to get a signal that informs the control system when the machine element is properly positioned.

**Fact:** Many pneumatic cylinders are available with switching capabilities added to the cylinder package. By adjusting the location of the switching device, any point along the stroke of the cylinder can be identified.

**Fact:** The problem with these switching devices is they signal discrete positions only. As a result, changing the signal position requires repositioning the switching device.

Perhaps this last fact is a problem you know all too well? Well, a technology is now available in pneumatic cylinders that offers significantly more versatility in position sensing. A linear resistive transducer (LRT) built into the cylinder provides a constant voltage output that varies linearly with the movement of the cylinder piston. The LRT is connected to a known voltage potential using two of the three leads that extend from the blind end cap of the cylinder. The third lead is used to read the voltage as it varies from near zero to near the maximum of the applied voltage as the piston moves from one end of the cylinder stroke to the other.

### Benefits of an LRT

An LRT provides an analog signal quite different from the discrete signals received from switching devices. Since a signal is always present, varying only in magnitude, it's much more versatile than discrete switching devices. An LRT can perform the same tasks as discrete switching devices by feeding its analog signal into a control system which compares the signal to preset voltage levels. When the analog signal reaches one of the preset voltage levels, the control system knows the piston has reached the desired position. This set point can be reached from either direction of piston travel with the voltage increasing or decreasing.

One of the benefits of using an LRT instead of traditional switching elements is that an LRT doesn't suffer from high levels of hysteresis common among switching devices. Another benefit is that its switching positions don't have to be set and adjusted physically on the machine; they can be set and adjusted at the control system by changing the preset voltage levels.

## Application Notes



This position feedback cylinder is designed to offer continuous position sensing for a variety of applications.

An LRT in a pneumatic cylinder has uses far beyond traditional switching devices. For instance, by coupling an LRT-equipped cylinder to proportional pneumatic valving, the cylinder can be made to seek and lock onto predefined positions along its stroke. As previously described, these predefined positions are set by adjusting voltage set points at the controller. Maintaining mid-stroke positions can allow the machine to perform certain functions without engaging physical stops and then move the machine element to other positions for subsequent operations.

Using computers to control a machine that has a pneumatic cylinder with an LRT enhances the versatility of the LRT. The computer can automatically adjust the set points for the LRT after detecting features the machine is working with such as size or shape of a part. This allows for reduction in machine set-up as the machine's work varies, and reduced set-up translates into greater productivity.

An LRT in a pneumatic cylinder can also be used to determine velocity, acceleration, and deceleration of a machine element. This information can be valuable in coordinating the movement of other machine elements with the movement of the LRT-equipped cylinder. In fact, this information can also be used to affect the acceleration, velocity, and deceleration of the LRT-equipped cylinder itself.

In addition, an LRT in a pneumatic cylinder can be used as a measurement device. The voltage from the LRT at an initial piston position can be recorded and compared to the voltage from the LRT after the piston is moved to a new position. The difference between the two voltages can be translated to determine the actual physical distance the piston moved.

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